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(71) Applicant: **Cracco S.r.l.**
36070 Brogliano (VI) (IT)

(72) Inventor: **CRACCO, Manuel**
36070 Brogliano (Vicenza) (IT)

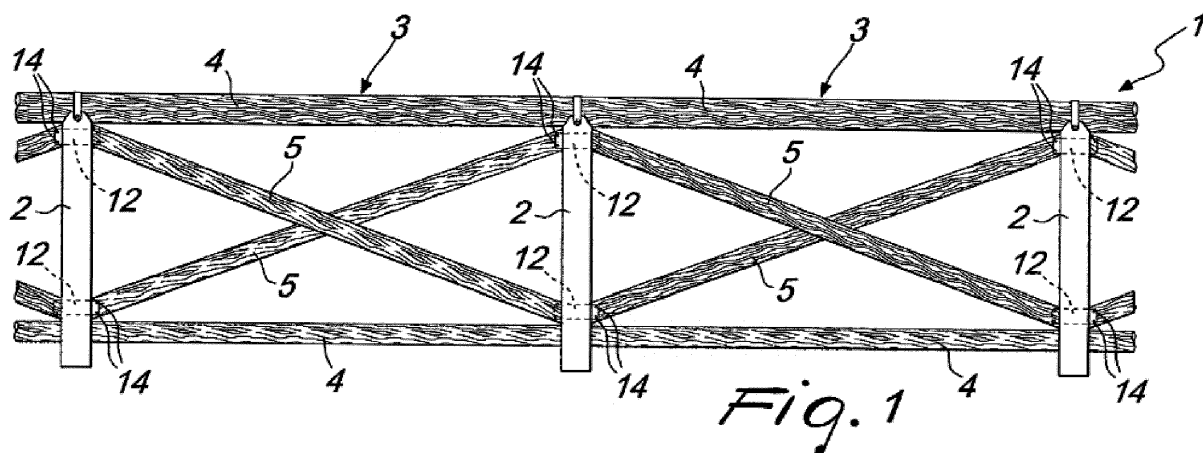
(74) Representative: **Feltrinelli, Secondo Andrea**
APTA S.r.l.
Patent Department
Via Ca' di Cozzi, 41
37124 Verona (IT)

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(54) **A MODULAR FENCE ASSEMBLY**

(57) The present invention refers to a modular fence structure which comprises a plurality of uprights, constituted by metal tubular bodies, adapted to support a plurality of transverse containment elements. The particular

feature of the present finding lies in the fact that the uprights comprise shaped notches, made along the extension thereof, adapted to allow the quick and safe connection of the containment elements.



Description

[0001] The present finding refers to a modular fence structure with high mounting simplicity and reduced maintenance.

[0002] As is known, due to their limited environmental and landscape impact and to their perfect integration with the environment, fences are increasingly used for delimiting cycling paths, gardens and parks, or for making parapets.

[0003] Such fencing is generally constituted by wooden prefabricated structural elements that are assembled together by using various connection systems.

[0004] Even if the wood is subjected to treatments in autoclaves, which preserve it from attacks of weathering agents such as fungi, molds and rot, such structures are in any case subjected to deterioration and damage.

[0005] Indeed, it is not uncommon to find fences that show the breakage of some crosspieces and the yielding of some uprights, or in any case reveal structural damage such to compromise the overall stability and safety thereof.

[0006] However, in addition to the preservation problems, the fences of known type also have criticalities tied, for example, to the mounting, and in particular to the connection of the crosspieces with the uprights.

[0007] The obtaining of the fences available on the market today thus requires the use of professional workers and experts, who nevertheless will not be able to avoid relatively long and costly intervention times.

[0008] US666947A, US4813651A, US200322257A1 and DE4436345C1 teach solutions according to the state of the art.

[0009] The task of the present finding is therefore that of attaining a modular fence structure which overcomes the drawbacks of the abovementioned prior art, and which in particular is simple to make and assemble.

[0010] In the scope of the abovementioned task, one particular object of the finding is to provide a modular fence structure that is obtained with materials capable of combining high resistance to wear and signs of time with limited environmental and landscape impact.

[0011] Another object of the finding is to provide a modular fence structure which allows considerably reducing the costs of labor during the achievement step.

[0012] Further object of the finding is to provide a modular fence structure which, due its particular structural features, is capable of facilitating the storage or transport.

[0013] Still another object of the finding is to provide a modular fence structure which allows increasing the array of the achievable models, starting from the same structural components.

[0014] Not least object of the finding is to provide a modular fence structure which is capable of ensuring the widest assurances of reliability and safety during use.

[0015] The above-described task, as well as the abovementioned objects and others which will be clearer hereinbelow, are achieved by a modular fence structure,

comprising a plurality of uprights adapted to support a plurality of transverse containment elements; said uprights being constituted by metal tubular bodies; said structure is characterized in that said uprights comprise a plurality of shaped notches, made along the extension thereof, adapted to allow the quick and safe connection of said containment elements.

[0016] Further characteristics and advantages will be clearer from the description of preferred but not exclusive embodiments of a modular fence structure according to the finding, illustrated as a non-limiting example in the drawing set, in which:

figures 1 and 1a are respectively side and front views of a modular fence structure according to the finding; figures 2 and 2a are respectively side and front views of a structural variant of the modular fence structure according to the finding;

figures 3 and 3a are respectively side and front views of another structural variant of the modular fence structure according to the finding;

figures 4 and 4a are respectively side and front views of another structural variant of the modular fence structure according to the finding;

figures 5 and 5a are respectively side and front views of another structural variant of the modular fence structure according to the finding;

figures 6 and 6a are respectively side and front views of another structural variant of the modular fence structure according to the finding;

figures 7 and 7a are respectively side and front views of another structural variant of the modular fence structure according to the finding;

figures 8 and 8a are respectively side and front views of another structural variant of the modular fence structure according to the finding;

figure 9 is a perspective view of several components of a modular fence structure according to the finding; figure 10 is a perspective view of several components of a modular fence structure according to the finding;

figure 11 is a side view with parts in section of a ground fixing system for an upright for a fence structure in accordance with the present invention;

figure 12 is a top view of an upright of the system of figure 11; and

figure 13 is a view of a detail in enlarged scale of the system of figure 11.

[0017] With reference to the abovementioned figures 1 to 7, as well as to figure 9, a modular fence structure is indicated in its entirety with the reference number 1.

[0018] The structure 1 is essentially composed of a series of uprights 2 suitable for a vertical fixing to the ground and conceived for supporting transverse containment elements 3.

[0019] More particularly, the uprights 2 are constituted by metal tubular bodies preferably made of COR-TEN

steel, or of other materials with substantially analogous characteristics, which can have substantially circular or polygonal cross section, in accordance with the requirements.

