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(54) **Improved modular enclosure**

(57) The invention is a modular enclosure (1) comprising a plurality of modular elements (2), each one of which consists of two horizontal rods (3) connected so that they are parallel to each other through a plurality of transversal elements (4) and is interposed between one pair of upright supporting elements (6) via connection means (7). In the modular enclosure each one of the connection means (7) comprises a first pin (81) defining a longitudinal rotation axis (Y) substantially parallel to the axis (Z) of the upright element (6) and associated with it through bracket means (11) and furthermore each one of the connection means (7) comprises a second pin (91) rotatingly inserted into a hole (10) made in any intermediate position in the first pin (81) in order to define a second rotation axis (X) orthogonal to the first rotation axis (Y).

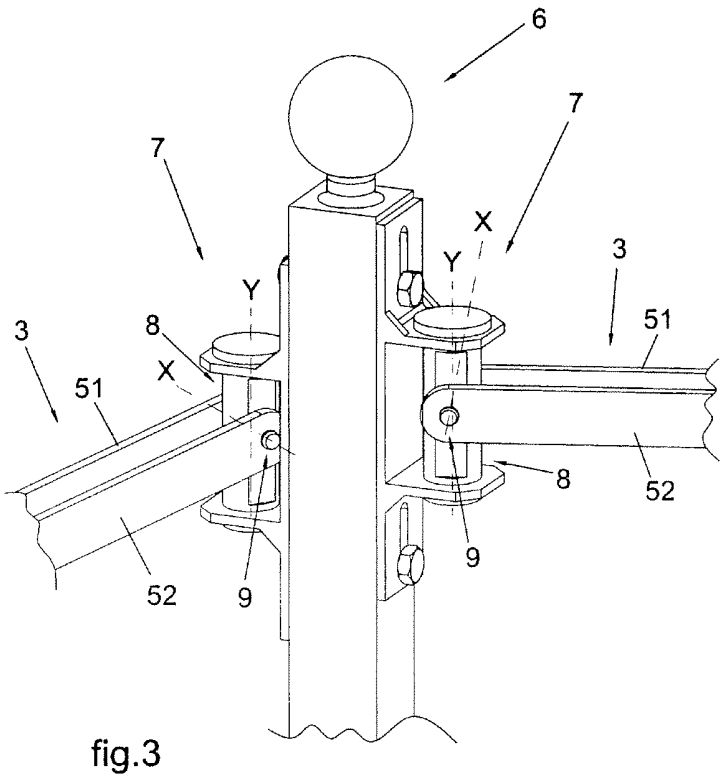


fig.3

EP 2 278 096 A1

## Description

DESCRIPTION

**[0001]** The invention concerns a modular enclosure particularly suited to delimit pieces of land and comprising a plurality of modular elements, each one of which is interposed between two upright elements via improved connection elements.

**[0002]** It is known that in the last few years the companies working in the field of wrought iron or in general but not only in the sector of metal enclosures have developed modular systems for making enclosures suited to be used for delimiting private and/or public properties.

**[0003]** These modular systems, in fact, when compared to enclosures of the traditional type, offer the recognized advantage of ensuring a quicker construction and installation process.

**[0004]** In greater detail, modular enclosures consist of a plurality of modular elements, each one of which is interposed and supported between two upright elements, which in technical jargon are called "posts".

**[0005]** Each modular element, in the specific case of enclosures made of wrought iron or any other metal alloy, comprises at least two horizontal rods arranged and connected parallel to each other by means of a plurality of transversal elements.

**[0006]** In particular, the connections between the above mentioned transversal elements and the horizontal rods are fixed and unchangeable.

**[0007]** Analogously, the arrangement and the connection between each individual modular element and the corresponding post is carried out in a single and fixed way using bracket means.

**[0008]** Consequently, it is evident that, notwithstanding the modular structure of the above mentioned enclosures, it is necessary to make specific modular elements and/or posts in such a way as to adapt them to the different situations that take place during installation.

**[0009]** A first example of this need is the situation in which the piece of land to be delimited is characterized by different levels.

**[0010]** In this case, the use of the above mentioned modular enclosures makes it necessary to carry out a first survey of the property to be delimited, in such a way as to determine the specific characteristics of the modular element that is then constructed at the company's facilities and only successively transported and installed on site.

**[0011]** Furthermore, in most cases enclosures are used to delimit completely pieces of land that have specific and even complex geometrical shapes.

**[0012]** For this reason it is necessary to provide many types of posts, in such a way as to be able to join adjacent modular elements having different angles of incidence.

**[0013]** In most cases said posts make it possible to join two adjacent modular elements with an angle of incidence of 90 or 180 degrees, in such a way as to obtain 90° corners or straight sections, respectively.

**[0014]** However, it may be necessary to provide specific posts that make it possible to connect two modular elements with angles of incidence different from those just mentioned.

**[0015]** In conclusion, the drawbacks posed by this type of modular enclosures are evident in the description just supplied.

**[0016]** In particular, a recognized drawback is represented by the fact that the modular elements and the corresponding posts are not characterized by such a universality as to allow the entire enclosure to adapt to the multiple situations that occur during installation.

**[0017]** Furthermore, it is clear and cannot be neglected that very often the system for constructing and installing said enclosures is complex and requires much time. It is also known that in order to partially overcome these drawbacks, various companies have developed improved modular systems, some of which are briefly described here below.

**[0018]** A first example, which has become commonly used, is the construction of modular elements provided with connection means between each transversal element and the corresponding horizontal rod of the type with pin.

**[0019]** This characteristic allows the operators to alter the profile of said modular elements so that they can adapt to the level variations in the surface of the piece of land to be delimited.

**[0020]** Furthermore, in this last type of enclosure the connection of the modular elements with the post doesn't occur by means of a welding or univocal locking process but by means of a fixing system that makes it possible to choose the inclination of the same horizontal rods of the modular element with respect to the corresponding post.

