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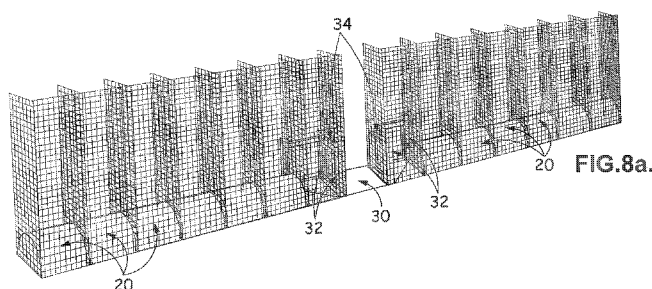


FIG. 8a.

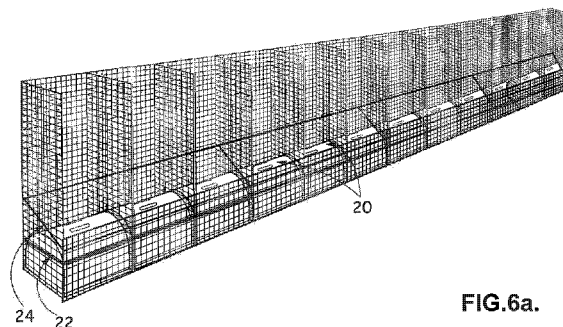


FIG. 6a.

(57) **Abstract:** The present invention relates to a security wall for deployment in crowd control and/or containment, the security wall comprising first and second security barriers and at least one connection member, the first and second security barriers comprise at least one compartment bounded at its front by a front panel for providing a barricade, at its rear by a rear panel, at its sides by respective side panels connecting the rear and front panels, and optionally at its bottom by a bottom panel connected to at least two of the front panel, the rear panel, and the respective side panels; wherein a) the at least one connection member extends across at least a part of the front panel, the rear panel, the bottom panel, the lower end, the upper end and / or the interior of the compartment of the first and second security barriers, or b) a space exists between the first and second security barriers in the security wall, the space being spanned by the at least one connection member.

SECURITY BARRIER

The present invention relates to a security barrier, and to a crowd control security barrier, particularly to a rapidly deployable and easily transportable crowd control security barrier which can be preferably be recovered after use, and re-used.

Security barriers which are the subject of this invention may be used for temporary crowd control purposes, for example at conferences, summits, concerts, festivals, marches and potentially hostile congregations of people. In some cases, security barriers may also be deployed to afford temporary or semi-permanent access protection to protect military, diplomatic or civilian installations from personnel assault. For convenience, such security barriers will be referred to as crowd control security barriers.

One common type of security barrier currently in widespread use comprises a wire mesh fence panel extending between two posts, each of which is anchored in a supporting block, generally of concrete or recycled rubber. Such security barriers have been deemed appropriate for many uses, but they are not sufficiently stable or robust to withstand a determined assault, either by an individual or by a crowd attempting to breach the barrier. Other common types of security barrier are based upon similar principles, although the nature of the panel and its means of support may vary somewhat.

WO-A-90/12160 discloses wire mesh cage structures useful as gabions, security barriers with a different function from the crowd control security barriers of the present invention. These gabions are primarily for securing areas against assault by small arms fire, rockets missiles and vehicle-borne explosives, and also by elemental forces such as floods, landslides, avalanches and the like. The gabion cage structure is made up of pivotally interconnected open mesh work frames which are connected together under factory conditions so that the cage can fold concertina-wise to take a flattened form for transportation to site, where it can be erected to take an open multi-compartmental form for filling with a suitable fill material, such as sand, soil, earth or rocks.

WO-A-00/40810 also concerns a multi-compartmental gabion-type security barrier which folds concertina-wise for transportation, and which comprises side walls extending along the length of the multi-compartmental security barrier, the side walls being connected at spaced intervals along the length of the security barrier by partition walls which are formed from two releasably connected sections, which after use of the security barrier can be released, and the security barrier unzipped for recovery purposes.

Existing crowd control security barriers have certain disadvantages with respect their efficacy, particularly in the face of determined assault. Although different problems pertain to different types of barrier, generally they are too easy to scale, topple, dismantle and/or otherwise breach. Gabion type

security barriers have not generally been used as crowd control security barriers, and are generally not suited for this purpose.

WO2008/020247 discloses a security barrier which is rapidly deployable and easily transportable and which can be recovered after use, and re-used.

There is a need for an improved security barrier, which is robust, not easily breached, which may include an opening or portal which is resilient and capable of withstanding high impacts.

Thus, according to a first aspect of the present invention, there is provided a security wall, the security wall comprising first and second security barriers and at least one connection member, the first and second security barriers comprise at least one compartment bounded at its front by a front panel for providing a barricade, at its rear by a rear panel, at its sides by respective side panels connecting the rear and front panels, and at its bottom by a bottom panel connected to at least two of the front panel, the rear panel, and the respective side panels; wherein: a) the at least one connection member extends across at least a part of the front panel, the rear panel, the bottom panel and / or the interior of the compartment of the first and second security barriers, and / or b) a space exists between the first and second security barriers in the security wall, the space being spanned by the at least one connection member.

As will be recognised, the security wall of the present invention has a wide range of applications. For example, it can be used for deployment in crowd control and / or containment. Alternatively, it may be deployed to afford temporary or semi-permanent access protection to protect military, diplomatic or civilian installations from personnel assault.

The security wall of the present invention comprises at least two security barriers. However, in preferred embodiments, additional security barriers are also present. The security barriers employed in the present invention may include only a single compartment, or a plurality of compartments. In especially preferred embodiments, the security barriers comprise 1 to 5 compartments, 1 to 4 compartments or most preferably, 1 to 3 compartments.

The security barriers may be single layered, i.e. where the compartments are all adjacently located to each other. However the use of multi-layered barriers which include one or more compartments positioned on top of other compartments in the respective barrier as the first and/or second security barrier is envisaged within the scope of the invention.

The compartments may have substantially identical dimensions or may differ in size. In certain embodiments of the present invention it is preferable that the compartments in the first and/or second security barriers, when erected, have the same shape in cross-section. For example each of the compartments in the first and/or second security barriers may be square, rectangular, or any other polygonal shape in cross section.

Additionally or alternatively, the compartments in the first and/or second security barriers may include correspondingly sized panels. For example, the front panels, the rear panels, the bottom panels and/or the side panels present in the first and/or second security barriers may be of generally consistent height and or width. In this context, 'generally consistent', is used to mean that the height and/or width of the respective panels in the first and/or second security barriers varies by less than about 50%, less than about 20%, less than about 15%, less than about 10%, less than about 5%, or that there is 0% variation, i.e. the height and/or width of the respective panels in the first and/or second security barriers is truly consistent. Where the 'height' of the bottom panel is discussed, reference is made to the dimension of the bottom panel which spans the front and rear panels. The 'width' of the bottom panel is the dimension that spans the side panels.

Through the use of a connection member, the strength between some if not all of the security barriers can be enhanced, increasing the damage-resistance capability of the wall.

The connection member can be arranged to extend across at least a part of the front panel, the rear panel, side panel/s, the bottom panel and / or the interior of the compartment of the first and second security barriers. In preferred embodiments, the connection member extends laterally across at least a part of the front panel, the rear panel and / or side panel/s. In alternative embodiments, the outer surface of one, some or all of the front

and/or side panels of the first and/or second security barriers do not include connection members extending across those panels.

The use of any form of connection or interconnection member which extends across a front or side panel of a security barrier or wall has previously been avoided to minimise the risk of tampering or damage by miscreant elements.

For the avoidance of doubt, it is not essential that the at least one connection member extends across at least a part of the same panel or part of the first and security barriers. For example, the connection member could extend across a part or all of a side panel of the first security barrier and a part of the front panel of the second security barrier.

In certain preferred embodiments, the at least one connection member extends across at least a part of the lower end and / or the bottom panel/s of the first and second security barriers.

Additionally, or alternatively, the at least one connection member extends laterally across at least a part of the front panel, the rear panel and / or side panel/s. The use of any form of connection or interconnection member which extends across a front or side panel of a security barrier or wall has previously been avoided to minimise the risk of tampering or damage by miscreant elements.

For the avoidance of doubt, where reference is made to a connection member extending across a panel, this encompasses the connection member extending along the inside or outside of the panel.

Further, where the term "laterally extending" is used, laterally should not be construed narrowly and equated with "horizontal", but to refer to any direction of extension across a panel except vertical. In preferred embodiments, the connection member extends across different panels in the wall in different directions. For example, the connection member may pass across one, some or all of any of the panels at an angle which ranges from 0°, 5°, 10°, 15° or 20° to 10°, 15°, 20°, 25°, 30°, 35°, 40° or 45° from horizontal.

The provision of one or more connection members which span a space or opening in the wall of the present invention has surprisingly been found to impart an unexpectedly high level of impact resistance to the wall. Previously, openings in security walls had been considered as regions of weakness or vulnerability to attack. However, by providing one or more connection members which span such openings, the connection member has the effect of tying the two free ends of the wall, adjacent the opening, together and the result is that the wall behaves almost as if it were continuous and there was no opening.

The wall of the present invention comprises at least one connection member. The at least one connection member may take a wide range of forms. Where

a plurality of connection members are present, these may be the same or differ from each other.

In one embodiment, the at least one connection member comprises a plate. The plate is preferably adapted to be coupled to one or both of the first and second security barriers. For example, the plate may be shaped or be provided with features to receive or mate with or otherwise facilitate connection to components of the first and / or second security barriers.

In preferred arrangements, the plate comprises coupling means which facilitate connection of the plate to the first and / or second security barriers while also preferably providing some degree of structural reinforcement to the security wall.

The coupling means preferably comprise one or more (preferably 1 to 12, 2 to 10, or, most preferably 4 to 8) upstanding posts.

The upstanding posts may be reinforced by bracing members joined to one or more of the upstanding members and / or the plate. The upstanding posts and bracing members may take any form and be formed of any material.

In preferred arrangements, one or more of the upstanding posts and / or bracing members may independently be solid or hollow and / or have L-shaped cross section, -shaped cross section, U-shaped cross section,

circular cross section, square cross section, oblong cross section, polygonal cross section, or any other shape in cross section.

In additional and / or alternative arrangements, the one or more upstanding posts and / or bracing members may independently be formed of a plastics or metal material, for example steel.

The upstanding posts and / or bracing members may be formed integrally with each other and / or the plate or joined to each other and / or the plate using any techniques known to those skilled in the art, for example using welds or bolts. At locations where the upstanding posts and / or bracing members meet each other and / or the plate, support plates may be used to increase the strength of the joint / formation.