[0020] It should be considered that the selection of COR-TEN steel, among the various available materials, is determined by the desire to intervene on the territory with minimum environmental and landscape impact, without however compromising the strength of the structure 1 as well as its ease of assembly.

[0021] With regard to the containment elements 3, these can instead have different configurations dictated by aesthetic and/or functional requirements.

[0022] In the case of figures 1 and 2, for example, the containment elements 3 are constituted by stringers 4, preferably made of wood or round, semi-round or square steel, jointed to the uprights 2 and arranged on one or more superimposed horizontal rows.

[0023] Advantageously, the stringers 4 are combined with oblique crosspieces 5, preferably made of half-round or square wood, associated with the uprights 2 and arranged as St. Andrew's Cross.

[0024] It will nevertheless be clear to the man skilled in the art that the containment elements 3 can also assume other configurations, which still fall within the scope of the present finding.

[0025] For example, as illustrated in figures 3 and 4, the containment elements 3 can be constituted by metal rods 6, preferably made of COR-TEN steel, joined to the uprights 2 and equipped with vertically arranged boards 7.

[0026] In other contexts, the containment elements 3 can instead consist of gridlike modular panels, as illustrated as an example in figures 5 and 6 in which they are respectively indicated with the reference numbers 8 and 9, or of cover panels 10, transparent or not transparent, as illustrated in figure 7.

[0027] Clearly, the containment elements 3 could also be constituted by nets, ropes, windbreak panels, and still other items, without departing from the scope of the employed solution idea.

[0028] According to the present finding, along the extension of the uprights 2, shaped notches 11 are defined which allow quickly and safely connecting the containment elements 3.

[0029] Advantageously, some or all of the shaped notches 11 illustrated in figures 1 to 7, as well as in figure 9, have a shape substantially complementary to that of the cross section of suitable fixing elements 12, which are made integral with the containment elements 3 and associable with the uprights 2.

[0030] In practice, diametrically-opposed pairs of shaped notches 11 define through seats for the fixing elements 12 on the uprights 2, which are inserted therein, with possibility of sliding in a manner such to traverse the same uprights 2 from side to side, projecting from opposite sides.

[0031] By complementary, it is clearly to be intended

that the shaped notches 11 have size corresponding to the cross section of the fixing elements 12, such that one or each fixing elements 12 is insertable to size, hence substantially without clearance, in the respective shaped notch 11.

[0032] Therefore, the complementarity between a shaped notch 11 and a respective fixing element means that only a respective fixing element 12 is insertable in the shaped notch 11 or in each of the shaped notches 11 and therefore not a containment element to be supported, whose ends are thus not inserted in the axial opening of respective uprights. Among other things, this ensures stronger uprights as well as a quick and effective insertion of the fixing element 12 in the shaped notch 11, as well as the maintenance in correct work position of the fixing element 12, in particular as long as the same is not connected or fixed to one or more containment elements.

[0033] More particularly, the pairs of shaped notches 11 are defined on the side of the uprights 2, at the top part and bottom part, i.e. substantially at the two opposite ends of the portions of the uprights 2 that project from the ground.

[0034] In the case of the embodiments of the structure according to the finding illustrated in figures 1 to 7, as well as in figure 9, the shaped notches 11 are advantageously elongated slots defined longitudinally or transversely with respect to the uprights 2.

[0035] In other words, the aforesaid elongated slots can be defined in a manner such to be operatively vertical or operatively horizontal in accordance with the requirements.

[0036] The fixing elements 12 instead consist of a series of metal plates, preferably made of COR-TEN steel, which suitably have slotted holes 13 made on the opposite ends thereof.

[0037] The slotted holes 13 allow fixing the containment elements 3 to the aforesaid plates by means of screws 14, bolts, rivets, or other equivalent connection members.

[0038] Suitably, such plates can also comprise mechanical blocks, constituted for example by projections that project from their profile, which fix the length of the plate sections insertable in the shaped notches 11 and block the sliding thereof relative to the uprights 2.

[0039] The uprights 2 can also comprise holes 15, or grooves 16, conceived in a manner such to receive the ends of the stringers 4.

[0040] Based on an embodiment variant, illustrated as an example in figures 8 and 10, in which the structure according to the finding is indicated with reference number 101, the shaped notches can assume a different shape.

[0041] More particularly, some or all the shaped notches 111 can be substantially H-shaped, in a manner so as to define wings 17 on the front of the uprights 2, such wings 17 being susceptible of being bent towards each other, in a manner such to substantially form flat connec-

tion zones where it is possible to easily set and fix the containment elements 3.

[0042] Advantageously, at the wings 17, bending raisers 18 can be provided that are essentially constituted by perforated slits.

[0043] In this case, the containment elements 3 can be constituted by bars 19, preferably made of round, semi-round or square wood, joined to the wings 17 by means of self-drilling screws.

[0044] For the embodiment variant illustrated in figures 8 and 10, the elements that correspond to the above-described elements with reference to the embodiment illustrated in figures 1 to 7, as well as in figure 9, the same reference numbers were employed.

[0045] It is important to underline that, irrespective of the form of the shaped notches, independently from the fact that they have an elongated slot or are H-shaped, experimental tests and a careful analysis of the results have allowed preferring laser technology, among the various techniques usable in cutting the tubular bodies that constitute the uprights 2.

[0046] Such technology in fact allows working uprights 2 with different profiles, rounded or polygonal, obtaining considerable advantages in the innovation of the production process and in the high quality level.

[0047] In particular, the use of the laser in cutting the uprights 2 allows executing complex cutting lines with high precision, reducing both the times for making the fence according to the finding, and the working discards.

[0048] The assembly of the modular fence structure, according to the present finding, is particularly simple and quick.

[0049] The structure is initially disassembled and its assembly starts with the installation of the uprights 2 which represent the essential elements for supporting the entire structure.

[0050] For such purpose, it is considered that the uprights 2 can be laid in various ways, for example by means of obtaining suitable concrete foundations, clamped with screws or screw anchors or by means of the pin system as represented in figures 11, 12, 13.

[0051] Once the uprights 2 are laid, it is possible to complete the structure by also mounting the containment elements 3.

[0052] More particularly, in the case of the structure 1, after having installed the stringers 4, if present, one proceeds by inserting the fixing elements 12, i.e. the plates, in the shaped notches 11, in a manner such to make them project equally from the opposite sides of each upright 2.

[0053] The exact positioning of the fixing elements 12 can be facilitated by the mechanical blocks, already mentioned above.

[0054] When the fixing elements 12 are correctly positioned, it is possible to block the containment elements 3 by means of the screws 14, terminating the mounting of the structure 1.

[0055] In the case of the structure 101, instead, after

having laid the uprights 2 one simply proceeds by fixing the rods 19 to the wings 17 by means of self-drilling screws.