**[0021]** In this way the problem represented by the level variation in the surface of the piece of land is resolved by means of a single type of modular elements and a post provided with an adjustable fixing system.

**[0022]** In most cases this fixing system consists of one or more brackets welded to the post itself, each one of which is provided with one ore more openings that are connected via fixing means to the ends of the properly inclined modular elements.

**[0023]** According to a different type of solution, which in this specific case has been introduced in order to overcome the problem posed by the different angle of incidence of adjacent modular elements, hinge means are used to connect the same modular elements to the corresponding post.

**[0024]** In this case it is possible to make a single type of post and, during installation, to properly rotate the modular element in such a way as to adapt it to the configuration of the piece of land to be delimited.

**[0025]** Obviously, once the installation of the entire enclosure has been completed, each modular element is constrained in such a way as to maintain a given position

of the two posts arranged at its ends.

**[0026]** Both the solutions of the known art just described, though partly resolving the drawbacks posed by the first type of modular enclosures, however pose the problem that they allow the modular element to adapt to the corresponding post according to one direction only.

**[0027]** In particular, as already explained, with the first system it is only possible to vary the inclination of the modular element with respect to the post so as to adapt the enclosure to the level variation in the surface of the piece of land.

**[0028]** In the second instance, on the contrary, it is only possible to make an enclosure that follows the configuration of the property perimeter, with no possibility to adapt it to the level variation in the surface of the piece of land. The present invention aims to overcome the drawbacks listed above.

**[0029]** In particular, it is one object of the present invention to provide a modular enclosure capable of adapting easily and in a universal way both to the level variation and to the variation in the angle of incidence between two adjacent modular elements.

**[0030]** It is a further object of the invention to provide a modular enclosure that can be easily put together by means of universal elements, with no need to provide individual modular elements for each specific situation.

**[0031]** The objects mentioned above are achieved by a modular enclosure having the characteristics described in the main claim.

**[0032]** Further details of the modular enclosure are described in the dependent claims.

**[0033]** Advantageously, the modular enclosure that is the subject of the invention is homogeneous and linear as a whole, like the enclosures of traditional type.

**[0034]** A further advantage offered by the use of the modular enclosure of the invention is represented by the considerable money savings ensured by the shorter time required and by the fewer operators necessary for its installation. The objects and advantages described above will be highlighted in greater detail in the description of a preferred embodiment of the invention that is supplied as an indicative, non-limiting example, with reference to the enclosed drawings, wherein:

- Figure 1 shows a side view of the modular enclosure that is the subject of the invention;
- Figure 2 shows an axonometric view of the modular enclosure that is the subject of the invention;
- Figure 3 shows an axonometric view of the upper portion of an upright element (post) with which two connection means are associated;
- Figure 4 shows a cross-section view according to a vertical plane of the upper portion of an upright element with which two connection means are associated;
- Figure 5 shows an axonometric view of a first embodiment of the connection means applied to the upright element;
- Figure 6 shows a second embodiment of the connection means applied to the upright element;
- Figure 7 shows a third embodiment of the connection means applied to the upright element;
- Figure 8 shows an axonometric view of a detail of the bracket element belonging to the connection means of the invention;
- Figure 9 shows an axonometric view of the first pin belonging to the connection means of the invention;
- Figure 10 shows an axonometric view of a first example of application of the modular enclosure that is the subject of the invention;
- Figure 11 shows a side view of a second example of application of the modular enclosure that is the subject of the invention.

**[0035]** The modular enclosure that is the subject of the invention is shown as a whole in Figures 1 and 2, where it is indicated by **1**.

**[0036]** It can be noted that the above mentioned modular enclosure **1** comprises a plurality of modular elements **2,** each one of which comprises at least two horizontal rods **3** connected to each other so that they are parallel by means of a plurality of transversal elements **4.**

**[0037]** In particular, in the preferred embodiment of the invention described herein and shown in Figure 1, the modular elements **2** are provided with two horizontal rods **31** and **32.**

**[0038]** However, it cannot be excluded that in different embodiments of the invention the number of horizontal rods **3** may be higher than two.

**[0039]** Always with reference to said horizontal rods **3,** in the preferred embodiment of the invention described herein each one of them comprises two plane elements **51** and **52** spaced from and parallel to each other, as clearly shown in Figure 3.

**[0040]** It cannot be excluded that in different embodiments of the invention, neither described nor illustrated herein, the above mentioned horizontal rods **3** are made from a single prismatic element with mainly longitudinal development. As shown in Figure 1, each modular element **2** is interposed between one pair of upright elements **6** that in technical jargon are called "posts", as already explained above.

**[0041]** In particular, the connection between each upright element **6** and the corresponding modular element **2** is obtained by means of one or more connection means **7.**

**[0042]** In the embodiment of the invention described herein and shown in Figure 1, each upright element **6** is provided with four connection means **7** arranged in pairs in a position opposite the upright element itself.

**[0043]** As shown again in Figure 1, according to the embodiment described herein the above mentioned connection means **7** are aligned, always in pairs, according to the longitudinal direction of the upright element **6,** so that each pair is associated with the same modular element **2.**

**[0044]** It cannot be excluded that in different construction variants each upright element **6** has more than two connection means **7** aligned according to its longitudinal direction and associated with the same modular element **2.** Moreover, in further embodiments of the invention said connection means **7** may be arranged in pairs, not necessarily in an opposite position with respect to the upright element **6** itself.