The coupling means are preferably positioned on the plate member such that they are located proximal or adjacent to components of the first and / or second security barriers as this facilitates coupling of the coupling means to the first and / or second security barriers. In preferred embodiments, the coupling means preferably nestle in one or more corners of one or more compartments of the first and / or second security barriers.

The plate may be formed of any material which provides sufficient tensile strength to function as a connection member in the security wall of the present invention. In preferred embodiments, the plate is formed of a plastics or metal material, for example steel or kevlar.

Additionally or alternatively, the at least one connection member may comprise an elongate member which may be coupled to two or more parts of the security wall, for example, panels comprised in one or both of the first and / or second security barriers. The connection member may be a continuous loop or it may be have free ends. Where present in the form of a member having free ends, the at least one connection member is preferably coupled to the security wall at least at or near to its free ends.

Where present in the form of a continuous loop, the at least one connection member may connect the first and second security barriers by passing around them in their entirety, or around one or more of their compartments. For the avoidance of doubt, the term "passing around" is not used to indicate that the security barriers / compartments are necessarily contacted on three of their four sides by the connection member, but simply that the security barriers / compartments are located within the perimeter of the connection member.

Similarly, for the avoidance of any doubt, when the term "continuous" is used, this should not be given its narrowest, strictly literal construction. The term should be taken to cover arrangements where the free ends of an elongate member, such as a rope or band are connected to each other, either directly, or via some form of coupling component.

In embodiments of the present invention, there may be any number of connection members of the types discussed above. Preferably, 1, 2, 3, 4 or 5

connection members are included. They may be of the same type or differ in terms of how they are arranged in the security wall, their dimension or the materials from which they are formed.

For example, if two connection members are present in the form of continuous loops, the loops may pass around different compartments of the first and / or second security barriers.

Additionally or alternatively, whether present as continuous loops or as elongate members, a plurality of connection members may pass around the same security barriers but at different heights. For example, the height of a first connection member, for example a continuous loop may, be from 0 to about 1.0m, 0 to about 0.8m, 0 to about 0.6m, 0 to about 0.5m, about 0.2 to about 0.8 or about 0.4 to about 0.6m above the bottom panels. A second connection member, for example a second continuous loop, may be located from about 0.2 to about 2.0m, about 0.3 to about 1.8, about 0.4 to about 1.6m, from about 0.6 to about 1.4m or from about 0.8 to about 1.2m above the bottom panels.

The connecting member/s employed in the security wall of the present invention may be connected to the first and/or second security barriers in situ, (i.e. when they are deployed) or may alternatively be connected to the barrier/s at the time of their fabrication.

The height of the one or more connection members may be constant or may vary as a whole, or between the members if a plurality are present. For example, in an arrangement comprising two connection members, the height of one of the first and / or second connection members may be constant and the height of the first and / or second connection member may vary (between its maximum and minimum height), e.g. by a maximum of about 1m, about 0.8m, about 0.6m or about 0.4m.

The height of the connection members may vary at certain points in the security wall of the present invention. For example, the at least one connection member may have a constant height as it extends across none, some or any of the front, rear and / or side panels of the first and / or second security barriers. In preferred embodiments, the height of the at least one connection member is constant as it extends across the front and / or rear panels of the first and / or second security barriers.

The height of the at least one connection member may vary as it extends across none, some or any of the front, rear and / or side panels of the first and / or second security barriers. In preferred embodiments, the height of the at least one connection member varies as it extends across the side panels of the first and / or second security barriers. In alternative preferred embodiments, the height of the at least one connection member varies as it extends across the front and / or rear panels of the first and / or second security barriers.

In embodiments where a space is located between the first and second security barriers, the height of all connection members which span the space is preferably zero, i.e. they are located around ground level.

The connection member may take any form or be made from any material which has sufficient strength, especially tensile strength to securely connect the first, second and any additional security barriers that may be present, while contributing positively to the impact resistance of the wall. While the requirements of the tensile strength of the connection member will vary depending upon the application in which the wall is employed, preferable minimum breaking strains are generally in the order of about 30, about 40 or about 50 KN, or about 3000, about 4000, or about 5000 KG.

In preferred embodiments, the at least one connection member comprises or consists of a plate, cable, rope, ribbon, band or a strap. Where more than one connection member is present, the connection members may take the same or different forms.

The connection member may be formed of or comprise any material. Preferably, the connection member is at least partially formed of metal and / or polymeric material. In a most preferred embodiment, the at least one connection member is formed of steel, for example a steel rope or plate.

One or more of the panels of the first and/or second security barrier may be provided with means to receive the at least one connection means, for

example channels or pairs of studs or other formations between which the at least one connection can pass.

The space between first and second security barriers preferably is no greater than about 1.8m, about 1.2m, about 1.1m, or about 0.9m (about 6 feet, about 4 feet, about 3½ feet or about 3 feet) and / or is preferably located between respective side walls of the first and second security barriers.

The security wall of the present invention is preferably made up of a plurality of rows (e.g. 2, 3 or 4 rows) of compartments comprised in a number of security barriers. The wall preferably includes a space or interval which divides the wall into the two rows. In preferred embodiments, the two rows have a region of first depth (for example 1, 2 or 3 compartment deep) and a region of second, greater depth at the end of the rows adjacent to the space (for example 2, 3, 4 or 5 compartments deep). The compartments making up the region of second depth may be comprised within the same or different security barriers.

The security wall of the present invention may be single or multilayered. By 'single layered', it is meant that the wall is single compartmental in height. By 'multi-layered', it is meant that some regions or all of the wall are multi-compartmental in height, i.e. have a height of 2, 3, 4 or more compartments.

The security barrier employed in the wall of the invention is preferably self-supporting and presents a relatively tall front panel as the barricade. The

height of the front panel is preferably at least about 1.8m (about six feet), preferably at least about 2.1m (about seven feet), more preferably at least about 2.4m (about eight feet), still more preferably at least about 2.7m (about nine feet), and most preferably at least about 3.0m (about ten feet) tall.

The rear panel is preferably of lower height than the front panel. Preferably the height of the rear panel is not more than about 1.5m (about five feet), more preferably not more than about 1.2m (about four feet) and most preferably no more than about 0.9m (about three feet). The relatively lower height of the rear panel facilitates access to the compartment for a fork-lift truck or other lifting apparatus to lower into the compartment a heavy weight, such as for example a "big bag" of sand or stones. The weight is preferably at least about 100kg, more preferably at least about 250kg and most preferably at least about 500kg. A typical "big bag" filled with sand for example weighs about 855kg.

The weight deployed in the compartment in the erected configuration of the barrier bears upon the bottom panel or plate, if present, and is effective, because the bottom panel or plate is preferably secured to the front panel and to the rear panel and/or the side panels, to prevent toppling of the security barrier, particularly when pushed or pulled from the front.

The weight may be deployed directly onto the bottom panel. Alternatively, a weight platform may be positioned in the compartment, with the weight deployed thereon. The weight platform may provide the compartment with

additional structural support in the form of upwardly extending compartment supports that preferably nestle in the corners of the compartment. The upwardly extending compartment supports may be formed of steel.

Preferably the bottom panel is connected to the front panel and to at least one other panel.

However, in certain embodiments, for example those in which a plate comprising coupling means is employed, the bottom panel may be connected to only one of the front panel, rear panel or side panels, or may be dispensed with completely. By providing security barriers configured in this way, the bottom panel will not impede the passage of coupling means which extend upwardly from the plate into the compartment/s as it will either be able to be folded up, opening the bottom end of the compartment, or will be absent. Such an arrangement is preferred when the coupling means take the form of upstanding posts.

Preferably the bottom panel is connected at least to the front panel and the rear panel. In this case, an attempt to topple the erected security barrier by pushing against the front panel will be resisted by the weight on the bottom panel and by the connection between the bottom panel and the front panel. An attempt to topple the erected security barrier by pulling the front panel will be resisted by the weight on the bottom panel and by the connection between the bottom panel and the rear panel.

However, the bottom panel may also, or alternatively, be connected to the respective side panels. Because the side panels are themselves connected to the front and rear panels, a weight bearing on the bottom panel will still hinder or prevent toppling of the barrier when pushed or pulled from the front.

The bottom panel may also be connected to the front panel, and to one or both of the respective side panels. In yet a further embodiment, the bottom panel is connected to the rear panel and to one or both of the respective side panels.

In one aspect of the present invention, the security barrier which is employed is multi-compartmental, comprising a plurality of pivotally connected front panels, a plurality of corresponding pivotally connected rear panels, and a plurality of respective pairs of side panels defining therebetween multiple compartments in the erected security barrier, each compartment optionally having a bottom panel.

Deployment of the security wall of the invention will generally be effected by transporting the folded first and second security barriers to a deployment site, unfolding the security barriers and optionally folding down the bottom panels, if present, by means of their pivotal connection with at least one of the front, rear and respective side walls, optionally securing the bottom panels, if present, to at least one other of the remaining front, rear or respective side walls, and in any order, providing specific compartments of the first and second security barriers with a weight material and connecting the first and

second security barriers using the at least one connection member. Some or all of the steps outlined above may be repeated or performed in an order differing from that outlined above.

Alternatively, deployment of the security wall of the invention will generally be effected by transporting the folded first and second security barriers to a deployment site, unfolding the security barriers and optionally folding down the bottom panels, if present, by means of their pivotal connection with at least one of the front, rear and respective side walls, optionally securing the bottom panels, if present, to at least one other of the remaining front, rear or respective side walls, and in any order, providing specific compartments of the first and second security barriers with a weight material and connecting the at least one connection member to the wall such that the at least one connection member spans the space. Some or all of the steps outlined above may be repeated or performed in an order differing from that outlined above.

Generally the weight material will be an easily liftable weight such as a big bag filled or part-filled with sand and/or aggregate, but alternatively or also with earth, soil, stones, rocks, rubble, concrete, debris, snow, ice, water, and combinations of two or more thereof. However, alternative weight materials may comprise concrete blocks for example.

To facilitate filling of the weight material, one, some or all of the compartments present in the security wall of the present invention may be open-topped and/or have an easily openable (e.g. hinged) or detachable top corner.

The pivotal connection between the pivotally connected panels of the security barriers employed in the wall of the present invention may for example be provided by a hinge member between two connected panels.

In one preferred embodiment the pivotal interconnection between connected panels may be achieved by providing interconnected panels with a row of apertures along an interconnection edge thereof and by providing a coil member helically threaded through a plurality of apertures along the interconnection edge. A single coil member may be helically threaded through the connection edge apertures of two (or more) neighbouring panels to achieve pivotal interconnection therebetween.