[0056] Such operation is clearly facilitated by the bending of the wings 17, which in this manner come to define substantially flat connection zones where it is possible to set and constrain the rods 19 with ease.

[0057] With reference now to figures 11 to 13, a modular fence structure 1a according to the present invention is illustrated, which comprises at least one upright 2 adapted to support at least one transverse containment element (as indicated above with reference to figures 1 to 10) and/or at least one stringer 4, for example as described above; such upright 2 is constituted by a tubular body, if desired metallic.

[0058] The fence structure 1a then comprises at least one connection and support element 20, e.g. a bar or round bar or pin, if desired made of iron, for the connection, e.g. removable, to the ground or to a curb or low wall constrained or fixed to the ground S of the upright 2 and the support thereof; such connection and support element 20 is, on one side, connectable or fixable or fitted in the ground S or in a curb or low wall and on the other side it is insertable or inserted in the through hole 2a delimited by a respective upright 2 or in any case it can be arranged side-by-side or outside a respective upright 2.

[0059] Preferably, the connection and support element 20 is arranged adjacent to and, if desired, in contact for the entire longitudinal extension thereof with the upright 2, in particular a lower, in use, internal surface section 2c of the upright 2.

[0060] In addition, the longitudinal extension axis of the connection and support element 20 is preferably parallel to the longitudinal extension axis of the respective upright 2.

[0061] The structure also comprises means 21, 22 for constraining or engaging the connection and support element 20 with the upright or with the respective upright 2.

[0062] The means for constraining 21, 22 can comprise at least one U-shaped or C-shaped clamp or bracket 21 enclosing or at least partially placed around the connection and support element 20 and with at least one free end 21a inserted in and constrained to the upright 2 or to the lateral wall thereof.

[0063] If desired, one or both free ends 21a of the clamp 21 is/are threaded and in such case the structure comprises at least one nut or a pair of nuts 22, each in screwing engagement with a threaded free end 21a; each nut 22 preferably abuts against the external surface 2b of the upright 2, in particular if the connection and support element 20 is inserted in the upright 2 or against the internal surface 2c of the upright, in particular if the connection and support element 20 flanks, from the outside, the upright 2, but in both cases such to constrain the upright 2 to the clamp 21 and to the connection and support element 20.

[0064] In substance, the clamp or bracket encloses the

connection and support element 20 and due to the nut 22 tightens - preferably removably - the connection and support element 20 against the external surface 2b or internal surface 2c of the upright 2.

[0065] With one such structure it is possible to removably fix the uprights 2 in the ground. To do this, one first installs the connection and support elements 20 in the ground, if desired by means of the use of pile-driver devices, for example in a layer of fresh concrete previously deposited on the ground, or one covers the connection and support elements 20 with resin and then the same are inserted or fixed in cement curbs or low walls.

[0066] Subsequently, the tubular uprights are fixed, previously provided with holes by means of suitable clamps.

[0067] Before using this system, one must evaluate the type of ground and suitably select the length of the pin.

[0068] A structure or system like that illustrated in figures 11 to 13 allows a removable mounting of one or more uprights and can for example be used for cleaning embankments and slopes.

[0069] In addition, such system limits or prevents the deterioration of the metallic uprights, which, in conventional systems, are fixed to the ground and are not removable.

[0070] In addition, if necessary it is possible to substitute the pin or round bar 20, without having the substitute the entire fence.

[0071] The pin or round bar 20 can also be made of a traditional steel lined for reinforced concrete, which can have anti-rotation characteristics and be knurled, in which case it ensures an increased adherence both to the ground and with regard to the surface of the respective upright 2.

[0072] In addition, the uprights 2 and the stringers 3 are obtained by means of laser technology and do not require subsequent working, in particular manual workshop working, e.g. welding, perforating, smoothing etcetera.

[0073] The pin or round bar 20 can have length equal to about 20-120 cm, for example about 80-120 cm, if desired 100 cm for fixing on the ground, or for example 20-60 cm, if desired 40 cm for fixing on concrete.

[0074] The pin 20 can be fitted or inserted for about 70-90% of its length, e.g. 80%, in the ground or about 40-60% of its length, e.g. 50%, in concrete.

[0075] In practice, it has been established that the modular fence structure, according to the finding, fully achieves the pre-established task and objects.

[0076] In particular, it is evident that the structure according to the finding is simple to achieve and assembly, even if comprising components made with heterogeneous materials.

[0077] Part of the structure according to the finding is in fact made of COR-TEN steel and therefore is capable both of self-protection from electrochemical corrosion, with undoubted advantages in terms of fence duration and safety, and of maintaining low environmental and

landscape impact.

[0078] It should also be underlined that due to its particular structural features, the structure according to the finding offers the possibility of considerably increasing the array of attainable configurations, substantially starting from the same structural components.

[0079] In addition, it is underlined that in the structure according to the finding the metal components present do not require welding, and this considerably reduces the labor costs during achievement.

[0080] Another advantage of the modular fence structure according to the finding lies in the reduced bulk of the disassembled components; such property facilitates both the storage and the transport.

[0081] The modular fence structure thus conceived is susceptible of numerous modifications and variants, all falling within the scope of the inventive concept; in addition, all details can be substituted by other technically equivalent elements.

[0082] In practice, the materials used, as long as they are compatible with the specific use, as well as the contingent shapes and sizes, can vary in accordance with the requirements and with the state of the art.