**[0045]** According to the invention, as shown in Figures 3 and 4, each one of said connection means **7** comprises a first pivotal element **8** suited to define a vertical rotation axis **Y.**

**[0046]** Always according to the invention, said first pivotal element **8** is also associated with a second pivotal element **9** that defines a second rotation axis **X** that is orthogonal with respect to the first axis **Y,** just mentioned. According to the construction form described herein and illustrated in Figure 5, said first pivotal element **8** preferably but not necessarily comprises a first pin **81** with its longitudinal rotation axis **Y** substantially parallel to the main axis **Z** of the upright element **6.**

**[0047]** Again, in the preferred embodiment of the invention described herein the second pivotal element **9** is a second pin **91** rotatingly inserted in a hole **10** made in any intermediate position in the first pin **81,** as shown in Figure 5.

**[0048]** In this way, said second pin **91** has its rotation axis **X** orthogonal to the first axis **Y.**

**[0049]** As regards the connection between the first pin **81** and the upright element **6,** as shown in the preferred embodiment of the invention shown in Figure 5, it is obtained using bracket means **11.**

**[0050]** In particular, always as shown in the detail of Figure 5, each one of the above mentioned bracket means **11** comprises a single supporting element **19** on which it is possible to identify a surface **191** that rests on the upright element **6.** The same supporting element **19** is provided with two openings **20** for the insertion of fixing means **15** in such a way as to allow it to be permanently associated with the upright element **6** itself.

**[0051]** In the preferred embodiment of the invention, the above mentioned fixing means **15** comprise a bolted screw **151.**

**[0052]** In different embodiments of the invention the fixing means **15** may be of a different type, provided that they allow the bracket means **11** to be locked onto the upright element **6** and that they belong to the known art.

**[0053]** The openings **20** are preferably but not necessarily slots **201** that allow the bracket means **11** to be adjusted according to the longitudinal direction of the upright element **6.**

**[0054]** Furthermore, two projecting surfaces **21** spaced from each other develop in a substantially orthogonal direction from said supporting element **19,** each projecting surface **21** being provided with a through opening **22** suited to house and constrain one end **811** of the first pin **81.**

**[0055]** In different embodiments of the invention, as shown in Figure 6, each one of the above mentioned bracket means **11** may comprise two bracket elements **12,** each having a substantially L-shaped profile.

**[0056]** Said bracket elements **12,** one of which is shown in Figure 8, are provided with a first supporting surface **13** in which it is possible to identify a first through opening **14** for the insertion of fixing means **15** that allow said bracket element **12** to be successively locked onto said upright element **6.**

**[0057]** Furthermore, on each one of the above mentioned bracket elements **12** it is possible to identify a further second surface **16,** substantially orthogonal to the first surface **13,** in which there is a second through opening **17** suited to house and constrain one end **811** of the first pin **81,** like in the embodiment described above.

**[0058]** In fact, the two bracket elements **12** belonging to the same bracket means **11** are mutually arranged, as shown in Figure 6, along the longitudinal direction of the upright element **6** at a distance that is not shorter than the height of the first pin **81,** so as to limit the movement of the latter only to the rotation around its axis **Y.**

**[0059]** Even in this case, the first opening **14** for the insertion of the fixing means **15** is preferably but not necessarily a slot **141** that allows the adjustment of the position of each bracket element **12** along the longitudinal direction of the upright element **6.**

**[0060]** In further alternative construction variants, as shown in Figure 7, the above mentioned bracket means **11** may be two brackets **18** fixed with a welding process so that they are orthogonal to the upright element **6** and parallel to each other.

**[0061]** Obviously, even in this case the distance between the two above mentioned brackets **18** along the longitudinal direction of the upright element **6** must be shorter than the height of the first pin **81,** so that the movement of the latter is limited to the rotation only.

**[0062]** In the embodiment of the invention described herein and shown in Figure 9, the first pin **81** is provided, at the level of each one of its own ends **811,** with locking means **23** that prevent it from coming out of the openings **17, 22** made for the purpose of constraining it.

**[0063]** In particular, a first end **811** is preferably but not necessarily provided with a contact surface consisting of a head **24** that is wider compared to the diameter of the first pin **81.**

**[0064]** In a different way, the opposite end, always according to the preferred embodiment of the invention, is provided with a stop ring **25** inserted in a groove **26** made in the body of the above mentioned first pin **81.**

**[0065]** Regarding the second pin **91,** it must be analogously associated with and constrained to a corresponding horizontal rod **3** belonging to the modular element **2.**

**[0066]** In order to allow the above, as for the first pin **81,** a contact surface is created at the level of one of its ends **911** and on the opposite end there is a stop ring inserted in a groove made in the body of said second pin **91.**

**[0067]** It cannot be excluded that in different embodiments of the invention, neither described nor illustrated herein, said locking means **23** arranged at the ends of the two pins **81** and **91** are carried out in an alternative manner, provided that it belongs to the known art.

**[0068]** As regards the horizontal rods **3** of each modular element **2,** as already mentioned above, in the preferred embodiment of the invention they consist of two plane elements **51** and **52** spaced from and parallel to each other, having their ends connected at the level of opposite sides of the corresponding connection means **7** through the second pin **91,** as shown in Figure 3.

**[0069]** It cannot be excluded, however, that in different construction variants not described herein each horizontal rod **3** is a single prismatic element with mainly longitudinal development, provided at its ends with a projecting element that fits into a slot created in the first pin **81.**

**[0070]** Obviously, said first pin **81** is provided with the through hole **10** that is transversally coupled with the second pin **91** that in its turn allows the rotation of the horizontal rod **3** around its own axis **X.**

**[0071]** Furthermore, according to an alternative embodiment of the invention, the horizontal rod **3,** always comprising a single prismatic element, is provided at each end with a fork that is arranged on opposite sides of the corresponding connection means **7** through the connection with said second pin **91.**

**[0072]** In practice, the characteristics of the modular enclosure **1** that have just been illustrated allow the installers to adapt each modular element **2** and the corresponding upright element **6** to the most different situations that occur during the assembly stage.

**[0073]** In particular, Figure 10 shows a first example of a section of the enclosure 1 in which the two adjacent modular elements **2** are simultaneously positioned with different inclination and arranged on two planes incident on each other.