The first and / or second security barriers of the present invention may be interconnected to further security barriers, for example by securing respective end panels of neighbouring security barriers to each other by means of a suitable interconnection member. For example, such an interconnection member may itself comprise a helical coil threaded between interconnection surface apertures of neighbouring end panels. Conveniently the end panels are of a mesh material and the mesh apertures themselves serve as interconnection surface apertures.

The security barrier panels may be of any suitable material, for example steel, aluminium, titanium, any other suitable metal or alloy, or from a plastic, ceramic or natural material such as timber. Normally, steel is preferred, in which case the steel is preferably treated (for example by zinc coating) to

prevent or hinder steel erosion during deployment of the security barrier. The panel may be a closed panel or may be a mesh panel. In the case of a closed panel, connection edge apertures where needed will normally be machined or otherwise provided in the panel edge. In the case of a mesh panel the mesh apertures may serve as connection edge apertures where needed.

Preferably at least the front panel of the security barrier is a mesh panel, in which the mesh size is sufficiently small for the panel to be an "anti-climb" panel. Generally, the mesh width on the front panel is no more than about 15.2cm (about 6 inches), preferably not more than about 12.7cm (about 5 inches), more preferably not more than about 10.2cm (about 4 inches) and most preferably not more than about 7.6cm (about 3 inches wide). Generally the mesh height on the front panel is no more than about 5.1cm (about 2 inches), preferably no more than about 3.8cm (about 1.5 inches), more preferably not more than about 2.5cm (about 1 inch) and most preferably not more than about 1.3cm (about ½inch) high.

The rear, side and bottom panels may be formed from metal mesh of, for example four inches by four inches mesh size.

Preferably, the multi-compartmental security barrier employed in the wall of the invention comprises a cage structure.

Also preferably, the security barriers employed therein comprise pivotally interconnected, preferably open meshwork, panels which are connected

together under factory conditions so that the security barrier can take a flattened form for transportation to site where it can be erected to take a form in which panels thereof define front, rear, side, bottom and end walls and an open top through which the compartments of the security barrier may be filled. Preferably, under factory conditions said panels define front, rear, side, bottom and end walls and are pivotally interconnected edge to edge and are relatively foldable to lie face to face in the flattened form for transportation to site and can be relatively unfolded to bring the security barrier to the erected condition without the requirement for any further connection of the walls site, save for the connection of the bottom panel to at least one of the front, rear or respective side walls to which the bottom panel is unconnected in its folded configuration.

In one embodiment of the invention, the front and rear panels of the security barrier each comprise a plurality of front and rear side panel sections pivotally connected edge to edge and folded concertina fashion one relative to another. The front and rear panels are connected by respective side panels which are pivotally connected thereto, the security barrier structure being adapted to be erected on site by pulling it apart by the end walls so that when it is moved from the flattened form to the erected condition the front and rear walls unfold and define with the end walls and partition walls an elongated wall structure having a row of cavities to be provided with a weight material and of which each partition wall is common to the pair of cavities adjacent the partition wall.

According to another aspect, the present invention provides a connection member for connecting first and second security barriers to form a security wall, the first and second security barriers comprising at least one compartment bounded at its front by a front panel for providing a barricade, at its rear by a rear panel, at its sides by respective side panels connecting the rear and front panels, and at its bottom by a bottom panel connected to at least two of the front panel, the rear panel, and the respective side panels; wherein: the connection member comprises a plate having coupling elements formed thereon operative to couple parts of said first and second barrier to said connection member.

This connection member may be used in the security wall described above

Optionally, the coupling means of the connection member may be arranged to define a space between an end of a first security barrier coupled to said connection member and an opposing end of a second security barrier coupled to said connection member.

The plate may extend across at least a part of the lower end and / or bottom panel of the first and / or second security barriers.

The coupling means may comprise one or more upstanding posts. At least one of said one or more upstanding posts may be configured for location at a corner of a compartment of said first security barrier and at least one of said one or more upstanding posts may be configured for location at a corner of a

compartment of said second security barrier. At least one of said one or more upstanding posts may be configured for location within a compartment of at least one of said first and second security barriers and/or at least one of said one or more upstanding posts may be configured for location outside a compartment of at least one of said first and second security barriers.

The one or more upstanding posts may be connected to each other and / or the plate by means of one or more bracing members.

The connection member may be configured for lateral extension laterally across at least a part of the front panel.

The at least one connection member may be configured for extension across at least a part of the outer surface of the front panel, the rear panel and/or the bottom panel.

The invention will now be more particularly described with reference to the following drawings, in which:

Figure 1 shows a schematic perspective view of a multi-compartmental security barrier which may be employed in a wall in accordance with the invention;

Figure 2 shows the multi-compartmental security barrier of Figure 1 in schematic form from a top plan view;

Figure 3 shows in schematic top-plan form the multi-compartmental security barrier of Figure 2 when adopting a collapsed configuration for transportation and/or storage;

Figure 4 shows a type of pivotal connection between neighbouring panels of the security barrier shown in Figures 1 to 3;

Figure 5a shows a wall arrangement of three connected multi-compartmental security barriers shown of Figures 1 to 3, in schematic form from a top plan view;

Figure 5b shows the wall arrangement of Figure 5a with one compartment folded up; and

Figure 5c shows the wall arrangement of Figure 5b, having one section rotated to create a secure 90 degree turn in the wall.

Figure 6a shows a perspective view of a wall arrangement of the present invention.

Figure 6b shows a side elevation view of the wall arrangement depicted in Figure 6a.

Figure 7a shows a front perspective view of a wall arrangement including a portal or interval according to the present invention.

Figure 7b shows a rear perspective view of the wall arrangement shown in Figure 7a.

Figure 7c shows below perspective view of the wall arrangement shown in Figure 7a.

Figure 8a shows a front perspective view of a further embodiment of a security wall in accordance with the present invention.

Figure 8b shows a front perspective view of the plate and coupling means employed in the security wall shown in Figure 8a.

Figure 8c shows top plan view of the plate and coupling means shown in Figure 8b.

Figure 8d shows a magnified perspective view of a joint formed between two upstanding posts, a bracing member and a plate included in the arrangement illustrated in Figures 8b and 8c.

Referring to Figure 1, there is shown a multi-compartmental security barrier 1. This barrier consists of three separate compartments 2, 3 and 4. The compartments are themselves defined by front panels 5, 6 and 7, by

respective side panels 8, 9, 10 and 11, by rear panels 12, 13 and 14, and by bottom panels 15, 16 and 17.

Security barrier 1 is shown in its erected configuration, and formed from metal mesh panels – although other suitable materials may of course be used. The metal mesh is shown schematically in Figure 1 as a 10.2cm by 10.2cm (four inch by four inch) mesh as far as the side, rear and bottom panels are concerned, and as a 7.6cm by 1.3cm (three inch by half inch) mesh as far as the front panels are concerned (although the mesh is depicted uniformly for schematic purposes in Figure 1).

The smaller size of the mesh in front panels 5, 6 and 7 provides an anti-climb facility to security barrier 1. The front panels depicted in Figure 1 are approximately 3.0m (ten feet) tall. By contrast, the rear panels are considerably shorter to allow access to compartments 2, 3 and 4 for the placement of heavy weights bearing down on bottom panels 15, 16 and 17. These heavy weights are not shown in Figure 1, but would conveniently comprise a “big bag” filled with sand or earth or other suitable material.

Side panels 8 and 9 are pivotally connected to front panel 5 by means of a hinge connection which is not shown in Figure 1, but one general type of which is shown in Figure 4 to be described later. Pivotal or foldable connections of the same or a different type are deployed at the interconnection edge between side panels 8 and 9 and rear panel 12.

Referring now to Figure 2, there is shown a top plan view of the security barrier of Figure 1 in which the pivotal connection between the respective front, side and rear panels can be seen. These pivotal interconnections remain in place when the security barrier is flattened to its collapsed configuration for transportation and/or storage, as shown in Figure 3.

Not shown in Figure 3 (to avoid complexity of the drawing) are bottom panels 15, 16 and 17 which in the collapsed condition remain pivotally connected to one of the front, rear or side panels. In the flattened configuration shown in Figure 3, the bottom panel is folded up against the front, rear or side panel to which it is pivotally connected.

One type of pivotal connection is shown in Figure 4, in which helical coil spring 18 is coiled through the mesh panels of neighbouring sections of the security barrier. Helical coils 18 are also shown in Figures 2 and 3, but not in Figure 1.

If bottom panels 15, 16 and 17 are pivotally connected in the collapsed condition front panels 5, 6 and 7 then when the security barrier is erected the bottom panels are dropped down from their folded up orientation against front panels 5, 6 and 7, before being secured to at least one of their neighbouring side or rear panels with a suitable means of connection. Such means might include clips, fasteners and ties of a variety of design, but may also include helical coil springs of the same type used for the pivotal interconnections between connected panels of the security barrier.

In Figure 5a, there is shown a top-down plan view of three multi-compartmental security barriers 1a, 1b, and 1c of Figure 2 which form a security fence. The barriers are placed side by side and with neighbouring side walls connected together by means of suitable connecting elements, for example by helical coil springs or by other types of fastener, to create a wall of security barriers. Preferably, the means of connection is kept away from the front edge so as to minimise the risk of tampering from miscreant elements beyond the front panel. The meshwork of the bottom panels 15, 16, and 17 is not depicted in these figures.

Figure 5b shows the security wall of Figure 5a, but with the bottom panel 16b and the rear panel 13b of the middle security barrier 1b folded up against the front or side panels. As shown in Figure 5c, the third compartment of the second multi-compartmental security barrier 1b and the third multi-compartmental security barrier 1c, can then be pivoted 90 degrees about connection 18 to create a 90 degree turn in the wall.

The turn can be made using any compartment of a security fence allowing a wide range of configurations. Making the turn using the middle cell of a security barrier rather than at a connection of two separate security barriers can create a more secure turn in the fence.

The security barrier employed in the security wall of the invention may be provided with any suitable number of compartments. For example, a single-

compartment barrier would comprise simply side walls 8 and 9 together with front panel 5, rear panel 12 and bottom panel 15. It may also be desirable to provide corner units of a type in which the end side panel, and optionally the end-most rear and/or bottom panels are missing.

Figure 6a shows a security wall in accordance with the present invention. A row of compartments is visible. Each of the compartments has a weight deployed therein, which is covered by a counterweight cover (20). The compartments are tightly surrounded by two connection members, namely first and second loops (22, 24). The first loop (22) is positioned around 60cm from the ground or bottom panel. Its distance above the ground is relatively constant.