Claims

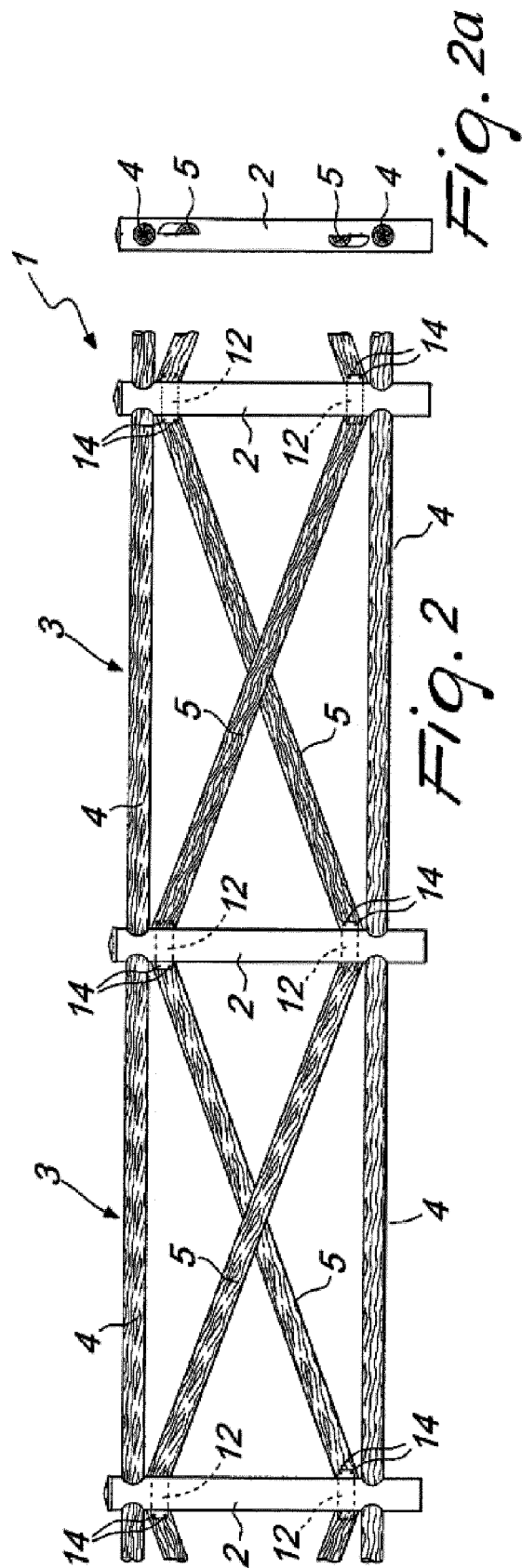
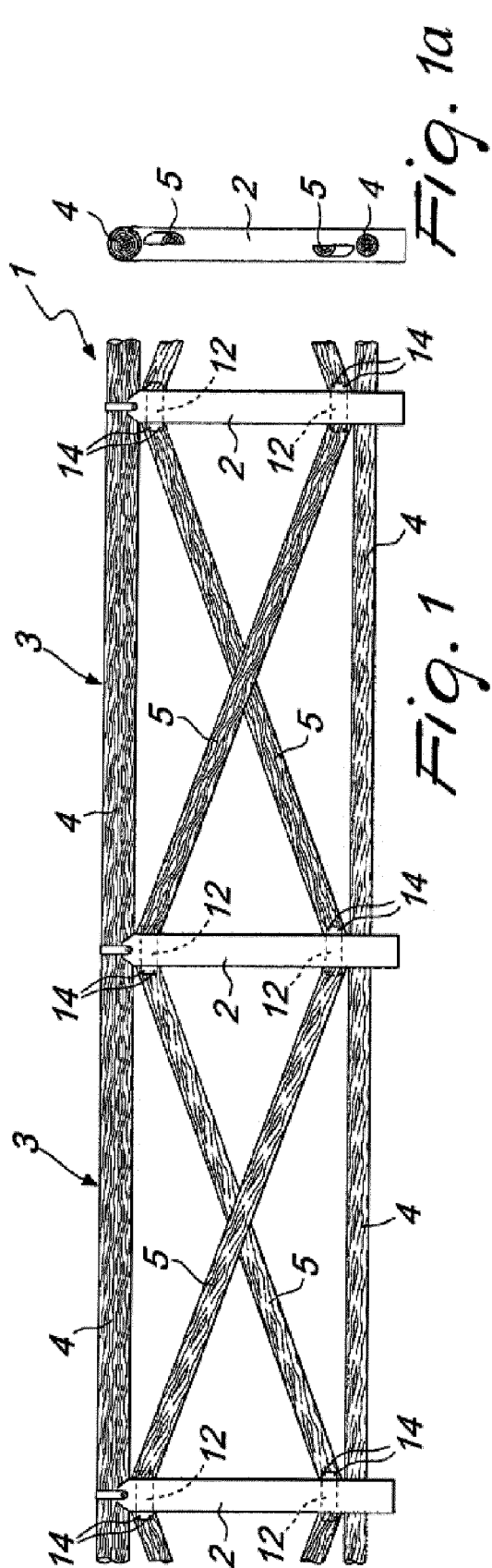
1. Modular fence structure, comprising a plurality of uprights (2) adapted to support a plurality of transverse containment elements (3, 4, 6, 8, 9, 10, 19), said uprights (2) being constituted by metal tubular bodies; said structure is **characterized in that** said uprights (2) comprise a plurality of shaped notches (11, 111), made along the extension thereof, adapted to allow the quick and safe connection of said containment elements (3, 4, 6, 8, 9, 10, 19).
2. Structure according to the preceding claim, **characterized in that** some or all said shaped notches have shape substantially complementary to the profile of the cross section of fixing elements (12) that can be made integral with said containment elements (3, 4, 6, 8, 9, 10, 19) and associable with said uprights (2); said fixing elements (12) being insertable in said shaped notches (11), with possibility of sliding, in a manner such to traverse said uprights (2) from side to side, projecting from opposite sides.
3. Structure according to claim 2, **characterized in that** at least one shaped notch (11) has size corresponding to the cross section of the respective fixing element (12).
4. Structure according to claim 3, **characterized in that** one or each fixing element (12) is insertable to size, i.e. substantially without clearance, in the respective shaped notch (11) and in a manner such that, in at least one of said shaped notches (11), only one re-

