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(54) **FENCE**

(57) The present invention relates to a fence comprising at least one tubular upright (2) delimiting at least one through housing hole (TH) and at least one crosspiece (3) partially inserted in the at least one through housing hole (TH), said fence comprising fastening means of the at least one crosspiece (3) to the at least one upright (2) and/or locking means in position of the at least one crosspiece (3) relative to the at least one upright (2).

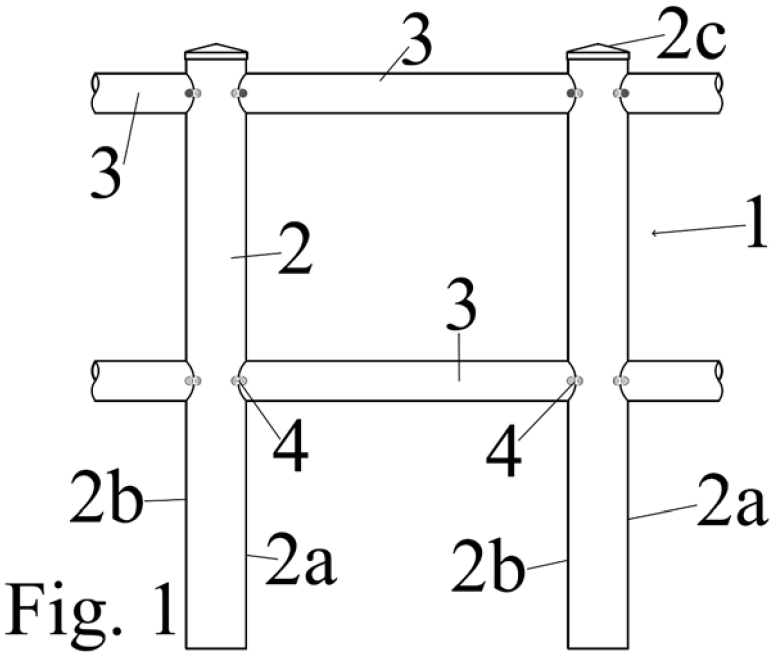


Fig. 1

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] This invention concerns a fence, specifically a fence made with posts and crosspieces interlocked with one another.

STATE OF THE PRIOR ART

[0002] Many types of fences have been proposed.
[0003] EP3054066B1, for example, shows fences with tubular Cor-Ten uprights interlocked with crosspieces made of wood, Cor-Ten, or other materials.
[0004] Means for connecting the uprights to the crosspieces are also provided, consisting of fins in one piece with the uprights and bent at the holes for inserting the crosspieces into the uprights, with special screws or rivets inserted into the fins and the underlying crosspieces.
[0005] While this solution is technically very effective, it nevertheless requires a specific machine to appropriately cut the posts where the holes for inserting the crosspieces are to be made.
[0006] Furthermore, if the fence needs to be dismantled and reassembled, for example for maintenance, the tabs could be inadvertently bent, which could lead to breakage of the tabs over time or damage to the fence.
[0007] In any case, no valid alternatives to those taught by EP3054066B1 have been proposed to date.
[0008] AU2023200681A1, US6499725B2, and JP2016180275A teach other solutions according to the prior art.

OBJECTIVES OF THE INVENTION

[0009] One objective of the present invention is to provide a new fence, particularly one that resists or prevents the onset of corrosion.
[0010] Another objective of the present invention is to provide a fence that is simple and quick to manufacture and assemble.
[0011] Another objective of the present invention is to provide a fence that is easy and quick to maintain.
[0012] A further objective of the present invention is to provide a fence that can be disassembled and reassembled, even multiple times, should this be necessary.
[0013] According to one aspect of the invention, a fence according to claim 1 is provided.
[0014] The dependent claims refer to preferred and advantageous embodiments of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0015] Other features and advantages of the invention will be more clearly understood from the description of embodiments of fence, illustrated by way of example in the accompanying drawings, in which:

- figure 1 represents a front view of a part of a fence according to the present invention;
- figure 2 is a side view of the fence of figure 1;
- figures 3 and 4 illustrate enlarged-scale details of figures 1 and 2;
- figure 5 is a top view of a detail of figure 1, without the top cap;
- figures 6 to 8 are front, side, and top views, respectively, of a detail of another fence according to the present invention;
- figures 9 to 11 and figures 12 to 14 are views similar to figures 6 to 8, but relating to other respective embodiments;
- figures 15 and 16 show respective embodiments of block or slab elements;
- figures 17 to 19 are front, side, and top views, respectively, of a detail of another fence according to the present invention;
- figure 20 shows an exploded view of the pieces required to connect or attach an upright to a crosspiece according to the example of figures 17 to 19;
- figures 21 to 23 as well as views 24 to 26 are views similar to figures 17 to 19, but relating to respective other embodiments;
- figures 27 to 29 are front, side, and top views, respectively, of a detail of a fence according to the present invention; and
- figures 30 to 32 are views similar to figures 27 to 29, but relating to respective other embodiments.

[0016] In the attached drawings, identical parts or components are identified by the same reference numbers.

EMBODIMENTS OF THE INVENTION

[0017] With reference to the figures, a fence 1 is illustrated comprising at least one tubular upright 2, preferably made of metal, such as steel, preferably Cor-Ten steel.
[0018] "Fence" in the present invention means an enclosure or barrier along the boundary of a field, park, yard, or any place intended to be protected from intruders or unauthorized persons, or to be demarcated to prevent the passage or advancement of people in a given area.
[0019] In this regard, Cor-Ten steel belongs to the category of low-alloy steels known as weathering steels.
[0020] The main characteristic of Cor-Ten steel is its ability to protect itself from electrochemical corrosion by forming a compact, passivating surface patina composed of the oxides of its alloying elements, preventing the progressive spread of corrosion. This film changes color over time and is usually brown in color.

[0021] There are three types of Cor-Ten steel:

- Cor-Ten type A: commonly referred to as phosphorus Cor-Ten,
- Cor-Ten type B: commonly referred to as vanadium Cor-Ten,
- Cor-Ten type C.

[0022] Preferably, but not limited to, the composition of Cor-ten steel includes:

- iron (Fe) in a percentage by weight of the total composition between approximately 70 and approximately 75;
- copper (Cu) in a percentage by weight of the total composition between approximately 0.25 and approximately 0.75;
- chromium (Cr) in a percentage by weight of the total composition between approximately 0.30 and approximately 1.25;
- nickel (Ni) in a percentage by weight of the total composition between approximately 0 and approximately 0.65;
- phosphorus (P) in a percentage by weight of the total composition between approximately 0 and approximately 0.04;
- silicon (Si) in a weight percentage of the total composition between 0 and approximately 0.50;
- manganese (Mn) in a weight percentage of the total composition between approximately 0.50 and approximately 1.25.

[0023] Clearly, these values may vary slightly depending on the alloy and manufacturer specifications.

[0024] Referring now to the term "tubular", it indicates a tube or tubular body configuration, geometrically speaking, which is a hollow three-dimensional solid with a constant cross-section, circular, square, rectangular, or polygonal, regular or irregular, preferably with a wall or walls of uniform thickness, obtained as the difference between two coaxial solids.

[0025] Clearly, the uprights are arranged with their main axis or main extension dimension or length, in use, vertical.