In contrast, it can be seen that the height of the second loop (24) is lower (around 80 cm from the ground) as that loop (24) extends laterally along the rear panels of the compartments than as it extends laterally along the front panels of the compartments (at a height of about 120cm from the ground). However, the height of the loop as it extends along both sets of panels is constant. As is clearly visible from Figure 6b, the change in height occurs as the loop (24) extends laterally across the side panels of certain compartments.

An alternative arrangement is shown in Figures 7a to 7c. In that arrangement the wall is divided into two rows by a space (26). The space (26) is spanned by a first connection member in the form of a loop (22).

The two rows have regions of a first depth (one compartment deep) and regions of a second depth (two compartments deep). The illustrated arrangement is prepared by assembling two rows of five compartments comprised in two two-compartment security barriers (positioned adjacent the space (26) and two three-component chambers interconnected to the two two-compartment security barriers. Weights (26) are then deployed

A steel wire loop (22) is then passed around the two two-compartment security barriers and secured. Two parts of the loop (22) span the space (26). Two additional two-compartment security barriers are then positioned such that their front panels contiguously abut the rear panels of the already connected two-compartment security barriers and the two two-compartment security barriers are then interconnected to the adjacent two-compartment security barriers. Weights (26) are then deployed in the newly installed two-compartment security barriers and they are connected by means of a second continuous loop (28).

As can be seen, the height of both the first and second loops (22, 28) increase from ground level (as they span the space (26) and extend across the lower edge of the adjacent front and rear panels) to a more elevated position.

Figure 8a depicts a security wall of the present invention in an optional arrangement. Rather than the two parts of the wall being connected with a continuous loop, the two parts of the wall are connected by a plate (30) including upstanding posts (32) and bracing members (34).

The upstanding posts (32) extend from the plate (30) at locations which correspond to the internal corners of compartments of the first and second security barriers. By locating the upstanding posts in the corners or adjacent to the panels of the compartments, this facilitates coupling of the panels to the posts.

In the illustrated arrangement, the compartments adjacent to the space (26) do include bottom panels. However, these are only connected to one of the front, rear or side panels and are not folded down or connected to one or more additional other panels. This is to allow the upstanding posts and bracing members to pass into the compartments. Once the upstanding posts and / or bracing members are coupled to the adjacent panels, the plate (30) functions in much the same way as the bottom panel and is capable of receiving a weight thereupon.

As can more clearly be seen from Figure 8b, illustrated arrangement comprises eight upstanding posts which are linked in pairs by bracing members to form fence-like arrangements. The fence-like arrangements advantageously facilitate coupling of the side and rear panels of the

In the illustrated arrangement, the upstanding posts have a height (i.e. extend from the plate (30)) by a distance of 1 metre. However, their height may range from 40 to 160cm, from 60 to 140cm, or from 80 to 120cm.

Figures 8c and 8d illustrate in greater detail how the plate, upstanding posts and bracing members are connected. As can be seen, one surface of one of the L-shaped bracing members (34) is welded to the plate (30). An end region of the other surface of that bracing member (34) is welded to the lower end of a surface of an adjacent upstanding post (32) having a  shape in cross section. The other upstanding posts (32) and bracing members (34) are either welded or bolted to each other as can most clearly be seen from Figure 8c.

In another optional arrangement, two parts of a security wall or barrier may be connected using a combination of the plate arrangement illustrated in Figs. 8a to 8d and the continuous loop arrangement illustrated in Figs. 6a, 6b, 7a, 7b or 7c.

CLAIMS

1. A security wall, the security wall comprising first and second security barriers and at least one connection member, the first and second security barriers comprise at least one compartment bounded at its front by a front panel for providing a barricade, at its rear by a rear panel, at its sides by respective side panels connecting the rear and front panels, and at its bottom by a bottom panel connected to at least two of the front panel, the rear panel, and the respective side panels; wherein:
 - a) the at least one connection member extends across at least a part of the front panel, the rear panel, the side panel/s, the bottom panel and / or the interior of the compartment of the first and second security barriers, and / or
 - b) a space exists between the first and second security barriers in the security wall, the space being spanned by the at least one connection member.
2. The security wall of Claim 1, wherein the at least one connection member comprises a plate, cable, rope, ribbon, band and / or a strap.
3. The security wall of Claim 2, wherein the at least one connection member is at least partially formed of metal and / or polymeric material.
4. The security wall of Claim 3, wherein the metal is steel.

5. The security wall of any one of the preceding claims, wherein the at least one connection member comprises a plate having coupling means formed thereon.
6. The security wall of Claim 5, wherein the plate extends across at least a part of a lower portion of front, back and/or side panels and / or said bottom panel of the first and / or second security barriers.
7. The security wall of Claim 5 or 6, wherein the coupling means comprise one or more upstanding posts.
8. The security wall of Claim 7, wherein the one or more upstanding posts are connected to each other and / or the plate by means of one or more bracing members.
9. The security wall of any one of the preceding claims, wherein the at least one connection member extends laterally across at least a part of the front panel of one or both of said first and second security barriers.
10. The security wall of any one of the preceding claims, wherein the at least one connection member extends across at least a part of the outer surface of the front panel, the rear panel and/or the bottom panel of one or both of said first and second security barriers.

11. The security wall of any one of the preceding claims, wherein the at least one connection member is coupled to one or both of the first and second security barriers at one or both of its ends.
12. The security wall of any one of the preceding claims, wherein the wall comprises further security barriers in addition to the first and second security barriers.
13. The security wall of any one of the preceding claims, wherein the security wall comprises a first connection member in the form of:
- a. a continuous loop of elongate material which passes around at least one compartment in the first and second security barriers to connect them, or
 - b. an elongate member which is coupled to one or both of the first and second security barriers.
14. The security wall of Claim 13, wherein the security wall comprises a second connection member in the :
- a. a continuous loop of elongate material which passes around the at least one compartment in first and second security barriers to connect them, or
 - b. an elongate member which is coupled to one or both of the first and second security barriers.

15. The security wall of Claim 13 or 14, wherein the first and / or second connection member passes around the first and second security barriers to connect them.
16. The security wall of any one of Claim 13 or 14, wherein the first and second connection members pass around different compartments of one or both of said first and second security barriers.
17. The security wall of Claim 13 or 14, wherein the first and / or second connection member is coupled to one or both of the first and second security barriers at a location on their respective panels.
18. The security wall of any one of Claims 13 to 17, wherein the height of the first and / or second connection member above the bottom panel of one or both of said first and second security barriers is generally constant.
19. The security wall of any one of Claims 13 to 17, wherein the height of the first and / or second connection member above the bottom panel of one or both of said first and second security barriers varies.
20. The security wall of any one of Claims 13 to 19, wherein the height of the first and / or second connection members above the bottom panel is constant as it extends along the front and / or rear panels of the first and second security barriers.

21. The security wall of any one of Claims 13 to 17, 19 or 20, wherein the height of the first and / or second connection members above the bottom panel varies as it extends along the side panels of the first and second security barriers.
22. The security wall of any one of Claims 13 to 17 or 19 to 21, wherein the height of the first and / or second connection members above the bottom panel varies as it extends along the front panels of the first and second security barriers.
23. The security wall of any one of Claims 13 to 22, wherein the height of the first and / or second connection members above the bottom panels of the first and second security barriers is substantially zero as it extends through the space, if present.
24. The security wall of any one of the preceding claims, wherein the space between the first and second barriers is no greater than about 1.8m (6 feet).
25. The security wall of any one of the preceding claims, wherein the space between the first and second barriers is no greater than about 1.2m (4 feet).
26. The security wall of any one of the preceding claims, wherein the space between the first and second barriers is no greater than about 1.1m (3½ feet).

27. The security wall of any one of the preceding claims, wherein the space between the first and second barriers is no greater than about 0.9m (3 feet).
28. The security wall of any one of the preceding claims, wherein the space is positioned between the respective side walls of the first and second security barriers.
29. The security wall of any one of the preceding claims, wherein the security wall comprises two rows of compartments separated by the space, the two rows having a region of first depth and a region of second, greater depth at the end of the rows adjacent to the space.
30. The security wall of Claim 29, wherein the depth, in terms of the number of compartments, at the region of first depth is one compartment and / or the region of second depth is two compartments.
31. The security wall of Claim 29 or 30, wherein the compartments making up the region of second depth are comprised within the same or different security barriers.
32. The security wall of any one of the preceding claims, wherein a weight is received in the at least compartment of one or both of the first and second security barriers.

33. The security wall of Claim 32, wherein the weight is positioned on a weight platform positioned upon the bottom panels of one or both of the first and second security barriers.
34. The security wall of any one of the preceding claims, wherein the weight platform is provided with upwardly extending compartment supports.
35. The security wall of any one of Claims 32 to 34, wherein the weight deployed in the compartment of the first and/or second security barrier bears upon the bottom panel of said first and/or second security barriers and is effective, through the connection of the bottom panel to at least two of the front panel, the rear panel, and the respective side panels, to prevent toppling of the security barrier when pushed or pulled from the front.
36. The security wall of any one of Claims 32 to 35, wherein the weight material comprises a bag filled or part-filled with sand, earth, soil, stones, rocks, rubble, concrete, debris, snow, ice, water, and combinations of two or more thereof.
37. The security wall of any one of the preceding claims, wherein the bottom panel of one or both of the first and second security barriers is connected to the respective front panel and to at least one other respective panel.

38. The security wall of Claim 37, wherein the bottom panel of one or both of the first and second security barriers is connected at least to the respective front panel and rear panels.
39. The security wall of any one of the preceding claims, wherein the bottom panel of one or both of the first and second security barriers is connected to the respective side panels.
40. The security wall of any one of the preceding claims, wherein the bottom panel of one or both of the first and second security barriers is connected to the respective front panel, and to one or both of the respective side panels.
41. The security wall of any one of the preceding claims, wherein the bottom panel of one or both of the first and second security barriers is connected to the rear panel, and to one or both of the respective side panels.
42. The security wall of any one of the preceding claims in which one or both of the first and second security barriers is multi-compartmental.
43. The security wall of Claim 42, wherein the bottom panel and the rear panel of at least one compartment of one or both of said first and second security barriers is arranged to be foldable against any one of the front or side panels by means of a pivotal connection, allowing the bottom panel and rear panel to adopt a substantially flattened configuration against the front

or side panel so as to enable the front panel to adopt a substantially flattened configuration against a side panel to create a turn in the security barrier.