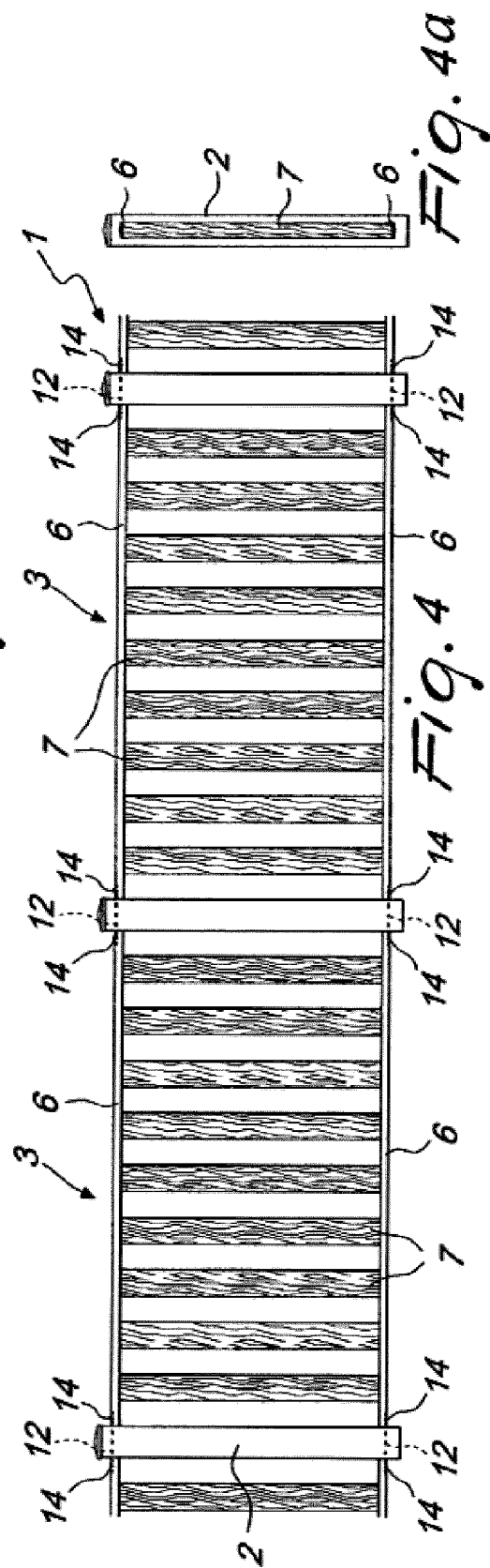
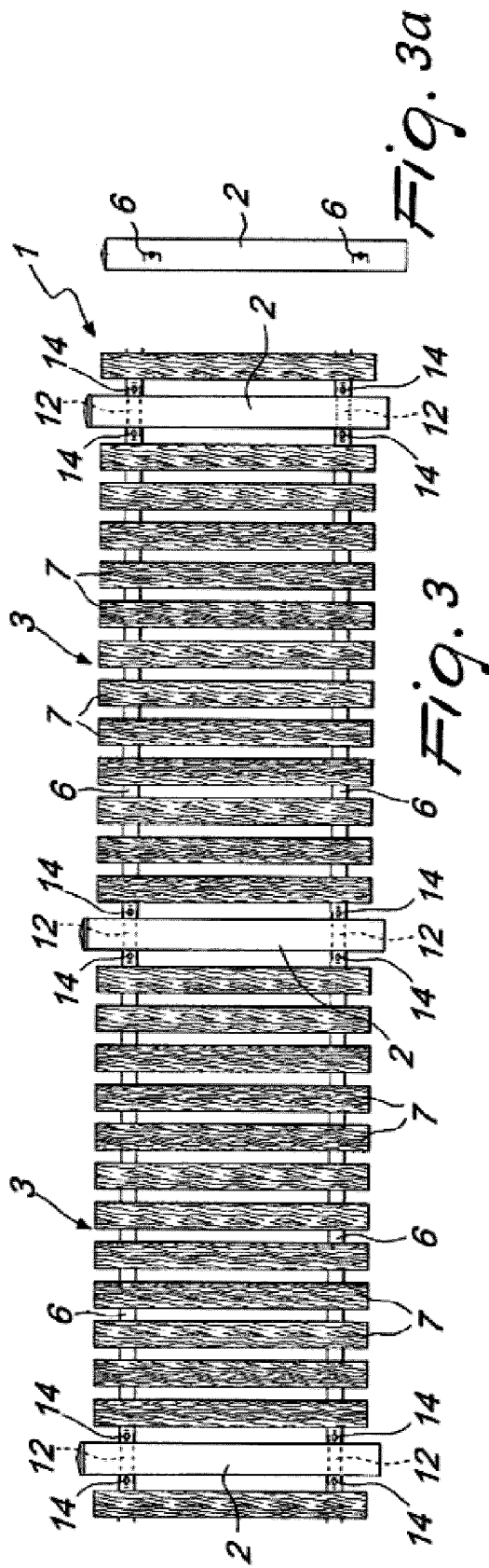
spective fixing element (12) is insertable.

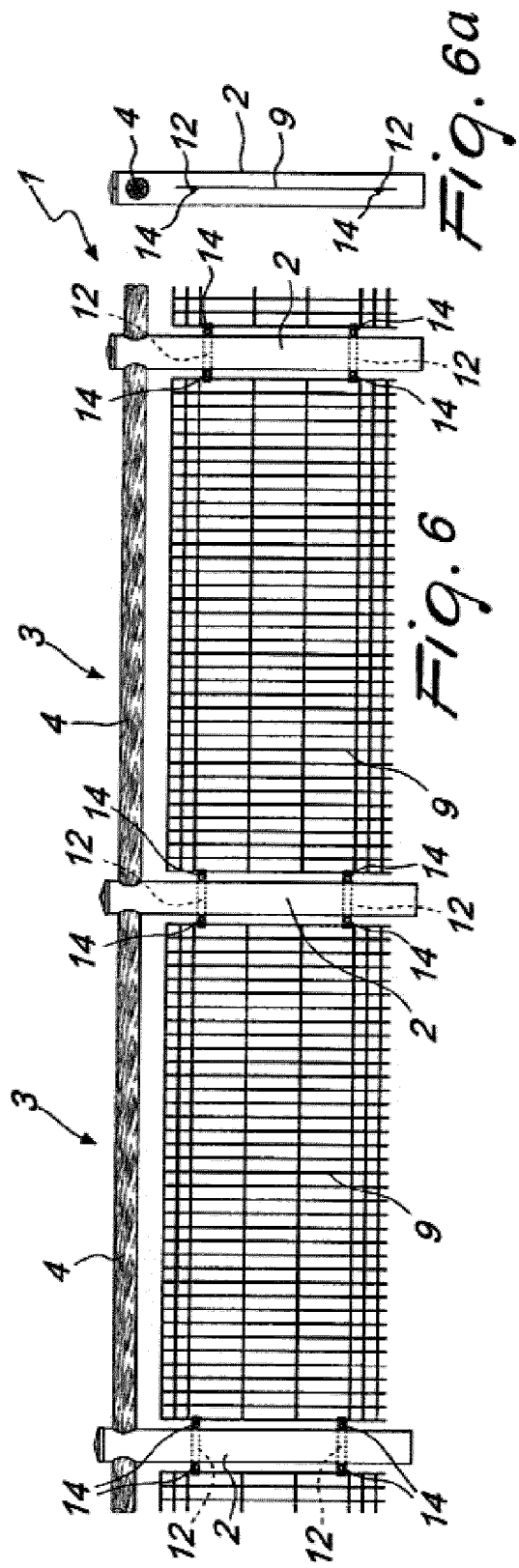
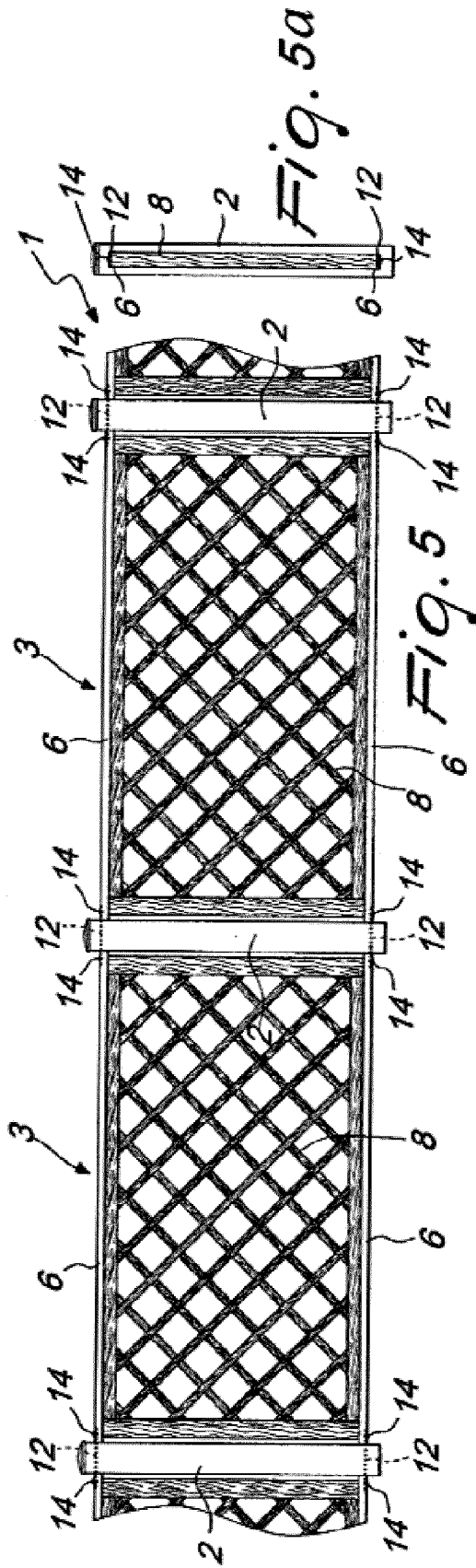
5. Structure, according to one or more of the preceding claims, **characterized in that** said shaped notches (11) are made on the side of said uprights (2). 5
6. Structure, according to one or more of the preceding claims when dependent on claim 2, **characterized in that** said shaped notches (11) are substantially shaped as an elongated slot; said fixing elements being essentially constituted by plates (12). 10
7. Structure according to claim 5, **characterized in that** said elongated holes (11) are longitudinally extended on said uprights (2). 15
8. Structure according to one or more of the claims 1 to 6, **characterized in that** said elongated holes (11) are transversely extended on said uprights (2). 20
9. Structure according to one or more of the preceding claims when dependent on claim 6, **characterized in that** said plates (12) have, at the opposite ends thereof, slotted holes (13), said containment elements (3, 4, 6, 8, 9, 10, 19) being integral with said plates by means of screws, bolts, or equivalent connection members, insertable in said slotted holes (13). 25
10. Structure according to one or more of the preceding claims when dependent on claim 6, **characterized in that** said plates (12) have mechanical stops adapted to fix the length of the section thereof insertable in said shaped notches (11) and to block the sliding thereof relative to said uprights (2). 30
11. Structure according to one or more of the preceding claims, **characterized in that** some or all said shaped notches (111) are substantially H-shaped; said shaped notches (111) being adapted to define, on said uprights (2), pairs of wings (17) susceptible of being bent towards each other, in a manner such to define substantially flat connection zones, said containment elements (19) having, at the opposite ends thereof, substantially flat portions that can be made integral with said connection zones. 35
12. Structure according to claim 11, **characterized in that** said shaped notches (111) comprise bending raisers (18) substantially defined at said wings (17). 40
13. Structure according to claim 11 or 12, **characterized in that** said shaped notches (111) are made frontally on said uprights. 45
14. Structure according to one or more of the preceding claims, **characterized in that** said shaped notches have shape substantially complementary to the pro-