**[0074]** In the example of Figure 11 it is possible to observe the adaptation of the above mentioned two modular elements **2** that serves to overcome the difficulty posed by the different inclination of the ground.

**[0075]** The above clearly shows that the modular enclosure **1** that is the subject of the invention achieves all the set objects.

**[0076]** In particular, the invention achieves the object to provide a modular enclosure capable of adapting easily and in a universal way both to the level variation in the ground surface and to the variation in the angle of incidence between two adjacent modular elements.

**[0077]** The invention also achieves the object to provide a modular enclosure that can be easily put together by means of universal elements, with no need to provide individual modular elements for each specific situation.

**[0078]** During the construction phase, the modular enclosure that is the subject of the invention may undergo further changes that, though not illustrated or described herein, shall nonetheless be covered by the present patent, provided that they come within the scope of the claims that follow.

**[0079]** Where technical features mentioned in any claim are followed by reference signs, those reference sings have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the protection of each element identified by way of example by such reference signs.

## Claims

1. Modular enclosure (1) of the type comprising a plurality of modular elements (2), each one of which consists of at least two horizontal rods (3) connected parallel to each other by means of a plurality of transversal elements (4) and is interposed between one pair of upright supporting elements (6) through connection means (7), **characterized in that** each one of said connection means (7) comprises a first pin (81) defining a longitudinal rotation axis (Y) substantially parallel to the axis (Z) of said upright element (6) and associated with it through bracket means (11) and furthermore each one of said connection means (7) comprises a second pin (91) rotatingly inserted into a hole (10) made in any intermediate position in said first pin (81) in order to define a second rotation axis (X) orthogonal to said first rotation axis (Y).

2. Modular enclosure (1) according to claim 1), **characterized in that** each one of said bracket means (11) comprises a supporting element (19) on which it is possible to identify a surface (191) for resting on said upright element (6), said supporting element (19) being provided with openings (20) suitable for the insertion of fixing means (15), and wherein two projecting surfaces (21) spaced from each other depart from said supporting element (19) according to a substantially orthogonal direction, each one of said projecting surfaces (21) being provided with a through opening (22) suited to accommodate one end (811) of said first pin (81).

3. Modular enclosure (1) according to claim 2), **characterized in that** said first through opening (20) for the insertion of said fixing means (15) is a slot (201) suited to allow the adjustment of the position of each one of said bracket means (11) according to the longitudinal direction of said upright element (6).

4. Modular enclosure (1) according to claim 1), **characterized in that** each one of said bracket means (11) comprises two bracket elements (12), each one of which has a substantially L-shaped profile in which it is possible to identify a first plane (13) for resting on said upright element (6) provided with a first through opening (14) suitable for the insertion of fixing means (15) and a second plane (16) provided

with a second through opening (17) suited to house one end (811) of said first pin (81), said two bracket elements (12) being spaced from each other along the longitudinal direction of said upright element (6) at a distance that is not shorter than the height of said first pin (81 ).

**5.** Modular enclosure (1) according to any one of the preceding claims, **characterized in that** each one of said upright elements (6) is provided with at least two of said connection means (7) aligned along its longitudinal direction and suited to be associated with the same modular element (2).

**6.** Modular enclosure (1) according to any one of the preceding claims, **characterized in that** each one of said upright elements (6) comprises four connection means (7) fixed two by two in opposite position of said upright element (6).

**7.** Modular enclosure (1) according to any one of the claims from 1) to 6), **characterized in that** said first pin (81) and said second pin (92) are provided with locking means (23) at the level of each end (811, 911).

**8.** Modular enclosure (1) according to claim 7), **characterized in that** said locking means (23) of said first pin (81) and said second pin (91) comprise at one first end a contact surface defined by a widened head (24) and at the opposite end a stop ring (25) inserted into a groove (26) made in said first and said second pin (81, 91).

**9.** Modular enclosure (1) according to any one of the preceding claims, **characterized in that** each one of said horizontal rods (3) comprises two plane elements (51, 52) spaced from and parallel to each other having their ends connected on opposite sides of said connection means (7) through said second pin (91).