44. The security wall of Claim 43, wherein one or both of the first and second security barriers comprises a plurality of pivotally connected front panels, a plurality of corresponding pivotally connected rear panels, and a plurality of respective pairs of side panels defining therebetween multiple compartments in the erected security barrier, each compartment having a bottom panel.

45. The security wall of any one of the preceding claims, wherein the height of the rear panels of the first and second security barriers is lower than the front panels.

46. The security wall of any one of the preceding claims, wherein the height of the front panel is at least about 1.8m (six feet).

47. The security wall of any one of Claims 1 to 46, wherein the height of the rear panel is not more than about 1.5m (five feet).

48. The security wall of any one of the preceding claims, wherein the side panels of the compartment of the first and/or second security barriers are pivotally connected to the respective front and rear panels.

49. The security wall of Claim 48, wherein the side panels of the compartment of the first and/or second security barriers are capable of being collapsed into a second configuration for storage and/or transportation, the bottom panel being folded up against any one of the respective front, rear or side panels and connected to the said panel by means of a pivotal connection, the pivotal connections between the side panels and the respective front and rear panels allowing those panels to adopt a substantially flattened configuration together with the folded-up bottom panel.

50. The security wall of Claim 49, deployable by transporting the folded first and second security barriers to a deployment site, unfolding the security barriers and folding down the bottom panels by means of their pivotal connection with at least one of the front, rear and respective side walls, securing the bottom panels to at least one other of the remaining front, rear or respective side walls, and in any order, providing specific compartments of the first and second security barriers with a weight material and connecting the first and second security barriers using the at least one connection member.

51. The security wall of Claim 49, deployable by transporting the folded first and second security barriers to a deployment site, unfolding the security barriers and folding down the bottom panels by means of their pivotal connection with at least one of the front, rear and respective side walls, securing the bottom panels to at least one other of the remaining front, rear or respective side walls, and in any order, positioning the first and second security barriers such that there is a space therebetween,

providing specific compartments of the first and second security barriers with a weight material and connecting the at least one connection member to the wall such that the at least one connection member spans the space.

52. The security wall of any one of the preceding claims, wherein the pivotal connection between the pivotally connected panels is provided by a hinge member therebetween.

53. The security wall of Claim 52, wherein the pivotal interconnection between connected panels is achieved by providing interconnected panels with a row of apertures along an interconnection edge thereof and by providing a coil member helically threaded through a plurality of apertures along the interconnection edge.

54. The security wall of Claim 53, wherein a single coil member is helically threaded through the connection edge apertures of two (or more) neighbouring panels to achieve pivotal interconnection therebetween.

55. The security wall of any one of the preceding claims, wherein at least the or each front panel is formed from a mesh material.

56. The security wall of Claim 55 wherein the mesh material is a steel mesh.

57. The security wall of Claim 55 or 56, wherein the mesh size is sufficiently small for the front panel to be an "anti-climb" panel.

58. The security wall of any one of Claims 55 to 57, wherein the mesh width on the front panel is no more than about 15.2cm (6 inches).
59. The security wall of any one of Claims 55 to 58, wherein the mesh height on the front panel is no more than about 5.1cm (2 inches).
60. The security wall of any one of the preceding claims, wherein one or both of the first and second security barriers comprise pivotally interconnected, open meshwork, panels which are connected together under factory conditions so that the respective security barrier can take a flattened form for transportation to site where it can be erected to take a form in which panels thereof define front, rear, side, bottom and end walls and an open top through which the compartments of the security barrier may be provided with a ballast weight.
61. The security wall of any one of Claims 55 to 59, wherein under factory conditions said panels define front, rear, side, bottom and end walls and are pivotally interconnected edge to edge and are relatively foldable to lie face to face in the flattened form for transportation to site and can be relatively unfolded to bring the respective security barrier to the erected condition without the requirement for any further connection of the walls site, save for the connection of the bottom panel to at least one of the front, rear or respective side walls to which the bottom panel is unconnected under factory conditions.

62. The security wall of any one of the preceding claims, wherein the first and / or second security barriers are connected to the further security barriers by one or more interconnection members.
63. The security wall of Claim 62, wherein the one or more interconnection members comprise a helical coil threaded through interconnection surface apertures of neighbouring end panels.
64. A method for deploying a multi-compartmental security barrier according to any one of Claims 1 to 63 comprising transporting the folded first and second security barriers to a deployment site, unfolding the security barriers and folding down the bottom panels by means of their pivotal connection with at least one of the front, rear and respective side walls, securing the bottom panels to at least one other of the remaining front, rear or respective side walls, and in any order, providing specific compartments of the first and second security barriers with a weight material and connecting the first and second security barriers using the at least one connection member.
65. A method for deploying a multi-compartmental security barrier according to any one of Claims 1 to 63 comprising transporting the folded first and second security barriers to a deployment site, unfolding the security barriers and folding down the bottom panels by means of their pivotal connection with at least one of the front, rear and respective side walls, securing the bottom panels to at least one other of the remaining front, rear or respective side walls, and in any order, positioning the first and

second security barriers such that there is a space therebetween, providing specific compartments of the first and second security barriers with a weight material and connecting the at least one connection member to the wall such that the at least one connection member spans the space.

66. Use of a security wall according to any one of Claims 1 to 63 as a barrier for crowd control and/or containment purposes.

67. A connection member for connecting first and second security barriers to form a security wall, the first and second security barriers comprising at least one compartment bounded at its front by a front panel for providing a barricade, at its rear by a rear panel, at its sides by respective side panels connecting the rear and front panels, and at its bottom by a bottom panel connected to at least two of the front panel, the rear panel, and the respective side panels; wherein: the connection member comprises a plate having coupling elements formed thereon operative to couple parts of said first and second barrier to said connection member.

68. A connection member according to Claim 66, wherein the coupling means are arranged to define a space between an end of a first security barrier coupled to said connection member and an opposing end of a second security barrier coupled to said connection member.

69.A connection member according to Claim 66 or 67, wherein the plate extends across at least a part of the lower end and / or bottom panel of the first and / or second security barriers.

70.A connection member according to any one of Claims 66 to 68, wherein the coupling means comprise one or more upstanding posts.

71.A connection member according to Claim 69, wherein at least one of said one or more upstanding posts is configured for location at a corner of a compartment of said first security barrier and at least one of said one or more upstanding posts is configured for location at a corner of a compartment of said second security barrier.

72.A connection member according to Claim 69 or 70, wherein at least one of said one or more upstanding posts is configured for location within a compartment of at least one of said first and second security barriers.

73.A connection member according to any one of Claims 69 to 71, wherein at least one of said one or more upstanding posts is configured for location outside a compartment of at least one of said first and second security barriers.

74.A connection member according to any one of Claims 69 to 72, wherein the one or more upstanding posts are connected to each other and / or the plate by means of one or more bracing members.

75.A connection member according to any one of Claims 66 to 73, wherein the at least one connection member is configured for extension laterally across at least a part of the front panel.

76.A connection member according to any one of Claims 66 to 74, wherein the at least one connection member is configured for extension across at least a part of the outer surface of the front panel, the rear panel and/or the bottom panel.

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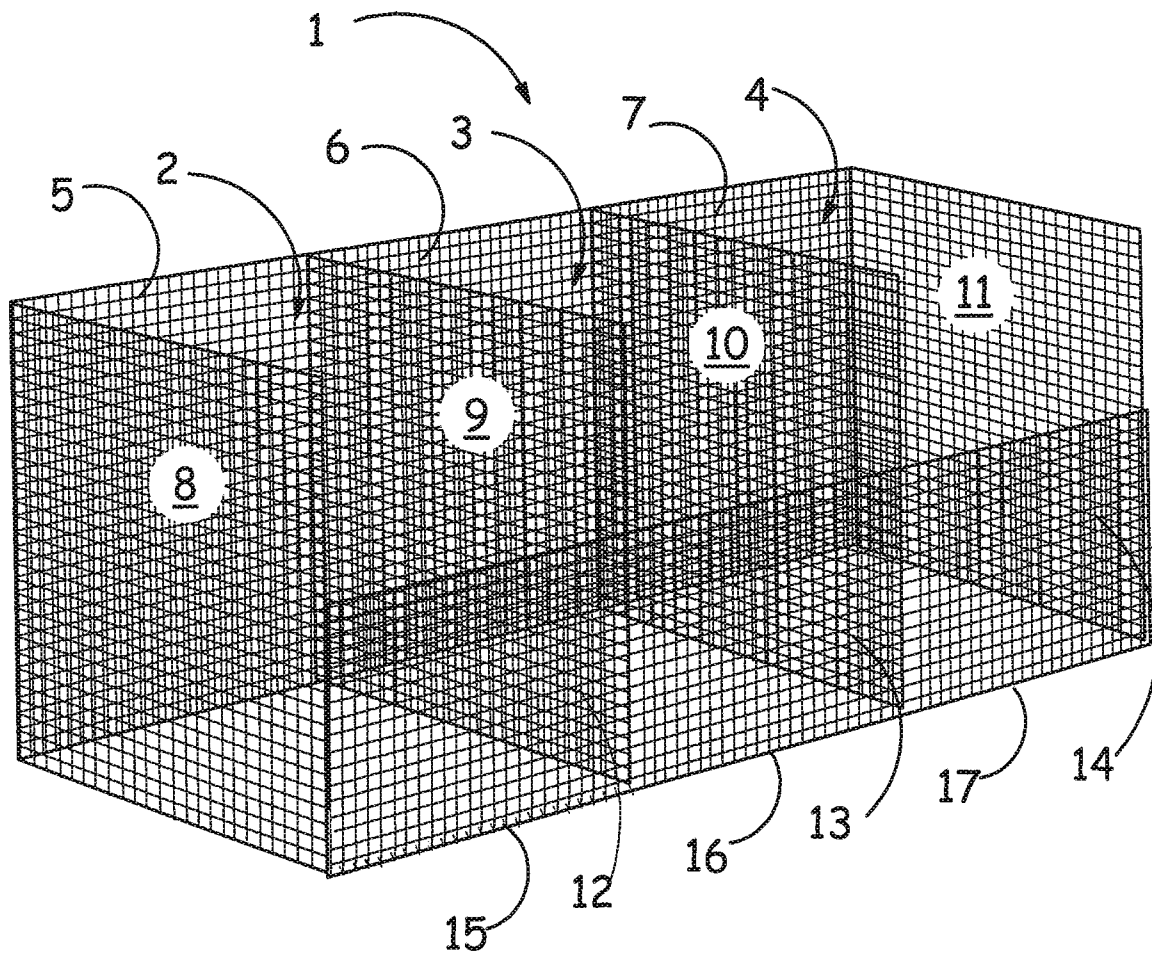


FIG.1.