[0026] The at least one upright 2 delimits at least one through housing hole TH or main hole, and the fence then comprises at least one crosspiece or stringer 3 partially inserted into the at least one housing hole TH.

[0027] The at least one crosspiece or stringer 3 could be tubular, in the sense indicated above, if desired, made of metal, such as steel, preferably Cor-Ten steel, or even a solid body, for example a parallelepiped or a cylinder, if desired, made of wood, metal, composite, or other.

[0028] The crosspieces 3 are arranged with their main axis or main extension dimension or length, in use, horizontal or even inclined with respect to the horizontal and vertical.

[0029] With reference to the expression "partially inserted", according to the embodiment illustrated in the figures, one end 3a of the at least one crosspiece 3 is inserted into a respective through hole housing TH and then ends or lies internally to or in the axial opening AL or internal zone (from here on, for simplicity, we will only refer to the "axial opening") of the upright 2 itself, while the remaining part of the crosspiece 3 extends outside the upright 2 starting from the through housing hole TH.

[0030] Alternatively, one or each crosspiece 3 could be fitted so as to protrude from both sides of an upright 2, that is, a crosspiece 3 would be fittted into an upright 2 starting from a first through housing hole TH so as to pass through the axial opening AL of the upright 2, pass through a second through housing hole TH (aligned with the first) on a second side of the upright 2 and protrude from the latter.

[0031] Preferably, the at least one upright 2 delimits at least two through housing holes TH aligned and/or staggered vertically and/or horizontally and in this case the fence 1 preferably comprises at least two crosspieces 3 each fitted into a respective through housing hole TH in the at least one upright 2.

[0032] In this regard, the at least one upright 2 delimits a first hole or first row of through housing holes TH staggered vertically on a first side 2a each for the insertion and anchoring or constraining an end 3a or section of a first crosspiece 3 and at least one second hole or second row of through housing holes TH (aligned with the first hole or first row of holes) staggered vertically on a second side or opposite side 2b of the upright 2 for the insertion and anchoring or constraint of a second section of the first crosspiece 3 or for the insertion and anchoring or constraint of one end 3a of a second crosspiece 3 on the opposite side to the first crosspiece 3 with respect to the upright 2.

[0033] Advantageously, each first housing hole TH on a first side 2a of an upright 2 will be substantially aligned with a second housing hole TH on a second side 2b of that upright 2, so that each first crosspiece 3 will be substantially aligned with a second crosspiece 3 and, more specifically, the free end 3a of a first transverse element fitted into a first hole TH will be facing and turned towards the free end 3a of a second crosspiece 3 fitted into a second hole TH aligned with the first hole TH.

[0034] In essence, according to this variant, the at least one upright 2 comprises a tubular body internally defining an axial opening AL into which both the first housing holes TH and the second housing holes TH open and can be used to support different crosspieces 3 and preferably two by two aligned at the respective sides 2a, 2b or a crosspiece or a row of crosspieces one vertically staggered with respect to the other which cross the entire axial opening AL protruding from both sides 2a, 2b of the upright 2.

[0035] In this regard, it should be noted that the

cross-section of the uprights 2 could, in this case, be larger than the cross-section of the crosspieces 3.

[0036] The fence 1 also includes means for fastening, preferably removable, the at least one crosspiece 3 to the at least one upright 2, and/or means for locking, preferably removable, the position of the at least one crosspiece 3 with respect to the at least one upright 2.

[0037] Clearly, if multiple crosspieces 3 are provided, fastening means or locking means will be provided for one or more crosspieces 3, preferably for all crosspieces 3.

[0038] Naturally, the fence 1 could comprise two or more uprights 2 connected in a bridge fashion by one or more cross-members 3 (see figure 1).

[0039] In this case, two or more rows of crosspieces 3 could be supported by two or more uprights 2.

[0040] Caps 2c may also be provided to close the tops of the uprights 2.

[0041] In particular, if at least one upright 2 is made of Cor-Ten, one or more first through slots SL1 could be delimited in it to improve ventilation or airflow in the axial opening AL or internal zone of upright 2.

[0042] The first through-slot(s) SL1, in use or with the fence assembled, are naturally not occupied by other components, meaning they are left empty or not crossed by other components.

[0043] These through-slot(s) SL1 could have any suitable size, for example, a width between 0.5 mm and 3 cm, optionally between 0.5 mm and 1 cm, or between 0.5 mm and 0.5 cm, or between 1 mm and 3 mm, and a length between 0.5 cm and 10 or 30 cm, optionally between 1 cm and 5 cm, or between 2 and 3 cm.

[0044] These dimensions, among other things, would prevent or limit the passage and nesting of bees, wasps, or hornets inside the uprights 2.

[0045] The slot(s) SL1 could be placed in any suitable position, for example, at the top, in an intermediate position, and/or on the bottom (obviously in a position, in use, not fitted into the ground) of the upright(s) 2, possibly in correspondence of, for example between 0.5 cm and 5 cm, a housing hole TH, so as to ensure ventilation or airflow sufficient to also affect a crosspiece 3 inserted in that hole TH.

[0046] If at least one crosspiece 3 were made of Cor-Ten, one or more second slots SL2 could be delimited in it to improve ventilation or airflow in the axial opening or internal zone of the crosspiece 3.

[0047] The second slot(s) SL1, in use or with the fence assembled, are naturally not occupied by other components, meaning they are left empty or not crossed by other components.

[0048] These slot(s) SL2 could have any suitable size, for example, a width between 0.5 mm and 3 cm, optionally between 0.5 mm and 1 cm, or between 0.5 mm and 0.5 cm, or between 1 mm and 3 mm, and a length between 0.5 cm and 10 or 30 cm, optionally between 1 cm and 5 cm, or between 2 and 3 cm.

[0049] The slot(s) SL2 could be placed in any suitable position, for example at an upright 2 or in an intermediate position of the crosspiece(s) 3, if desired in correspondence of, for example, between 0.5 cm and 5 cm, an upright 2 so as to guarantee ventilation or air passage such as to also affect the latter.

[0050] According to the non-limiting embodiment illustrated in figures 1 to 5, the fastening means comprise at least one bent or shaped plate 4 placed at the at least one housing hole TH so as to have a first segment 4a, preferably substantially straight or planar or flat, close to or in contact with the at least one upright 2, and a second segment 4b, preferably substantially straight or planar or flat, close to or in contact with the at least one crosspiece 3.

[0051] According to a variant, the plate 4 is curved, in which case the two segments 4a and 4b would be curved or would belong to the same surface or curved solid.

[0052] The at least one plate 4 is not a single piece with either the at least one upright 2 or the at least one crosspiece 3, but is a separate piece.

[0053] In accordance with this variant, the fence 1 then comprises at least one first constraining rivet or screw 5 inserted or fitted in the first segment 4a and in the at least one upright 2 and at least one second constraining rivet or screw 6 inserted or fitted in the second segment 4a and in the at least one crosspiece 3.

[0054] Preferably, a rivet 5 is inserted in the upright and a screw 6, preferably self-drilling, inserted in the crosspiece 3, as the rivet is easier to apply, but it is preferable for the insertion component to be pre-drilled. Therefore, in this case, since the position of the insertion hole can be easily planned only in upright 2, the combination indicated above is preferred.

[0055] Preferably, the at least one plate 4, if the sections 4a, 4b are planar or flat, is bent with an angle (the one facing away from the upright 2 and the crosspiece 3 to be connected by means of this plate) between the sections 4a, 4b between 100° and 160°.