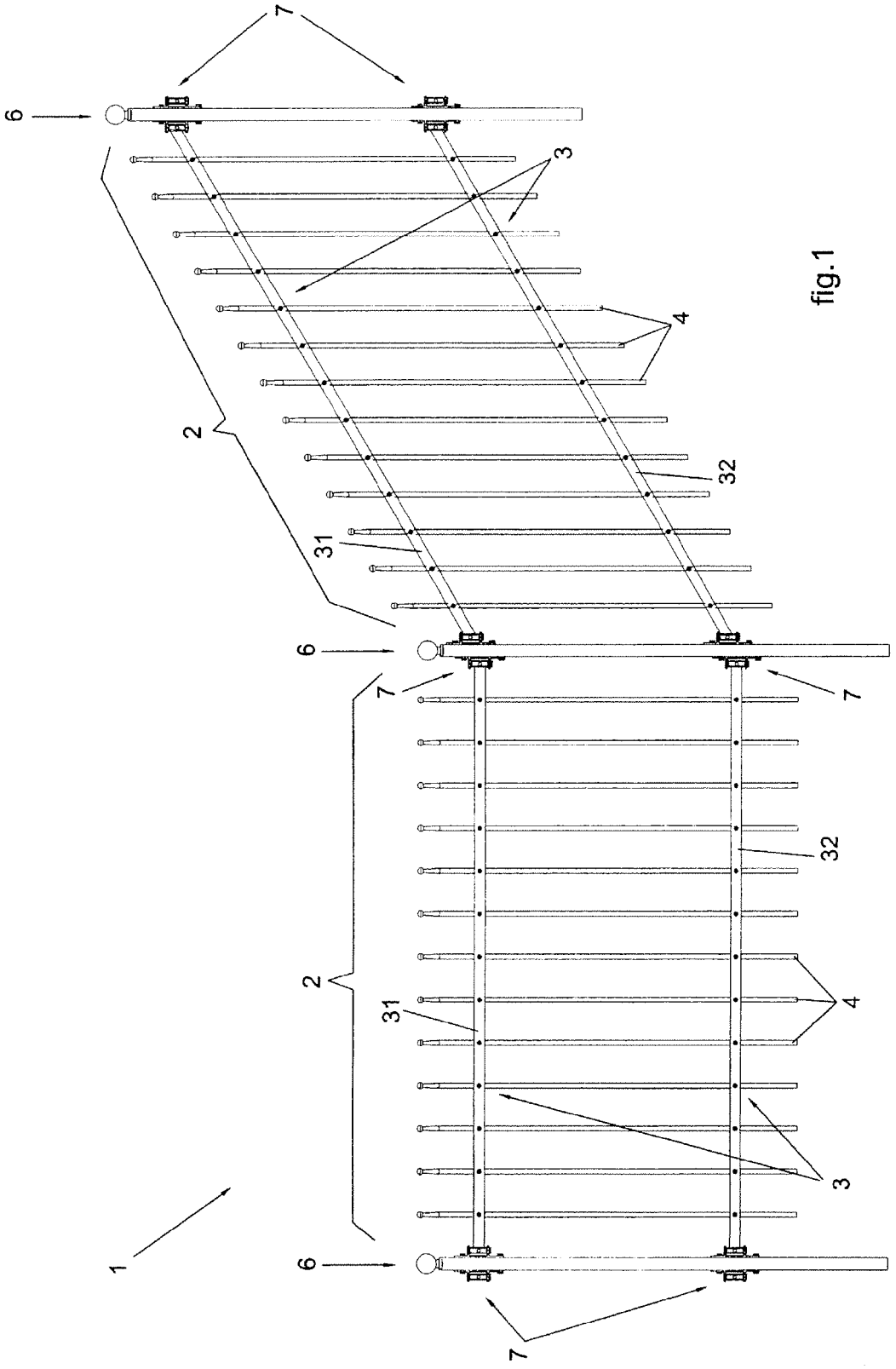


fig.1

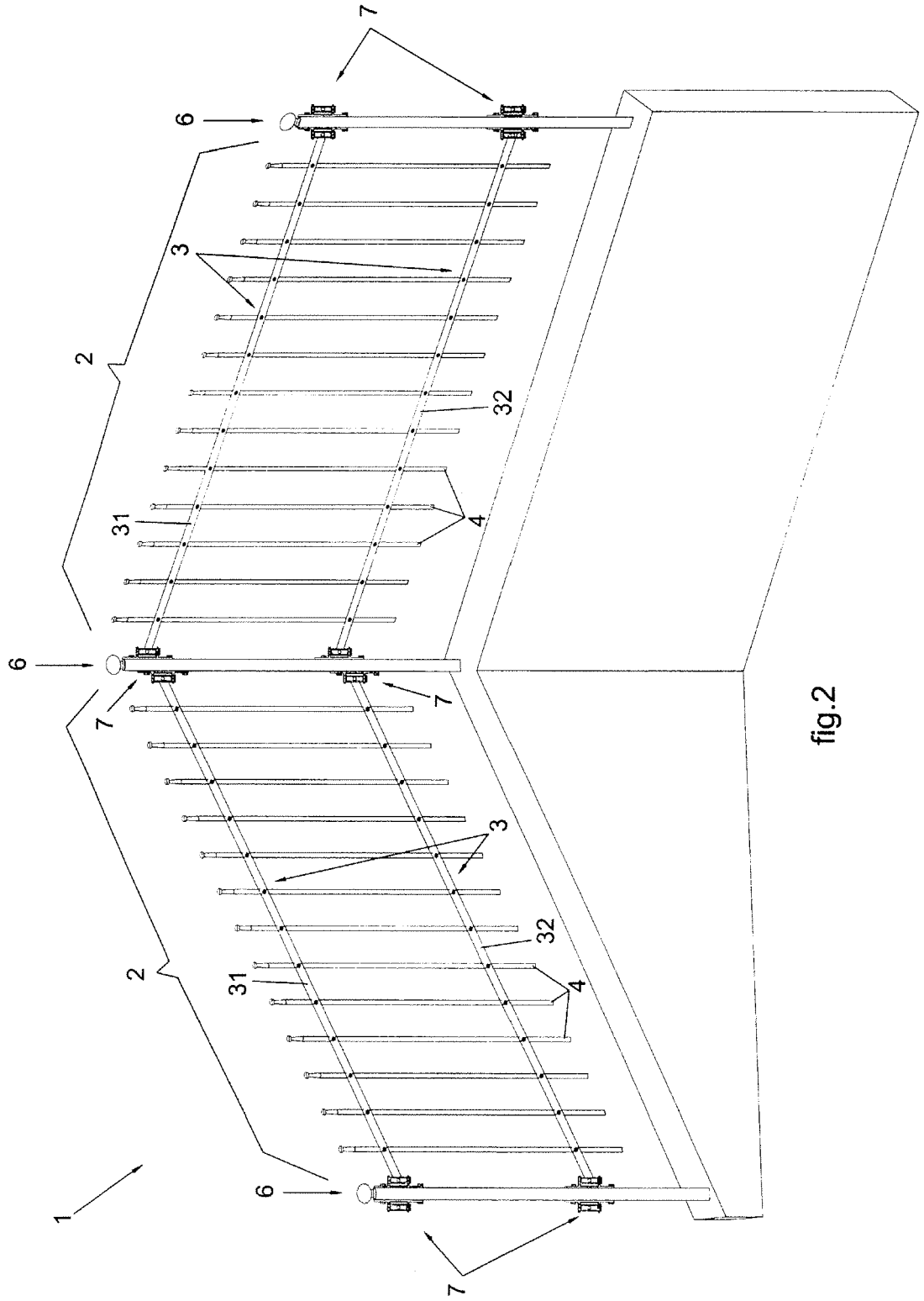


fig.2

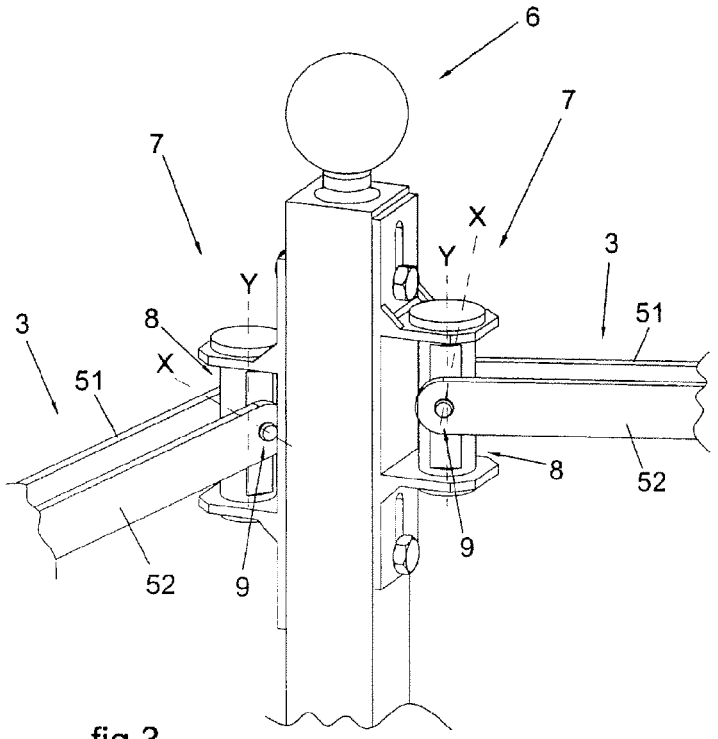


fig.3