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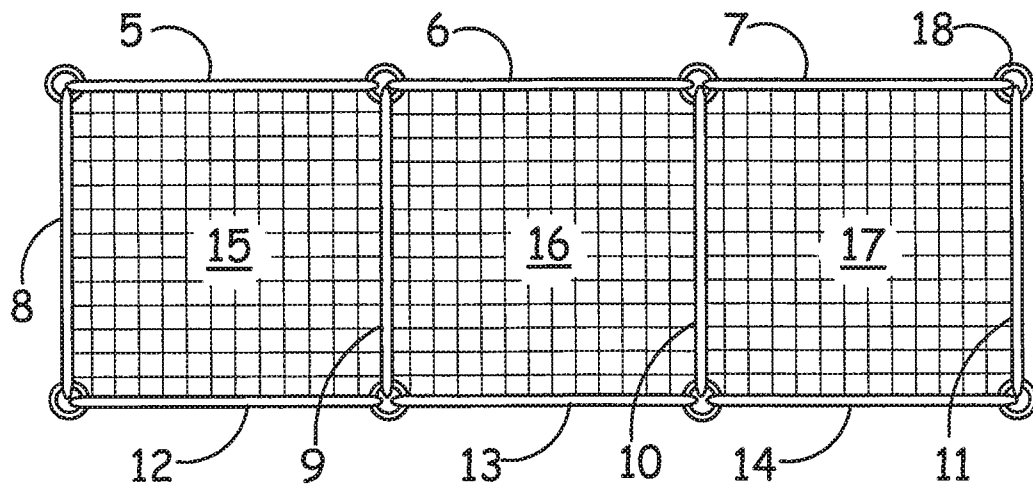


FIG. 2.

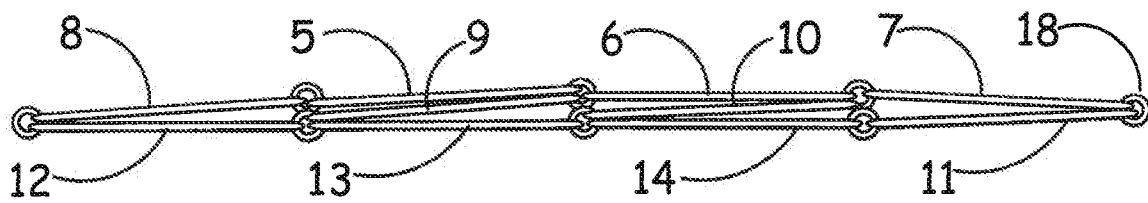


FIG. 3.

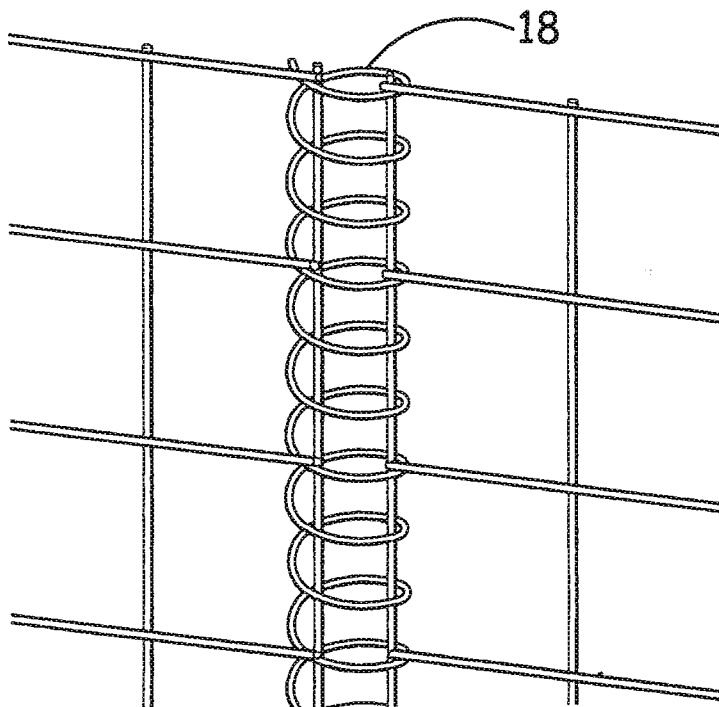
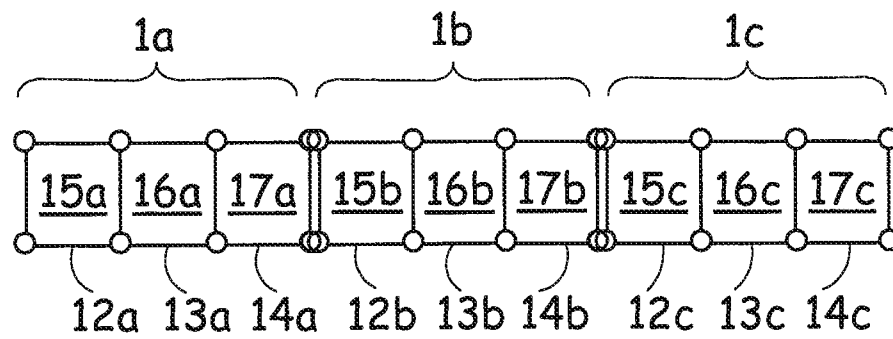
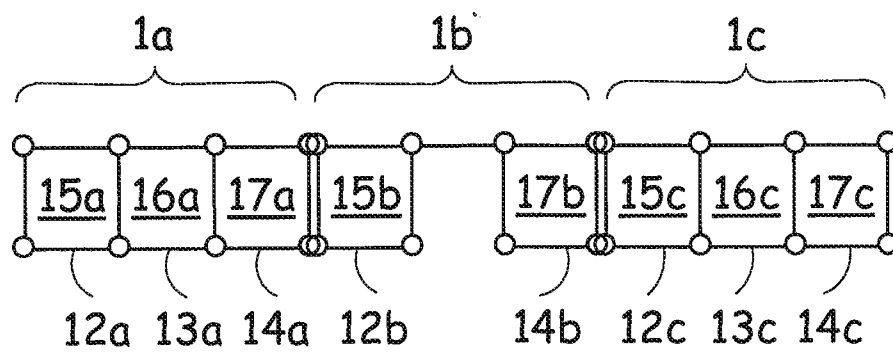
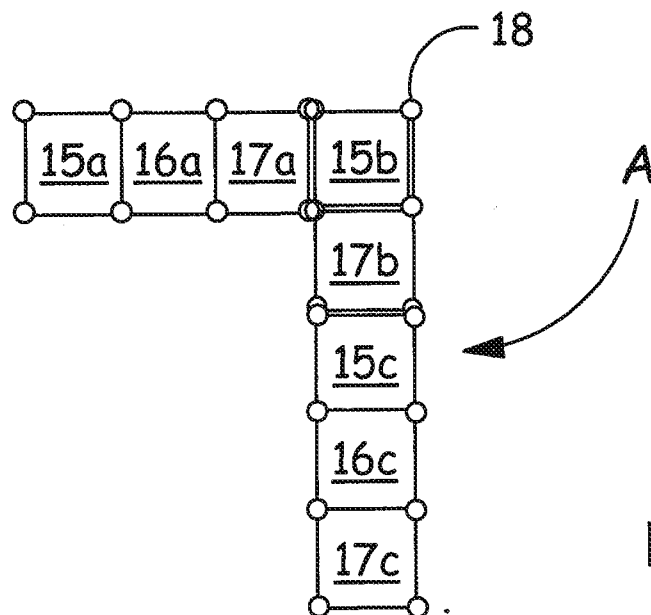


FIG. 4.

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**FIG. 5a.****FIG. 5b.****FIG. 5c.**

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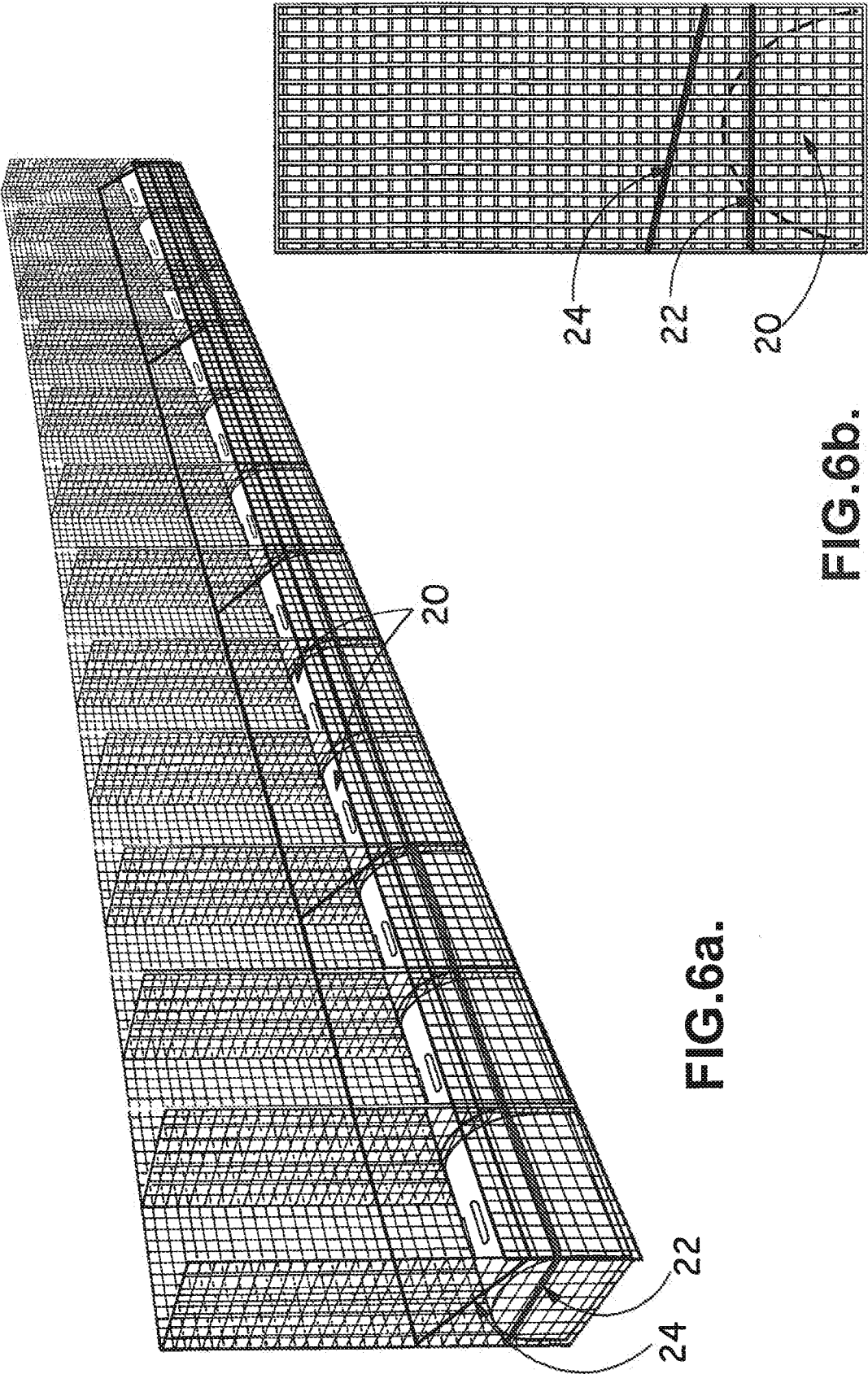


FIG. 6a.