[0056] Advantageously, the at least one plate 4 is positioned at the at least one through hole TH, i.e. it extends astride the edge 2d of the upright 2 delimiting such hole TH, so that the first segment 4a is placed alongside and in substantial contact with a portion of the upright 2 at that edge, for example, approximately 1-5 cm from it.

[0057] The second segment 4b, on the other hand, is placed alongside and in substantial contact with a portion of the crosspiece 3 that protrudes from the axial opening AL of the upright 2 and is closest to the respective hole TH, for example, approximately 1-5 cm from it.

[0058] It should be reiterated that the at least one crosspiece 3 can be horizontal or inclined with respect to the vertical and the horizontal, and can have any cross-section, circular, rectangular, square, regular or irregular polygonal, etc.

[0059] Preferably, the at least one plate 4 is positioned on the front, rear, or side of the upright 2, and advantageously approximately halfway up the height of the hole TH or the crosspiece 3. In this regard, the at least one first constraining rivet or screw 5 and the at least one constraining second rivet or screw 6 are advantageously positioned with their main extension direction horizontal.

[0060] Clearly, a solution could also be envisioned in which the at least one plate 4 is positioned below or above the upright 2.

[0061] The at least one plate 4 is made of any suitable material, such as steel.

[0062] The dimensions of the plate 4 are any suitable, for example, length 2-15 cm (dimension, in use, substantially parallel to the main extension dimension of the respective crosspiece 3), width 1-5 cm, and thickness 0.1-1 cm.

[0063] Preferably, at least one or two plates 4 are provided for connecting each crosspiece 3 to a respective upright 2. Clearly, if multiple uprights 2 are provided, at least one or two plates 4 could be provided for connecting each crosspiece 3 to each or just some of these uprights 2.

[0064] To assemble or mount the fence construction embodiment described above, one proceeds by fixing one or more uprights 2 to the ground and then inserting one or more crosspieces 3 into the housing holes TH of the upright(s) 2. Then one should proceed to bring the, some, or each plate 4 into abutment or contact with an upright 2 and a crosspiece 3 to be connected and then insert or fit the screw(s) and/or rivet(s) 5, 6 as indicated above.

[0065] In accordance now with the non-limiting embodiment of figures 6 to 16, the fastening means comprise at least one block or plate element 7 defining a seat, preferably internally threaded SE, optionally through, which block or plate element 7 abuts or rests with, as well as optionally inserted on or outside of, an end or portion 3a of the at least one crosspiece 3 in turn inserted in the at least one through hole TH.

[0066] In this case, the at least one fence 1 also comprises at least one connecting screw 8 in engagement, preferably screwed into the internally threaded seat SE and inserted into the at least one upright 2 or into a special opening or hole delimited or formed (if desired also following the insertion of the connecting screw 8) therein.

[0067] Advantageously, in this case, the at least one upright 2 delimits at least two housing holes TH, preferably substantially aligned, but if desired also horizontally staggered, and the fence 1 comprises at least two crosspieces 3, each with one end or section inserted into a respective housing hole TH or into such two holes TH in the at least one upright 2.

[0068] Preferably, the at least one block or plate element 7 abuts or rests with, as well as optionally inserted on or outside of (therefore abuts or rests from the inside or outside of) at least one end 3a of a first crosspiece 3 and it then abuts or rests on, as well as optionally inserted on or outside of, one end of the other or second crosspiece 3, while the at least one connecting screw 8 extends in a zone between the at least two crosspieces 3.

[0069] Clearly, in this case, one end or side 7a of the at least one block or plate element 7 abuts or rests on one end 3a of a first crosspiece 3 and the other end or side 7b of the at least one block or plate element 7 abuts or rests on one end 3a of a first crosspiece 3.

[0070] With reference to the variant of this non-limiting embodiment of figures 6 to 8, one or more pairs of aligned crosspieces 3 are provided for each upright 2 and each crosspiece has one end mounted or housed in a respective housing hole TH of the same upright 2.

[0071] In this case, at least one block or plate element 7 is provided for one or more pairs of aligned crosspieces 3, which block or plate element 7 has a terminal end abutting or resting on, as well as inserted into, one end 3a of a crosspiece 3 and the other terminal end in contact with or resting on, and if desired inserted into, one end 3a of the other crosspiece 3.

[0072] In this case, the at least one block or plate element 7 is arranged with a horizontal main extension dimension.

[0073] A connecting screw 8 is then provided for the at least one block or plate element 7, or rather one for each block or plate element 7, which screw 8 extends substantially orthogonally to the main extension dimension of the block or plate element 7, for example along a horizontal direction orthogonal to the main extension dimension of the crosspieces 3 or in any case to the alignment direction of the two through holes TH.

[0074] The screw 8 passes through the wall of the upright 2 from the outside towards the inside of the axial opening AL, with the head 8a abutting against the external surface of the upright 2 and the tip or stem 8b extending and terminating within the axial opening AL, passing through the seat SE in the block or plate element 7, in a zone delimited between the two free ends 3a of the two aligned crosspieces 3, which ends 3a are inserted into the axial opening AL through the housing holes TH aligned and delimited in the same upright 2.

[0075] In this case, the crosspieces 3 are preferably tubular.

[0076] Referring now to the variant shown in figures 9 to 11 of the non-limiting embodiment under discussion, it is very similar to that shown in figures 6 to 8, but in addition to or as an alternative to the horizontal crosspieces 3, with one or more rows of aligned crosspieces 3 if desired, it also features crosspieces 3 inclined with respect to the horizontal and vertical, which can also be staggered horizontally, meaning they lie in different horizontal zones.

[0077] In any case, one or more block or plate elements 7 are present, each abutting or resting on, and possibly inserted (see the right crosspiece 3 in figure 8)

or externally (see the left crosspiece 3 in figure 8) at least one end 3a of a crosspiece 3.

[0078] Preferably, one or more housing holes TH are anyway provided on a first side 2a of an upright 2 and one or more housing holes TH on a second side 2b of the upright 2, with one or more holes TH on one side 2a aligned with one or more holes on the other side 2b.

[0079] If two or more pairs of aligned holes TH are provided as indicated above, then two crosspieces 3 are advantageously provided, with ends 3a each inserted into one of the aligned holes. The crosspieces 3 could be horizontal, but also inclined with respect to the horizontal and the vertical.

[0080] In this case, at least one block or plate element 7 is then abutted or supported with, and if desired inserted or external to, one end of a first crosspiece 3 and one end of the other or second crosspiece 3, while the at least one screw 8 extends in an zone between the at least two crosspieces 3.

[0081] Referring now to the variant of figures 12 to 14 of the embodiment under consideration, it is very similar to the example of figures 6 to 8, but also comprising a plurality of posts 10 (only one visible in the figures) appropriately spaced from each other and with a main vertical extension, fitted or connected on one side in an upper crosspiece 3 and on the other in a lower crosspiece 3.

[0082] As regards the installation or assembly of the non-limiting embodiment of figures 6 to 16, one proceeds by fixing the upright(s) 2 to the ground, then insert a block or plate element 7 starting from a housing hole TH and then insert or fit the screw 8 into an upright 2 and into the block or plate element 7 inside it so as to temporarily constrain, for example by a few turns of the screw 8, the latter in the seat SE of the block or plate element 7.