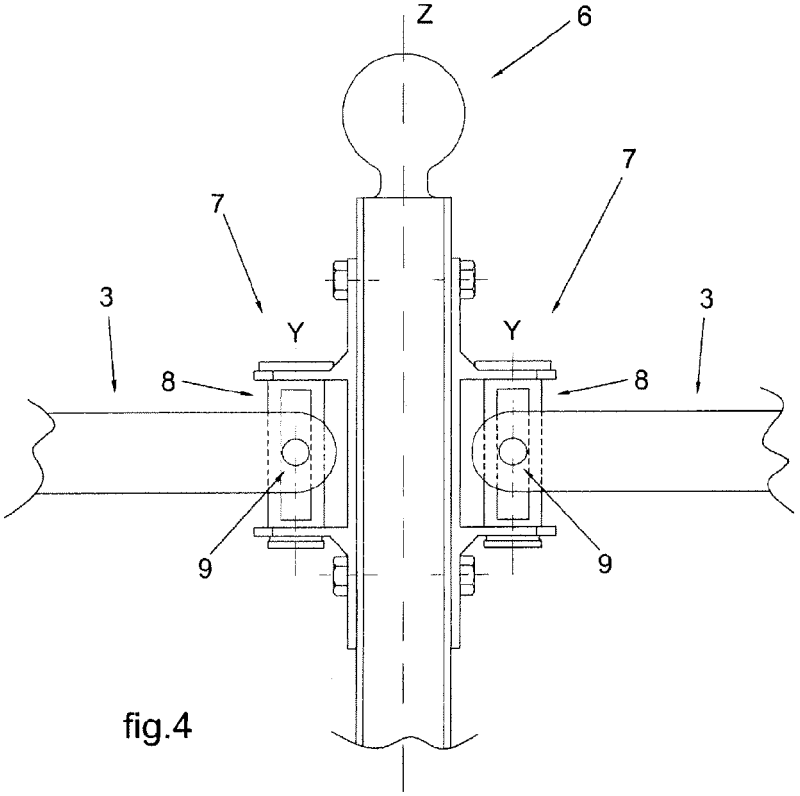


fig.4

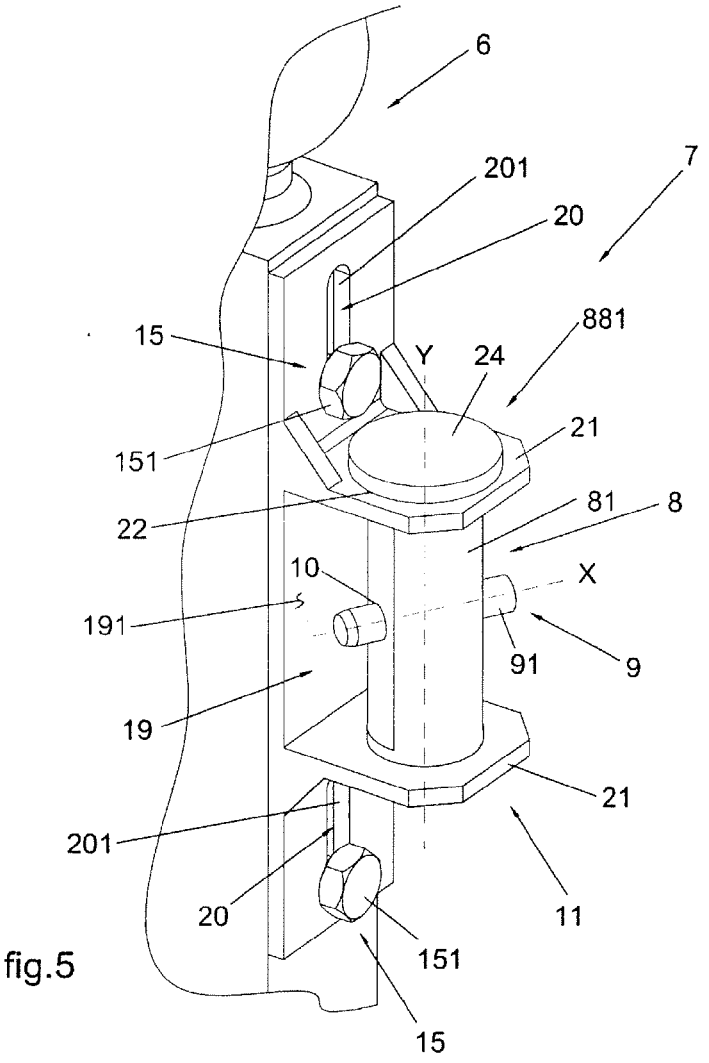
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fig.5