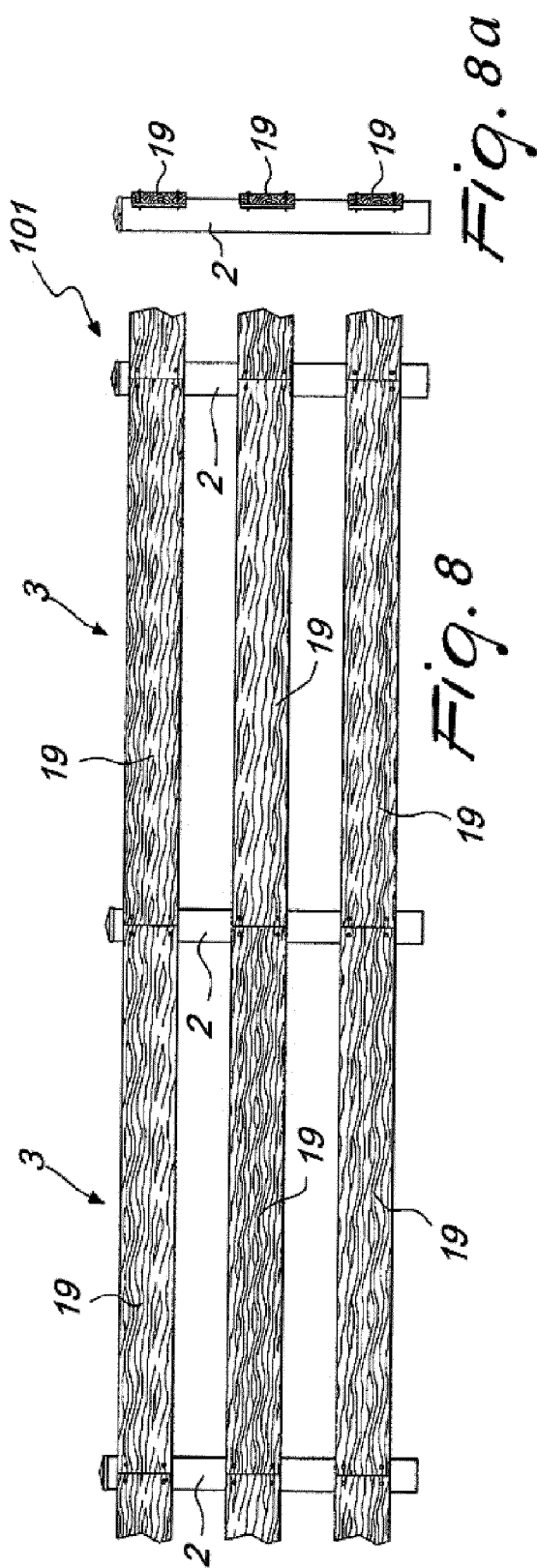
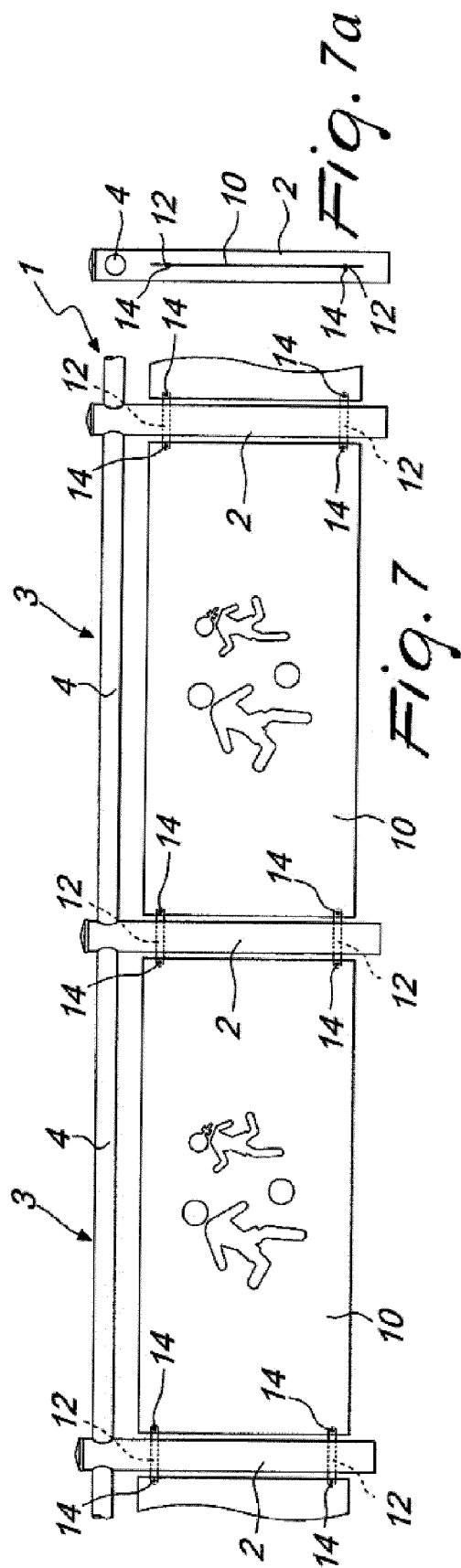
file of the cross section of said containment elements; said containment elements being essentially constituted by rods insertable for a pre-established section within said shaped notches.