[0083] At this point, the crosspiece(s) 3 are inserted until the end 3a of one or more crosspieces 3 engages with the block or plate element 7, for example with the latter abutting or resting on, or if desired inserted or outside of, at least one end 3a of a first crosspiece 3 and, if desired, abutting or resting on, or if desired inserted or outside of one end of the other or second crosspiece 3.

[0084] In this case, the block or plate element 7 cannot rotate, because it remains effectively trapped by the crosspiece 3 or, better still, between the two crosspieces 3, so it is possible to finish screwing or inserting the screw 8 into the seat SE of the block or plate element 7.

[0085] The at least one block or plate element 7 is made of any suitable material, for example steel, optionally galvanized or other, for example of the same material as the connecting screw 8.

[0086] The at least one block or plate element 7 may have a smooth main surface (see figure 15) or knurled (see figure 16) or in another suitable manner.

[0087] The dimensions of the block or plate element 7 are any suitable, for example, length 2-20 cm (dimension, in use, substantially parallel to the main extension dimension of the respective crosspiece(s) 3), width 1-10 cm, and thickness 0.2-3 cm.

[0088] Advantageously, the size of the block or plate element 7 must be such as to prevent its rotation once inserted into the axial opening or internal zone of the crosspiece(s) 3 or the respective end(s) 3a.

[0089] It can be of any appropriate configuration, for example, parallelepiped or other.

[0090] With reference now to the non-limiting embodiment shown in figures 17 to 26, the at least one upright 2 delimits at least two first connecting holes and/or slots CH1 aligned with each other, if desired along a horizontal direction, while the at least one crosspiece 3 delimits at least two second connecting holes and/or slots CH2, aligned, if desired along a horizontal direction, with each other and, in use, with the at least two first connecting holes and/or slots CH1.

[0091] Of course, the connection holes and/or slots CH1 and CH2 are significantly smaller than the housing holes TH, for example, between 1/20 (or less) and 1/4 or between 1/20 (or less) and 1/10 the extension or area of the latter, and are in fact slightly larger than the screw or plug to be inserted into them.

[0092] A pair of first connection holes or slots CH1 are delimited at a housing hole TH, for example advantageously at about half the height of the hole TH, with alignment direction substantially orthogonal to the insertion axis of a crosspiece 3 in a hole TH.

[0093] Therefore, the crosspiece 3 has the main extension direction substantially orthogonal to the alignment direction of the first CH1 and second CH2 connection holes or slots.

[0094] More specifically, a first connection hole or slot CH1 is defined at one side of the hole TH, while the other at the opposite side, where side means a lateral portion of a hole TH considering a hole TH viewed from the front with the respective upright in use or in a vertical position.

[0095] The second connection holes or slots CH2 are instead defined on the opposite sides or on the front and back of a crosspiece 3, at the end 3a, for example at a distance of approximately 0.1-10 cm, preferably 0.5-2 cm from the respective ends 3a. The sides or front and back of a crosspiece 3 clearly mean the lateral portions of a crosspiece 3 considering a position in use or with the same horizontal position or even inclined with respect to the vertical and horizontal.

[0096] Naturally, the second connection holes or slots CH2, in use, are within the axial opening AL of the uprights 2, and therefore are on a portion or section of a crosspiece 3 inserted into an upright 2 starting from a respective housing hole TH.

[0097] According to the non-limiting embodiment illustrated in the figures, first connection holes CH1 and second connection slots CH2 are provided, aligned along a horizontal direction, but other combinations

could be considered.

[0098] If desired, first and second connection holes or slots CH, CH2 are provided at each housing hole TH and at the ends of each crosspiece 3.

[0099] According to this embodiment, the fastening means comprise at least one fastening screw or plug 9 with a head 9a as well as a stem 9b at least partially externally threaded and inserted into the at least two first holes and/or slots CH1 and in the at least two second holes and/or slots CH2 aligned with each other.

[0100] The fence 1 then comprises at least one nut 9c in engagement, for example in screw engagement, with the at least one fixing screw or plug 9 and arranged close to the at least one upright 2 in alignment with the first CH1 and second CH2 holes and/or slots and on the opposite side to the head 9a of the screw or plug 9 with respect to the at least one upright 2.

[0101] According to this variant, the fence 1 could comprise at least one spacer or washer 11 tightened between the head 9a of the at least one fixing screw or plug 9 and the external surface of the at least one upright 2 and/or at least one spacer or washer 12 tightened between the nut 9c and the external surface of the at least one upright 2.

[0102] The spacer or washer 11, 12 could provide that the respective surface 11a, 12a in contact with the at least one upright 2 is substantially curved as the external surface of the latter or even inclined so as to follow the extension of the or be substantially parallel or flush with the external surface of the upright 2 around the respective hole CH1, CH2 or better where the spacer 11, 12 is applied. This is clearly the case in which the upright 2 has a circular or polygonal cross-section, while this would not be the case if the upright 2 has a square or rectangular cross-section.

[0103] If the upright 2 has a circular cross-section, the spacer or washer 11, 12 may have an annular body with a lateral surface on the outside, therefore a first curved base surface 11a, 12a and the other or second base surface 11b, 12b, in use, distal from the upright that is substantially planar and lies in a plane orthogonal to the direction of extension of the respective hole for the screw or dowel 9.

[0104] Alternatively, the first base surface 11a, 12a is inclined at a predefined angle less than 90° with respect to the plane orthogonal to the direction of extension of the respective hole of passage for the screw or dowel 9, this is particularly true if the upright has a circular or polygonal cross-section.

[0105] With reference to the variant of this non-limiting embodiment of figures 17 to 20, one or more pairs of aligned crosspieces 3 are envisaged, each with an end 3a mounted or housed in a respective housing hole TH of the same upright 2.

[0106] In this case, two pairs of first CH1 and second CH2 holes are provided for one or more pairs of aligned crosspieces 3, with a fixing screw or plug 9 for each crosspiece 3 inserted and secured using the nut 9c in two pairs of first CH1 and second CH2 holes and/or slots appropriately aligned.

[0107] In this case, the crosspieces 3 are preferably tubular.

[0108] Referring now to the variant in figures 21 to 23 of the non-limiting embodiment under discussion, it is very similar to that in figures 17 to 20, but in addition to or as an alternative to horizontal crosspieces 3, with one or more rows of aligned crosspieces 3 if desired, it also features crosspieces 3 inclined with respect to the horizontal and vertical.

[0109] In any case, the first CH1 and second CH2 holes or slots and fastening screws or plugs 9 are anyway present as indicated above.

[0110] Preferably, one or more housing holes TH are provided on a first side 2a of an upright 2 and one or more housing holes TH on a second side 2b of upright 2, with one or more holes TH on one side 2a aligned with one or more holes on the other side 2b.

[0111] If two or more pairs of holes TH are provided, aligned as indicated above, then two crosspieces 3 are advantageously provided, with ends 3a each inserted into one of the aligned holes. The crosspieces 3 could be horizontal, but also inclined with respect to the horizontal and the vertical.

[0112] Referring now to the variant shown in figures 24 to 26 of the embodiment under consideration, it is very similar to the example shown in figures 17 to 20, but also includes posts 10 appropriately spaced from each other as well as a main vertical extension, fitted or connected on one side to an upper crosspiece 3 and on the other to a lower crosspiece 3.