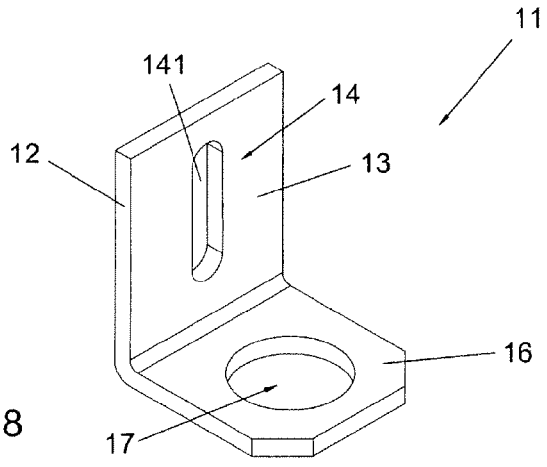
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fig.8

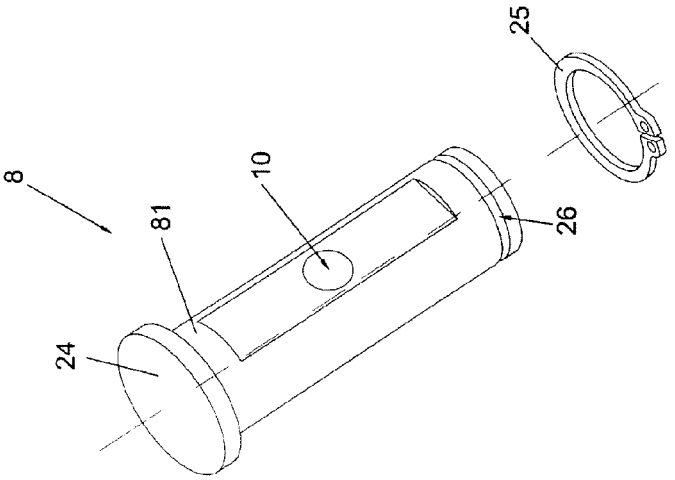


fig.9

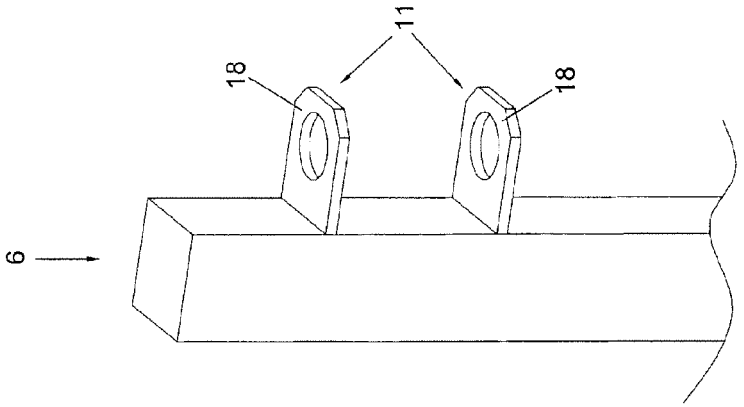


fig.7

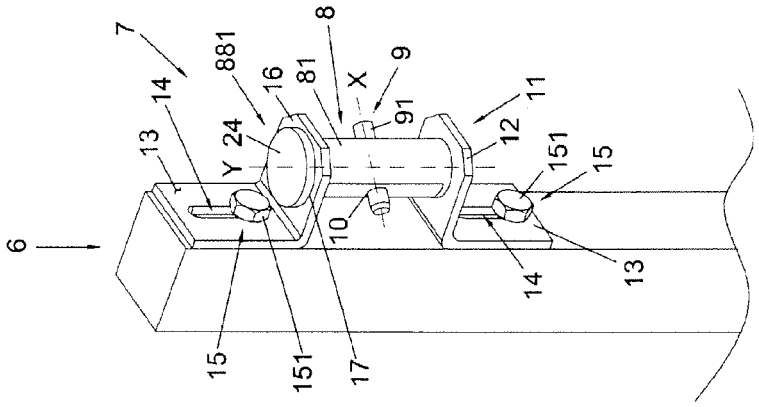


fig.6

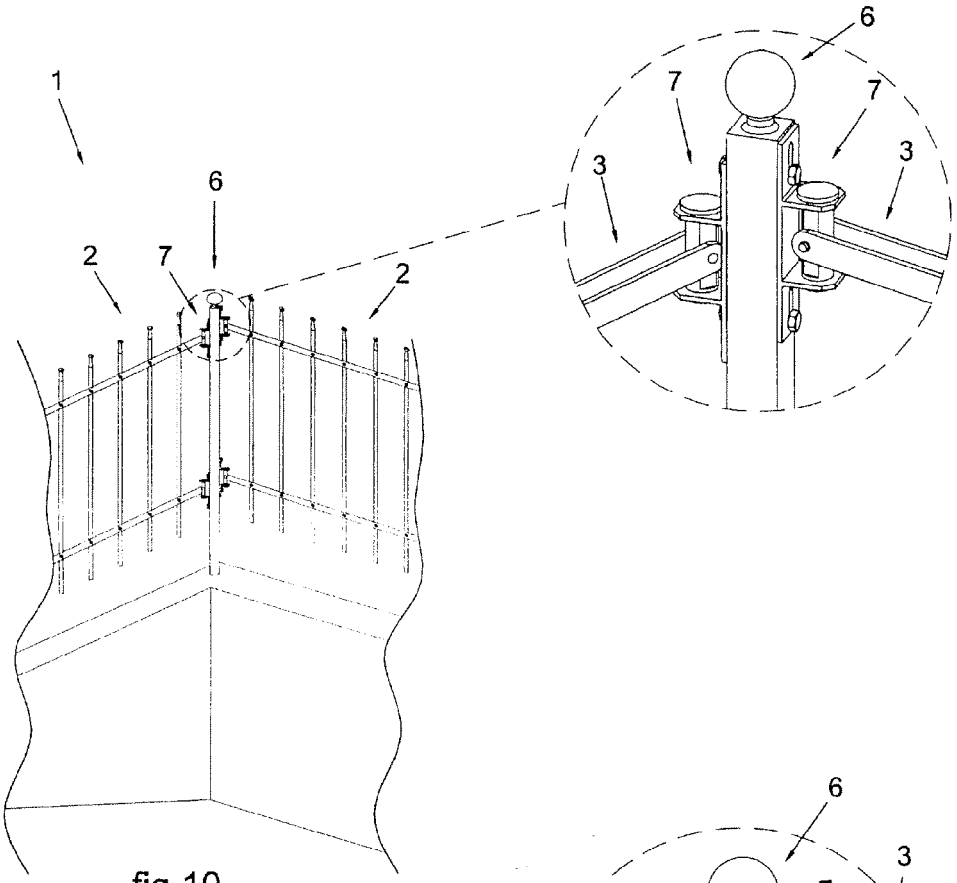


fig.10

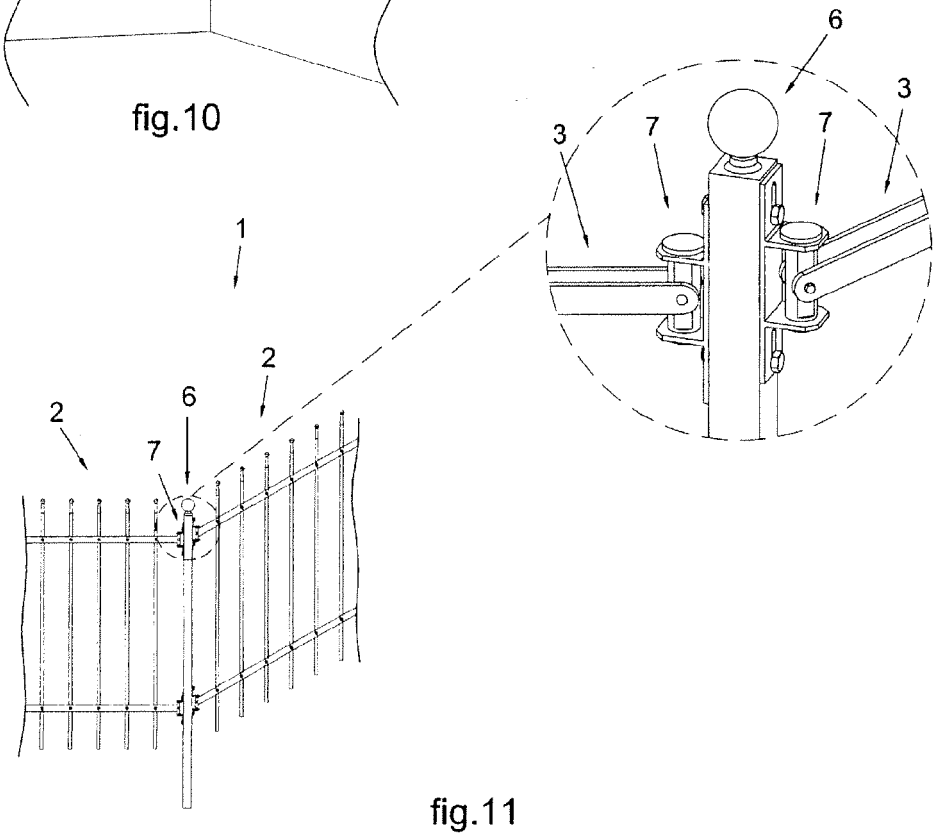


fig.11

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# EUROPEAN SEARCH REPORT

Application Number
EP 10 16 6571

## DOCUMENTS CONSIDERED TO BE RELEVANT

| Category | Citation of document with indication, where appropriate, of relevant passages | Relevant to claim | CLASSIFICATION OF THE APPLICATION (IPC) |
|---|---|---|---|
| A | GB 2 307 256 A (DARFEN LTD [GB])<br>21 May 1997 (1997-05-21)<br>* figures 3-5 *<br>* page 7, paragraph 5 *<br>* page 7, paragraph 2 *<br>----- | 1-9 | INV.<br>E04H17/14 |
| A | US 2006/033093 A1 (LO CHONG-YI [US])<br>16 February 2006 (2006-02-16)<br>* figures 1,2,4 *<br>* page 1, paragraph 6 *<br>----- | 1-9 | |
| A | US 2008/029748 A1 (FORD GARRETT N [US])<br>7 February 2008 (2008-02-07)<br>* figures 1-3,8 *<br>----- | 1 | |
| | | | TECHNICAL FIELDS SEARCHED (IPC)<br>E04F<br>E04H |

The present search report has been drawn up for all claims

| Place of search | Date of completion of the search | Examiner |
|---|---|---|
| Munich | 21 September 2010 | Brucksch, Carola |

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
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