15. Structure according to one or more of the preceding claims, **characterized in that** said uprights and said fixing elements are made of COR-TEN steel.
16. Modular fence structure, comprising at least one upright (2) adapted to support at least one transverse containment element (3, 4, 6, 8, 9, 10, 19) and/or at least one stringer (4), said at least one upright (2) being constituted by a tubular body, **characterized in that** it comprises at least one connection and support element (20) of said at least one upright (2) for the connection, e.g. removable, of said at least one upright (2) to the ground (S) or in a curb or low wall (B) constrained to the ground (S) as well as the support of said at least one upright (2), said at least one connection and support element (20) being, on one side, connectable or fixable or fitted in the ground (S) or in a curb or low wall (B) and on the other side it is insertable or inserted in the through hole (2a) delimited by a respective upright (2) or it is arranged side-by-side or outside a respective upright (2), said structure also comprising means for constraining (21, 22) or engaging (24) said at least one connection and support element (20) with said at least one upright (2).
17. Structure according to claim 16, **characterized in that** said means for constraining or engaging comprise at least one U-shaped or C-shaped clamp or bracket (21) placed at least partially around said at least one connection and support element (20) and with at least one free end (21a) inserted in and constrained to said at least one upright (2).
18. Structure according to claim 17, **characterized in that** said at least one free end (21a) of said at least one clamp (21) is threaded and in which said structure comprises at least one nut (22) in screwing engagement with said at least one threaded free end (21 a) and set to abut against the external surface (2b) or against the internal surface (2c) of said at least one upright (2).
19. Structure according to claim 16, 17 or 18, **characterized in that** said at least one connection and support element (20) comprises a round bar or a bar.
20. Structure according to any one of the claims 1 to 15 and according to any one of the claims 16 to 19.