[0113] As regards the installation or assembly of the non-limiting embodiment shown in figures 17 to 26, one proceeds by fixing the upright(s) 2 to the ground, then insert the crosspieces 3 into the housing holes TH and finally insert the screws or dowels 9 into the first CH1 and second CH2 aligned holes or slots and secure them using the nuts 9c.

[0114] Now in accordance with the non-limiting embodiment shown in figures 27 to 32, the at least one upright 2 delimits a single or at least two through holes TH, one at a higher level than the other, at least two of which holes TH are aligned along a vertical line or band.

[0115] In this case, the fence 1 comprises a single or at least two crosspieces 3, each fitted into a respective through hole TH in the at least one upright 2 so as to be positioned at a different level or height from each other and, in fact, one higher than the other, with a lower crosspiece 3 constituting the vertical projection of the other upper crosspiece 3, meaning that the two or more crosspieces 3 are vertically aligned.

[0116] According to this variant, the locking means could comprise at least one vertical rod or pin 13, in use, inserted into the single crosspiece 3 or into both of the at least two crosspieces 3, staggered from each other and positioned one higher than the other.

[0117] In this regard, the rod or pin 13 is inserted into special insertion openings OP delimited in a top portion and a bottom portion, in use, of the single crosspiece or of each crosspiece 3, so that the rod or pin 13 actually passes, in particular entirely, through the crosspiece 3 or crosspieces 3 from top to bottom, protruding from the bottom of the crosspieces 3. Clearly, the rod or pin 13 is inserted into the openings OP starting from the top, in particular from the top or from the open upper end (or freed from the caps 2c) of the upright 2.

[0118] The rod or pin 13 may not pass through the bottom of the lowest crosspiece 3, if at least two crosspieces are provided.

[0119] If desired, the upper end 13a of the at least one rod or pin 13 is bent close to or towards or in contact with the top of the only crosspiece 3 or the highest crosspiece 3, so as to prevent the crosspieces 3 of the rod or pin 13 from slipping out or coming out from below. Alternatively, a bushing or similar could be provided, fixed or blocked or welded on the upper, in use, end of the rod or pin 13 or at the same, the bushing being resting or in abutment on the top of the highest crosspiece 3.

[0120] Therefore, the insertion openings OP are defined at the top and bottom of the crosspieces 3, at the respective ends 3a, for example at a distance of approximately 0.1-10 cm, preferably 0.5-2 cm from the respective ends 3a.

[0121] The top and bottom of a crosspiece 3 clearly refers to the upper or lower portions of a crosspiece 3, considering a position in use, either with the crosspiece horizontally aligned or even inclined with respect to the vertical and horizontal.

[0122] Of course, the insertion openings OP, in use, are within the axial opening AL of the uprights 2, therefore they are on a portion or section of a crosspiece 3 inserted into an upright 2 starting from a respective housing hole TH.

[0123] Preferably, the lower end of the at least one rod or pin 13, in use, is effectively free and not engaged with other components of the fence. Even more preferably, the rod or pin 13 is engaged or abuts only the crosspiece 3 or the uppermost crosspiece 3 and is not engaged at other points, although contact could occur when passing through the crosspiece(s) 3.

[0124] If desired, a first row of vertically staggered housing holes TH is provided on a first side 2a and at least one second hole or second row of vertically staggered housing holes TH on a second side or opposite side 2b of the upright 2, with respective crosspieces 3 inserted inside these holes.

[0125] In this case, a rod or pin 13 could be inserted into openings OP in a row of crosspieces 3 corresponding to one side 2a of the upright 2 and a rod or pin 13 inserted into openings in a row of crosspieces corresponding to the other side 2b of the upright 2.

[0126] To assemble this fence, the upright(s) 2 are fixed to the ground, then the crosspiece(s) 3 are arranged in the installation position, then with the respective ends 3a inserted into the housing holes TH or sections inserted in the uprights 2 so as to protrude from both sides of the latter, and finally the rods or pins 13 are inserted from the top of the upright(s) 2 (with any cap(s) 2c removed) so that they pass through the openings OP, until the upper ends 13a of the rods or pins 13 are abutting or in contact with the top of the single traverse 3 or the highest traverse 3.

[0127] Clearly, a fence 1 could also include a combination of the fastening and locking means described above.

[0128] As will be understood, the present invention ensures obtaining fences different from those proposed thus far.

[0129] Furthermore, a fence 1 according to the present invention can be manufactured and assembled very simply and quickly.

[0130] Clearly, thanks to the fastening and locking means, the fence can be disassembled and reassembled many times, should this be necessary.

[0131] Furthermore, in the case of uprights 2 and, if desired, crosspieces 3 made of Cor-Ten, the specific structure and arrangement of the fastening means, preferably removable, or locking means, preferably removable, would facilitate, or at least not prevent, the formation of a compact, passivating surface patina on the external or internal surface of the upright(s) or crosspiece(s) more than solutions according to the prior art.

[0132] Modifications and variations of the invention are possible within the scope defined by the claims.

Claims

1. Fence comprising at least one tubular upright (2) delimiting at least one through housing hole (TH) and at least one crosspiece (3) partially inserted in said at least one through housing hole (TH), said fence further comprising fastening means of said at least one crosspiece (3) to said at least one upright (2) and/or locking means in position of said at least one crosspiece (3) with respect to said at least one upright (2).

2. Fence according to claim 1, wherein said fastening means comprise at least one bent or shaped plate (4) placed at said at least one housing hole (TH) so as to have a first segment (4a) close to or in contact with said at least one upright (2) and a second segment close to or in contact with said at least one crosspiece (3), said fence further comprising at least one first rivet or screw (5) inserted or fitted in said first segment (4a) and in said at least one upright (2) and at least one second rivet or screw (6) inserted or fitted in said second segment (4b) and in said at least one crosspiece (3).

3. Fence according to claim 2, wherein said segments (4a, 4b) are flat or planar, and wherein said at least one plate (4) is bent with an angle between the segments (4a, 4b) between 100° and 160°, the angle being the one facing away from the upright (2) and the crosspiece (3) to be connected.

4. Fence according to claim 2 or 3, wherein said at least one plate (4) is placed at at least one housing hole (TH), i.e. it extends astride the edge (2d) of said at least one upright (2) delimiting such housing hole (TH), so that said first segment (4a) is placed alongside and in substantial contact with a portion of the upright (2) at the corresponding edge (2d), while said second section (4b) is placed alongside and in substantial contact with a portion of the crosspiece (3) that protrudes from the axial opening (AL) of the upright (2) and is the closest to said at least one housing hole (TH).

5. Fence according to any one of the preceding claims, wherein said fastening means comprise at least one block or plate element (7) defining a seat (SE), said at least one block or plate element (7) being in abutment or resting on an end or portion (3a) of the at least one crosspiece (3) in turn inserted in the at least one housing hole (TH),
said at least one fence further comprising at least one connection screw (8) engaged with said seat (SE) and inserted into an opening or hole delimited or formed in said at least one upright (2).

6. Fence according to claim 5, wherein said at least one upright (2) delimits at least two housing holes (TH) and wherein said fence comprises at least two crosspieces (3), each with an end or section fitted in a respective housing hole (TH) of said at least two housing holes (TH) in said at least one upright (2),
said at least one block or plate element (7) being in abutment or resting on said at least one end (3a) of a first crosspiece of said at least two crosspieces (3) and then being in abutment or resting on an end (3a) of another crosspiece (3) of said at least two crosspieces (3), while said at least one connection screw (8) extends in a zone between said at least two crosspieces (3).