FIG. 6b.

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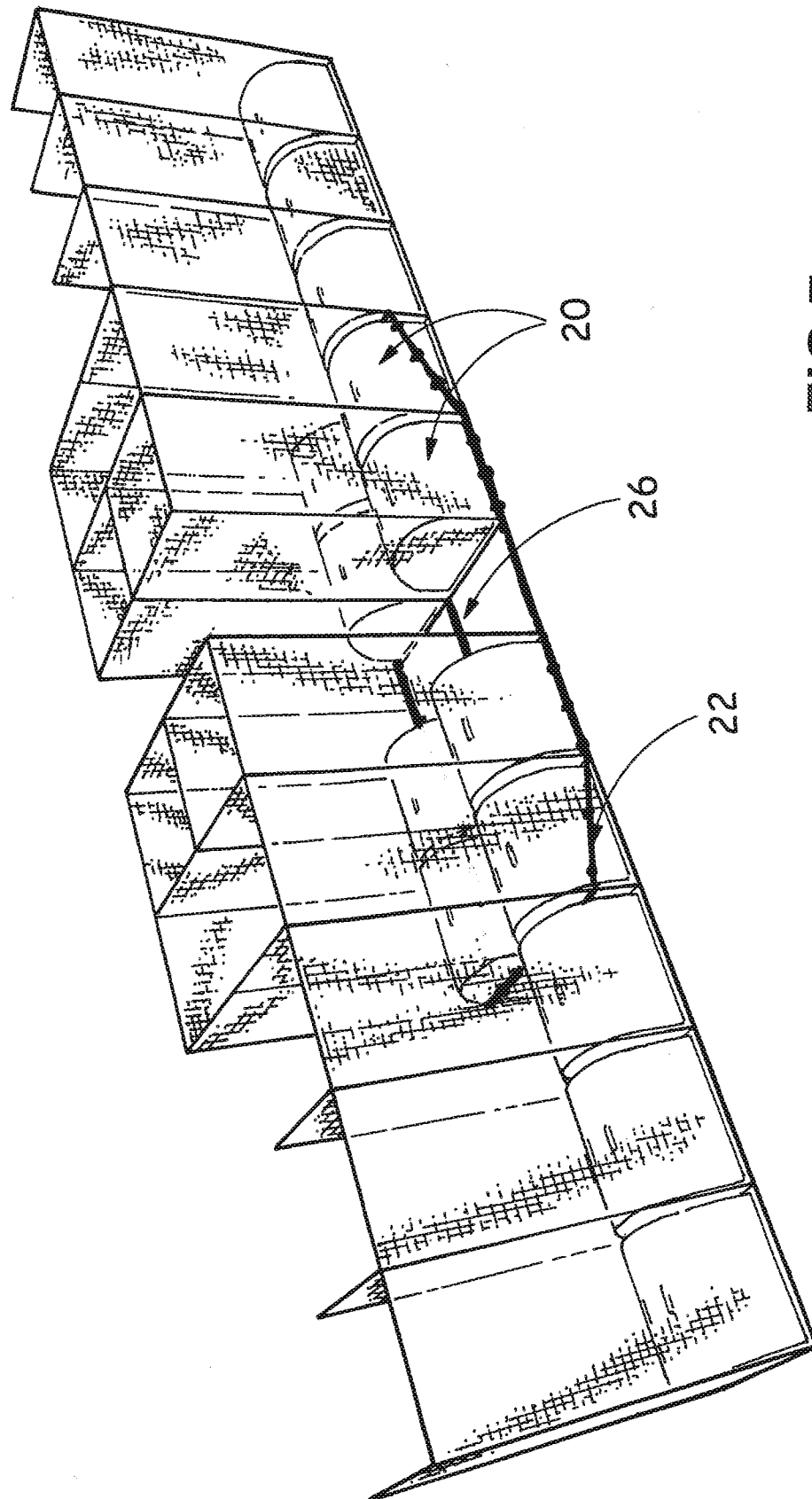
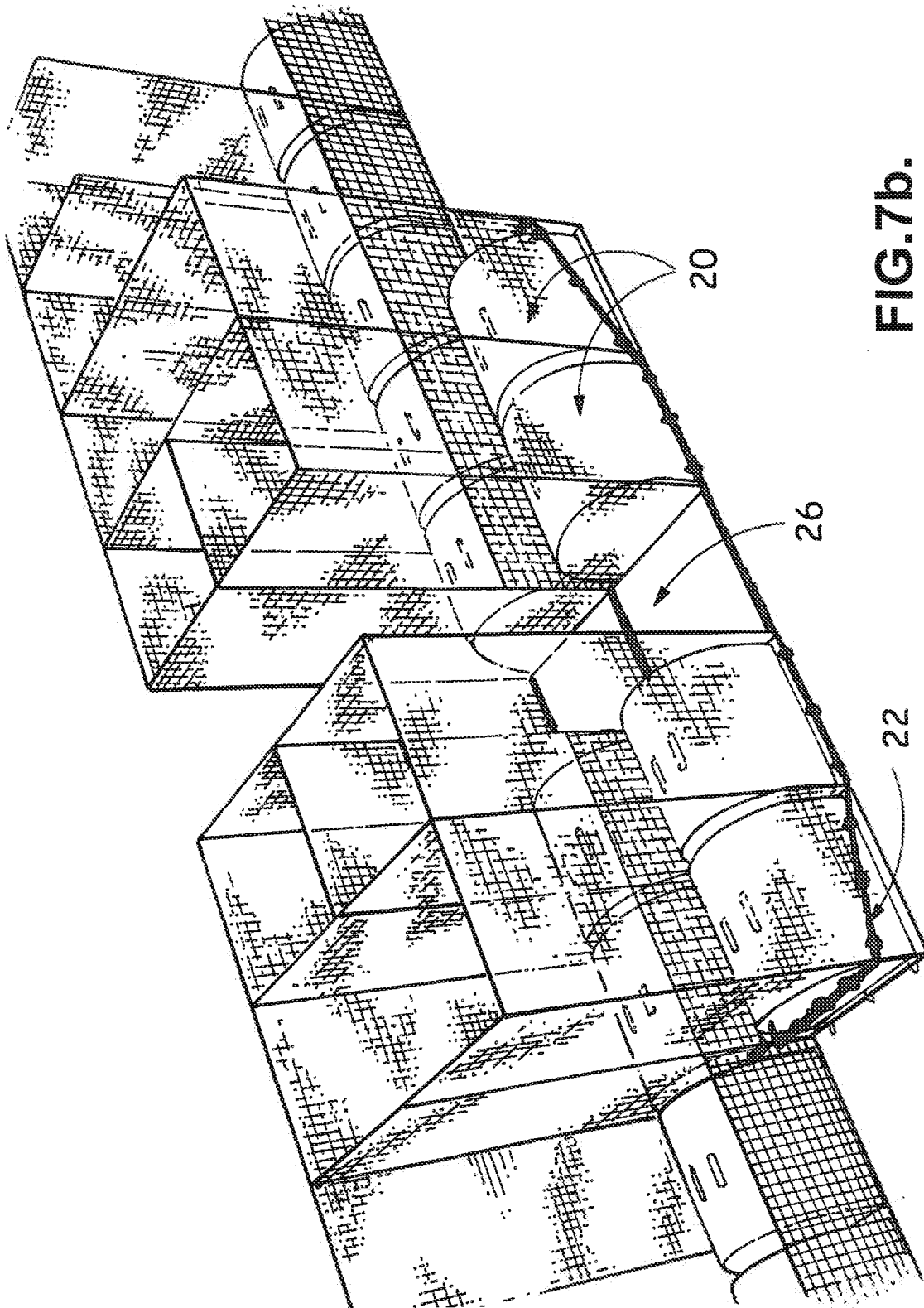
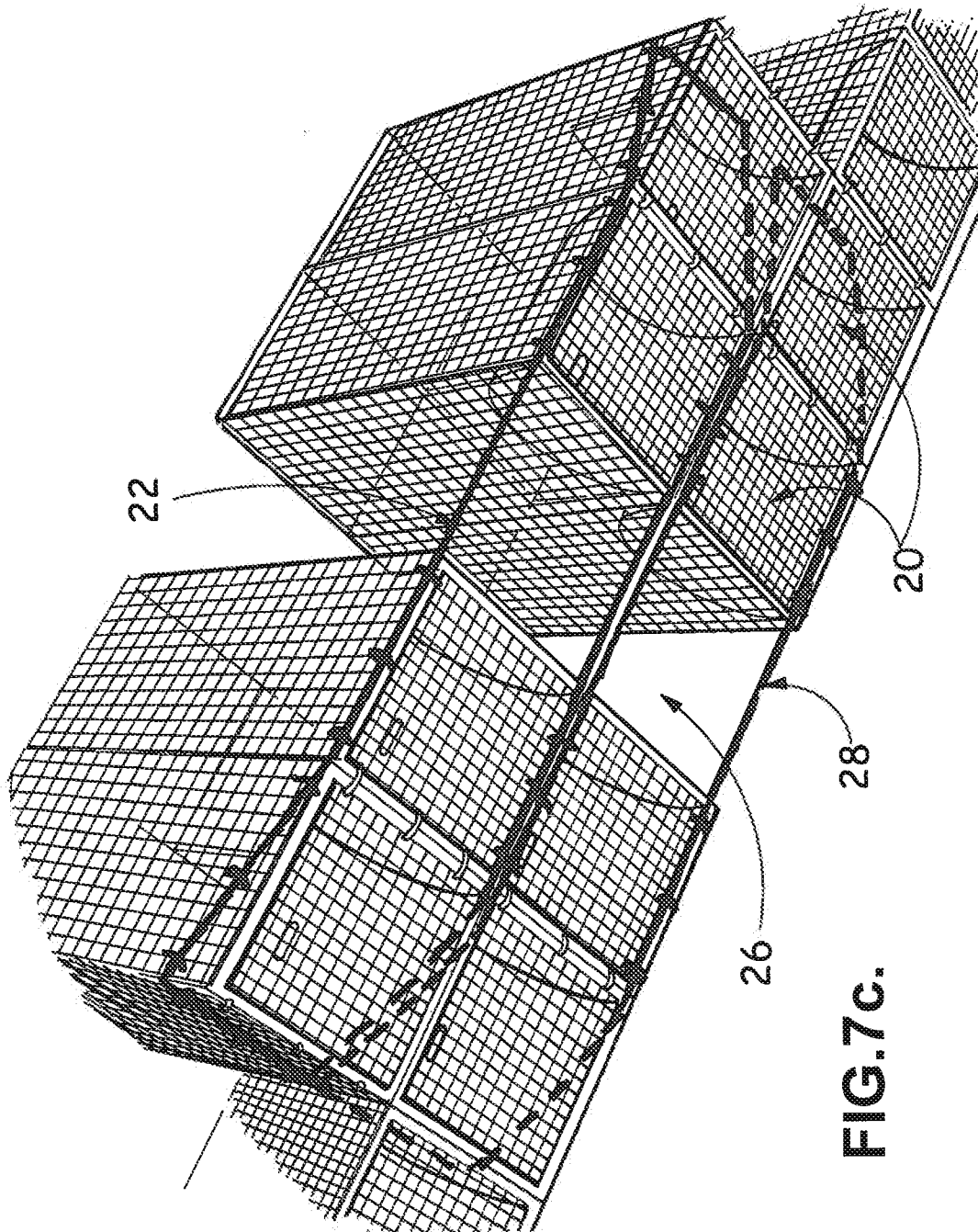