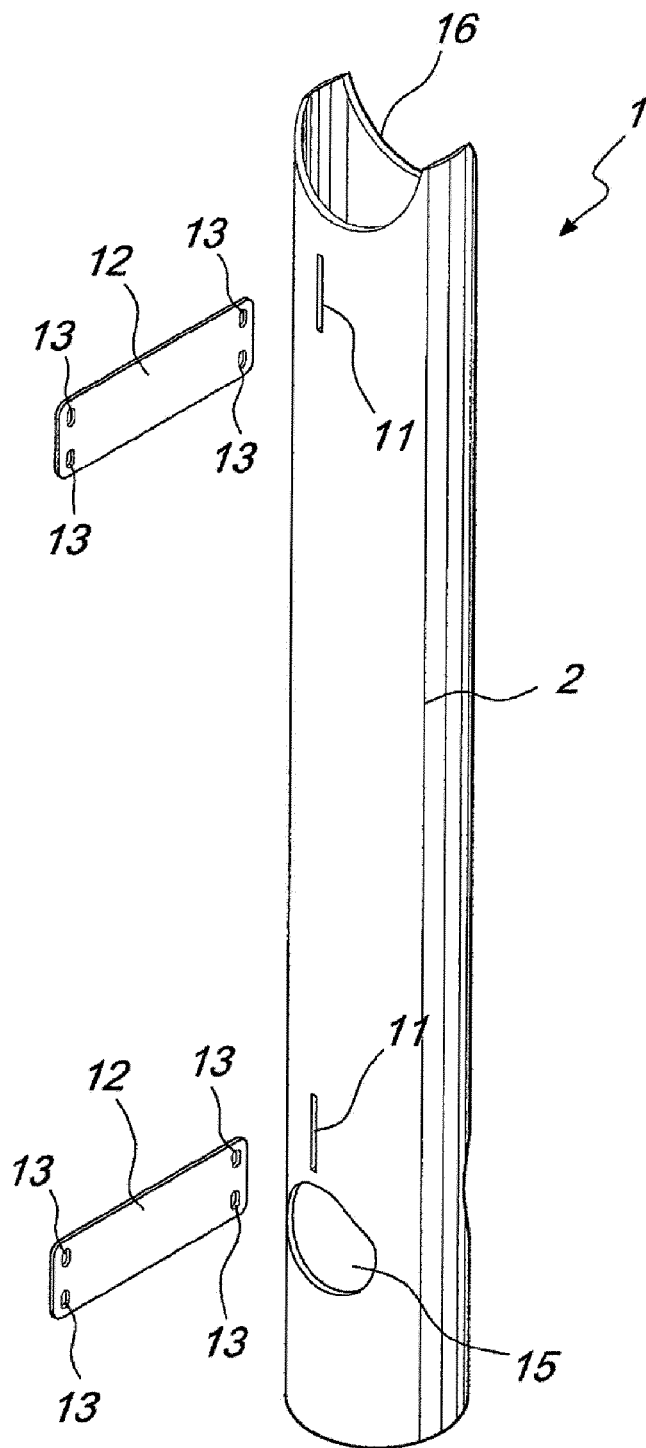


Fig. 9

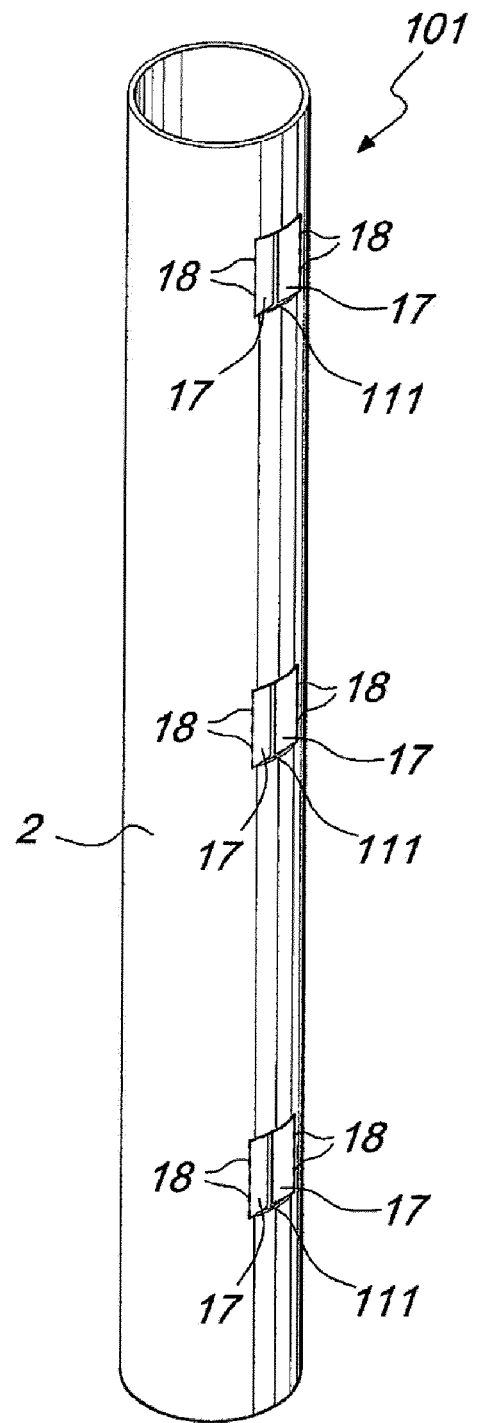
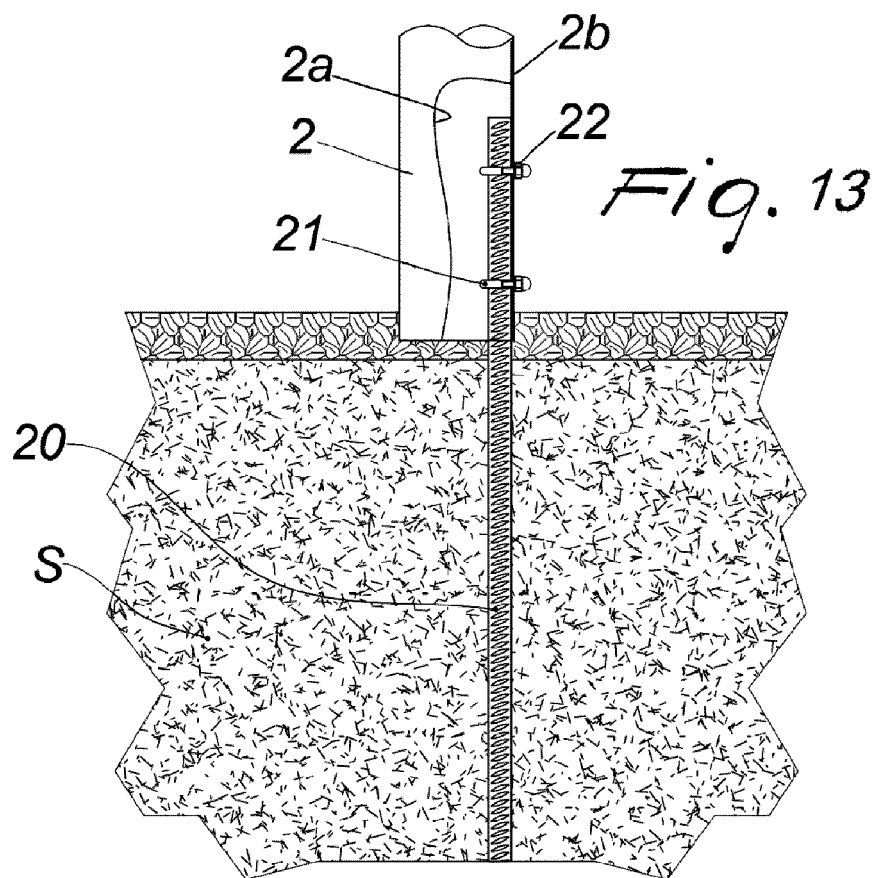
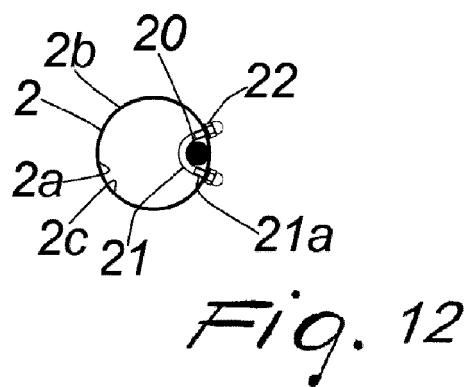
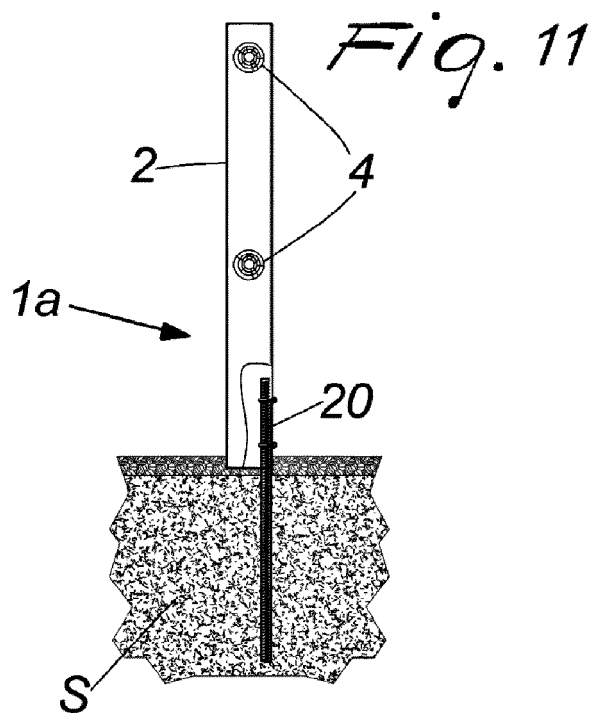


Fig. 10



REFERENCES CITED IN THE DESCRIPTION

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