7. Fence according to claim 6, wherein said at least one connection screw (8) passes through the wall of said at least one upright (2) from the outside towards the inside of the axial opening (AL) of the latter, with a head (8a) in abutment against the outer surface of said at least one upright (2) and a tip or stem (8b) extending and terminating within the axial opening (AL), passing through said seat (SE) in the block or plate element (7), in a zone delimited between the two free ends (3a) of the two crosspieces (3), which ends (3a) are inserted into the axial opening (AL) through the housing holes (TH) delimited in the same upright (2).

8. Fence according to any one of the preceding claims, wherein said at least one upright (2) delimits at least two first connection holes and/or slots (CH1) aligned with each other, while said at least one crosspiece (3) delimits at least two second connection holes and/or slots (CH2) aligned with each other and with said at least two first holes and/or slots (CH1), and wherein said fastening means comprise at least one fixing screw or plug (9) with a head (9a) and a stem (9b) inserted into said at least two first holes and/or slots (CH1) and said at least two second holes and/or slots (CH2) aligned, said fence further comprising at least one nut (9c) engaged with said at least one fixing screw or plug (9) and arranged close to said at least one upright (2) in alignment with said first (CH1) and second (CH2) holes and/or slots and opposite to said head (9a) of said screw or plug (9) with respect to said at least one upright (2)

9. Fence according to claim 8, comprising at least one spacer or washer (11) tightened between the head (9a) of said at least one fixing screw or plug (9) and the outer surface of said at least one upright (2) and/or at least one spacer or washer (12) tightened between said nut (9c) and the outer surface of said at least one upright (2).

10. Fence according to claim 9, wherein if said at least one upright (2) has a circular or polygonal cross-section, said at least one spacer or washer (11, 12) comprises a surface (11a, 12a) in contact with said at least one upright (2) which is substantially curved or inclined so as to follow the extension of or be substantially parallel to or flush to the outer surface of said at least one upright (2).

11. Fence according to claim 8, 9, or 10, wherein a first connection hole or slot (CH1) is defined at a side of a housing hole (TH), while the other is defined at the opposite side, and
wherein said second connection holes or slots (CH2) are defined on the opposite sides or on the front and rear of a crosspiece (3), at the end (3a) of the same inserted in said at least one housing hole (TH).

12. Fence according to any one of the preceding claims, wherein said at least one upright (2) delimits one or at least two housing holes (TH) passing one at a higher level than the other, and wherein said fence comprises a single crosspiece or at least two crosspieces (3) each fitted in a respective housing hole (TH) in said at least one upright (2) so

as to be placed at different levels or heights from each other, with one being higher than the other, wherein said locking means comprise at least one vertical, in use, rod or pin (13) inserted in the single crosspiece (3) or in both said at least two crosspieces (3),
wherein said at least one rod or pin (13) is inserted into suitable insertion openings (OP) defined at an upper portion and a bottom portion, in use, of the single crosspiece or of each of said at least two crosspieces (3), so that said at least one rod or pin (13) actually passes through said crosspiece or said at least two crosspieces (3) from top to bottom, protruding from the bottom of said crosspiece or said at least two crosspieces (3), although said at least one rod or pin (13) may not pass through the bottom of the optional lower crosspiece (3).

13. Fence according to claim 12, wherein the upper end (13a) of said at least one rod or pin (13) is bent close to or towards or in contact with the top of the single crosspiece or the higher crosspiece of said at least two crosspieces (3), so as to prevent the rod or pin (13) from being pulled out or from exiting from the bottom of the single crosspiece or the crosspieces (3), or alternatively, a bushing is provided fixed, locked, or welded on the upper, in use, end of said at least one rod or pin (13) or at the same, said bushing resting on or being in abutment with the top of the single crosspiece or the higher crosspiece of said at least two crosspieces (3).

14. Fence according to claim 12 or 13, wherein the lower, in use, end of said at least one rod or pin (13) is free and not engaged with other components of the fence.