FIG. 7a.

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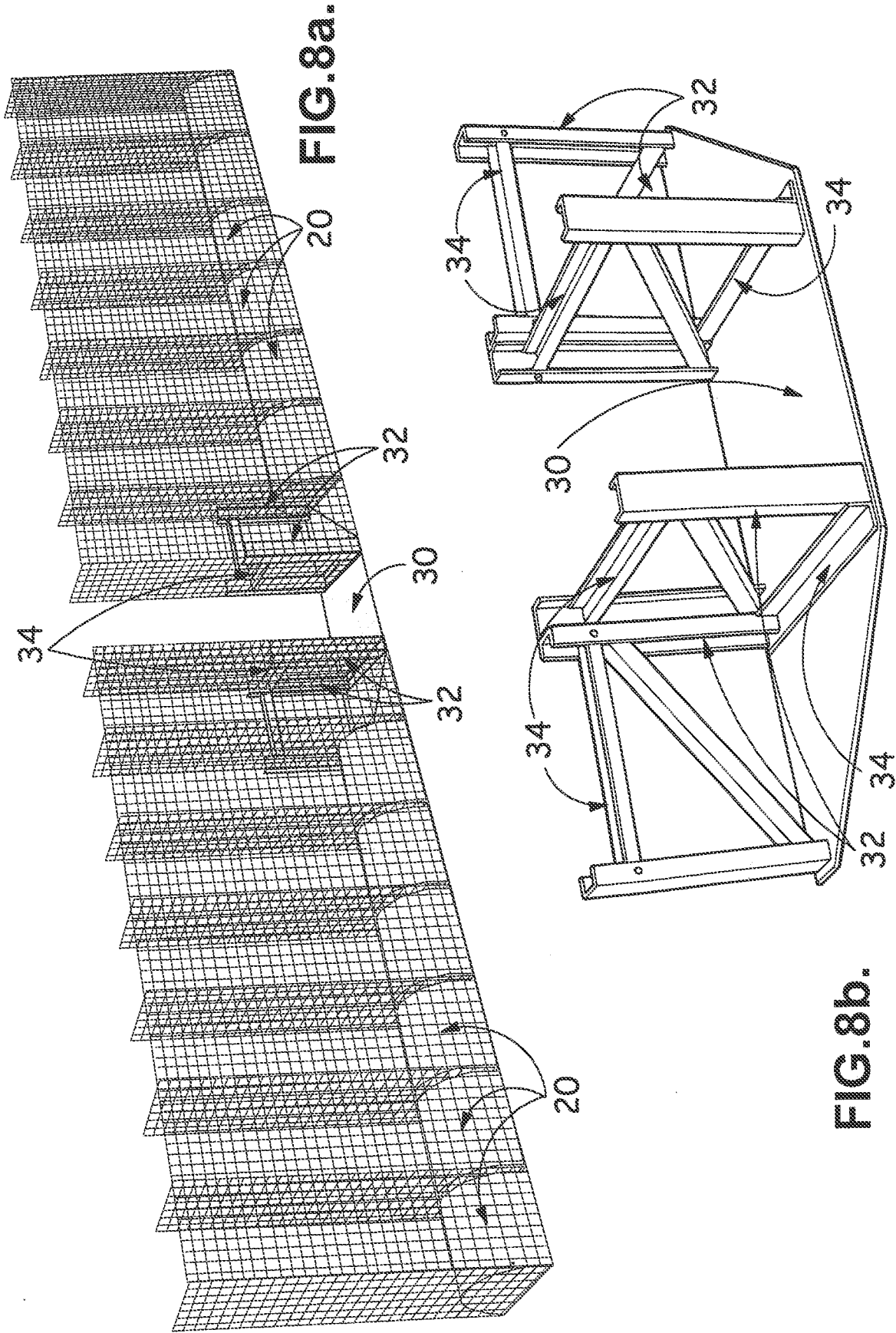
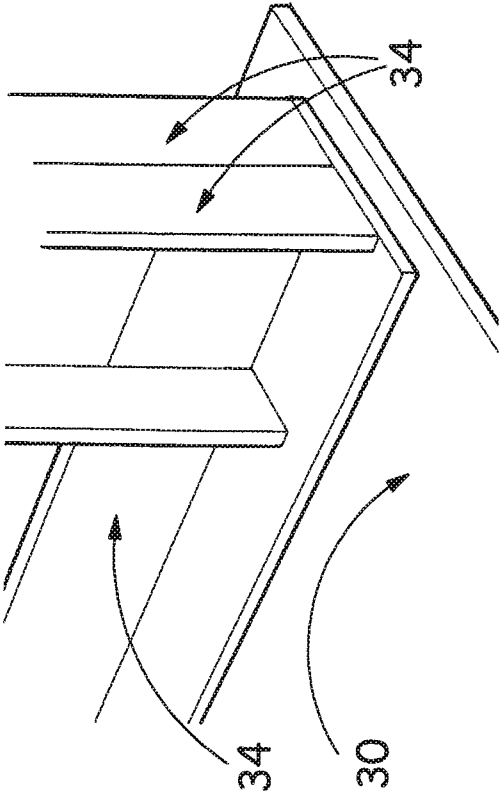
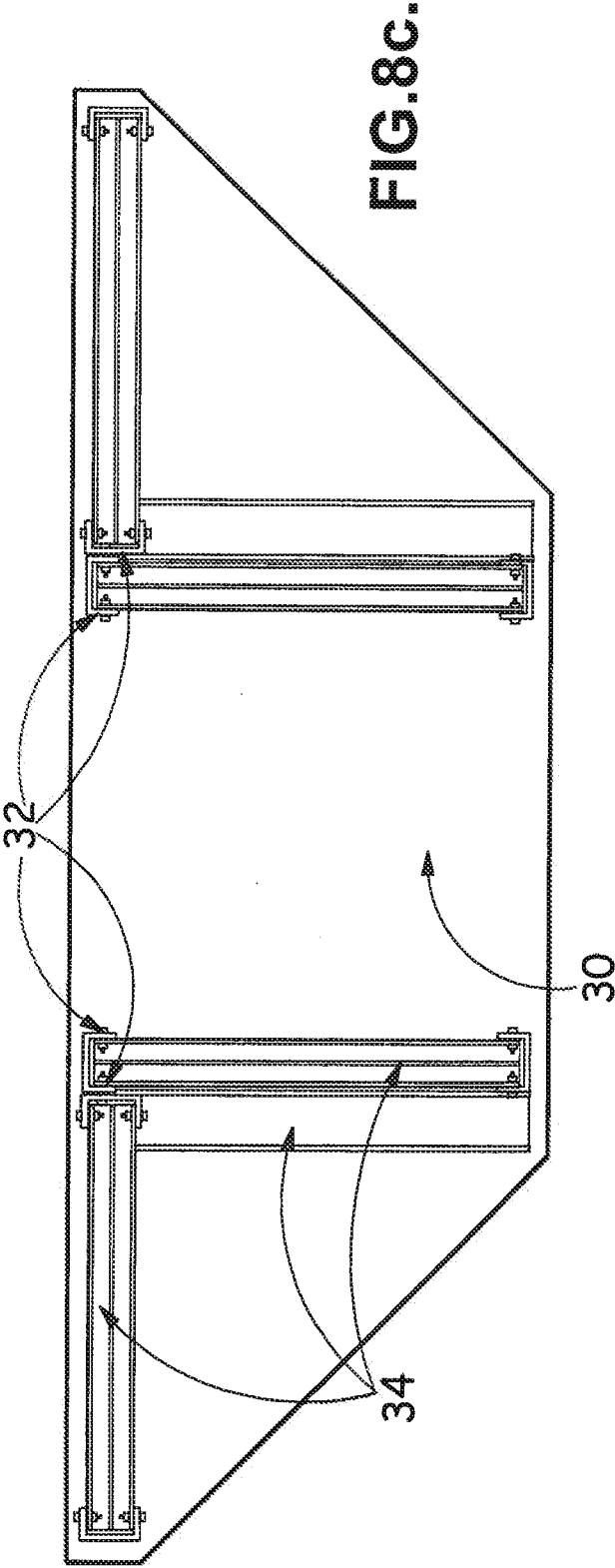


FIG. 8b.



INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2012/050255

A. CLASSIFICATION OF SUBJECT MATTER
INV. E01F8/02 E02D29/02
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E01F E02D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	BE 1 017 506 A3 (MOTTE DIT FALISSE GILLES JACQUES ABEL MARIE [BE]) 4 November 2008 (2008-11-04) the whole document	1,3,4, 8-14, 17-32, 35,36, 45-47, 52-59, 62,63,66
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☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

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Information on patent family members

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