15. Fence according to any one of the preceding claims, wherein said at least one upright (2) is made of Cor-Ten.

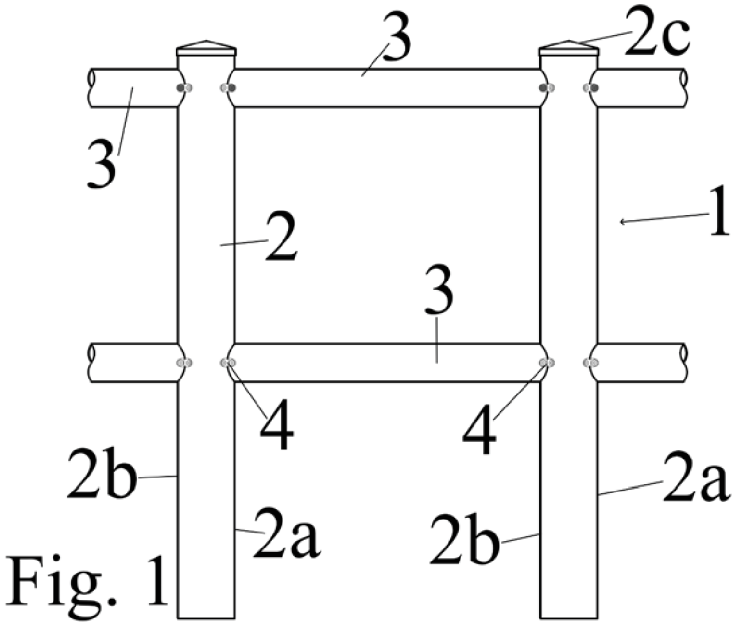


Fig. 1

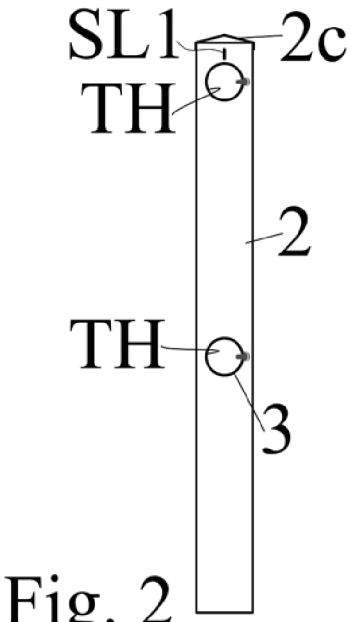


Fig. 2

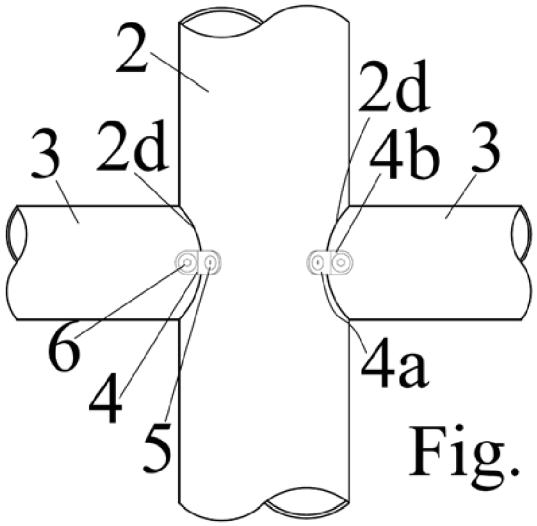


Fig. 3

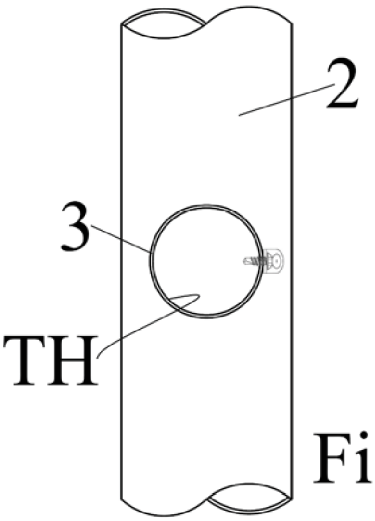


Fig. 4

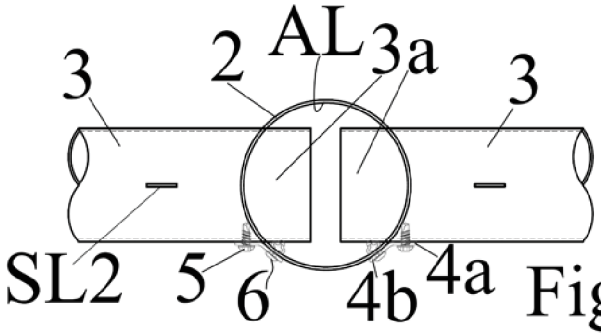


Fig. 5

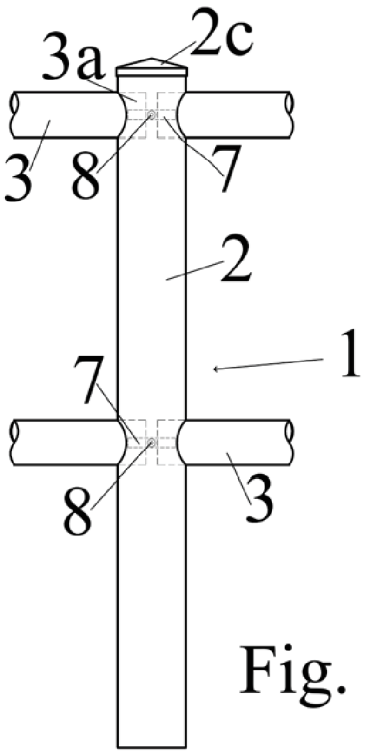


Fig. 6

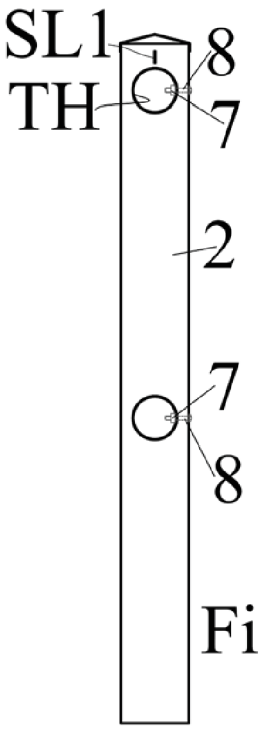


Fig. 7

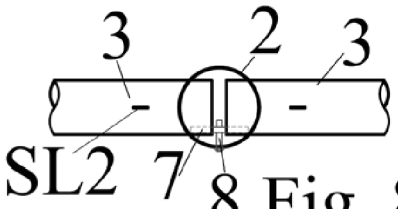


Fig. 8

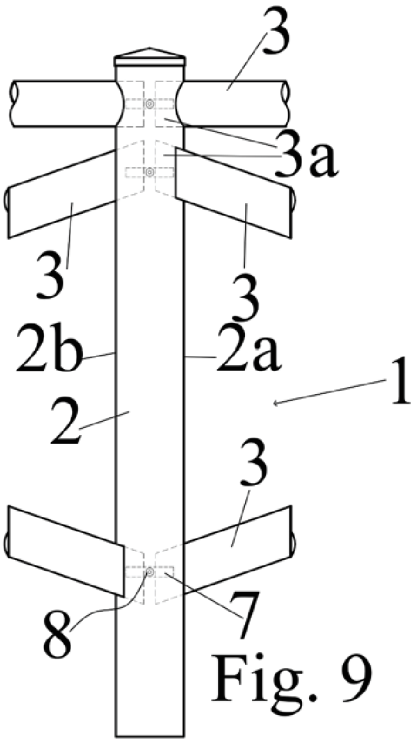


Fig. 9

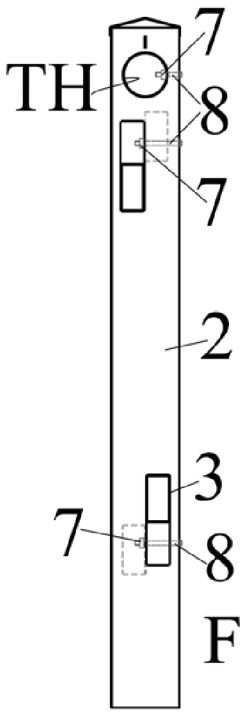


Fig. 10

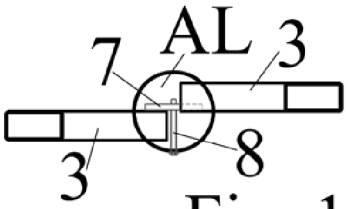


Fig. 11

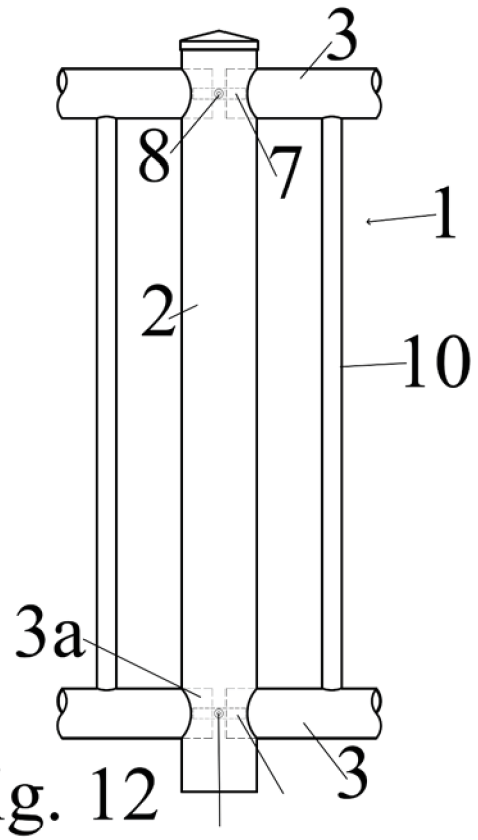


Fig. 12

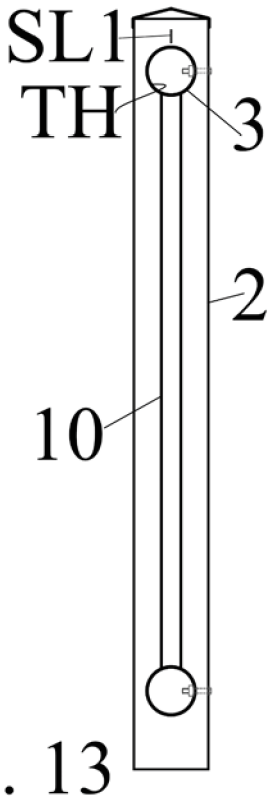


Fig. 13

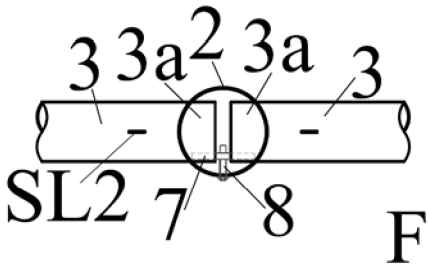


Fig. 14

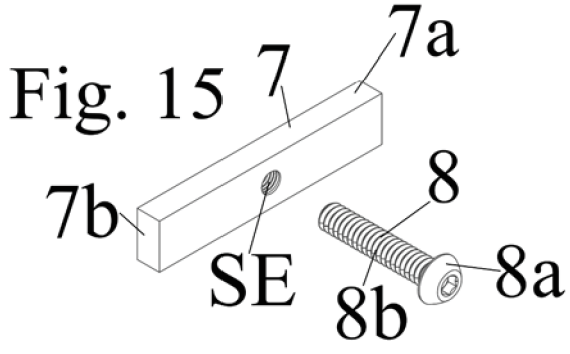


Fig. 15

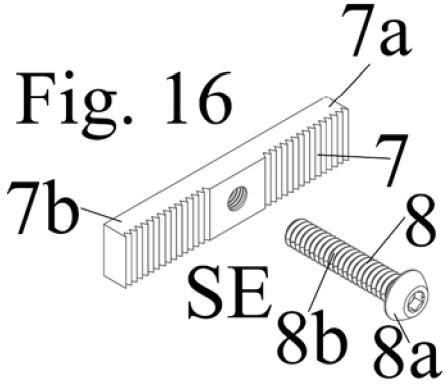


Fig. 16

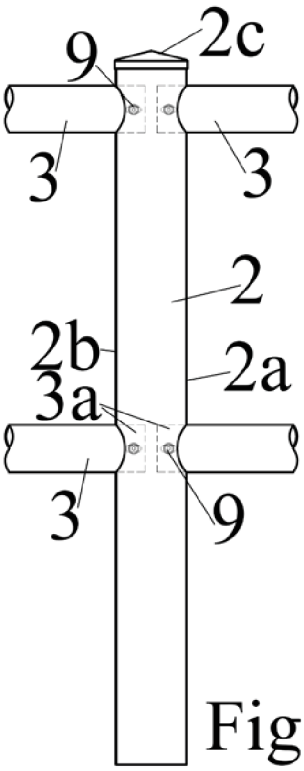


Fig. 17

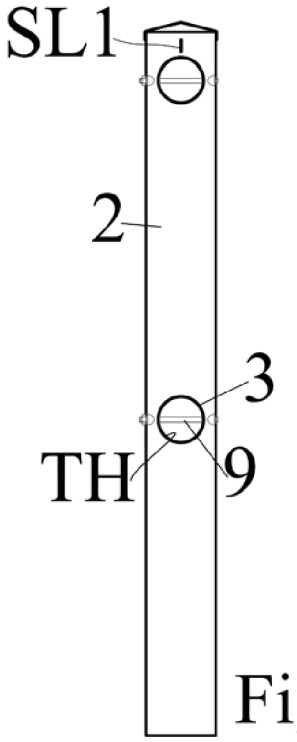


Fig. 18

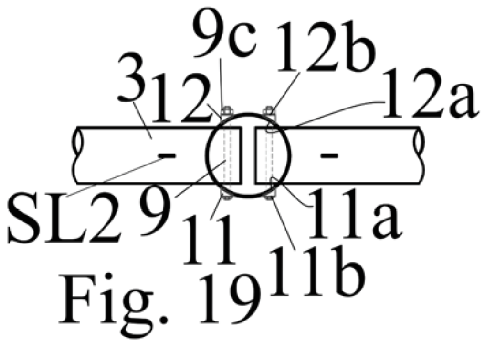


Fig. 19

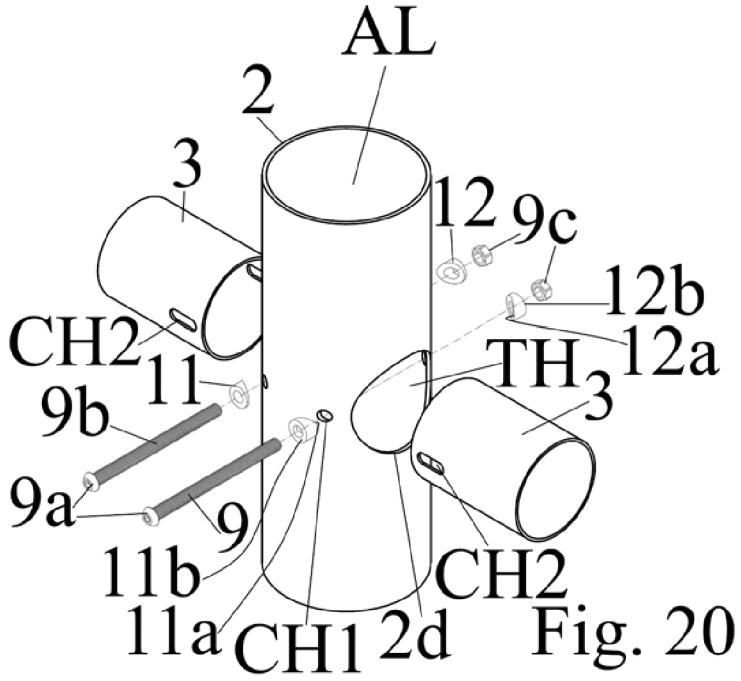


Fig. 20

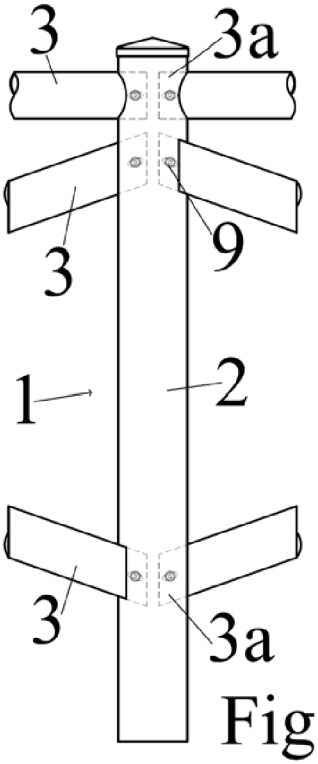


Fig. 21

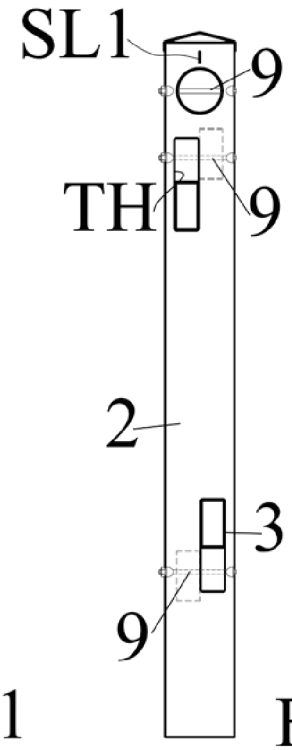


Fig. 22

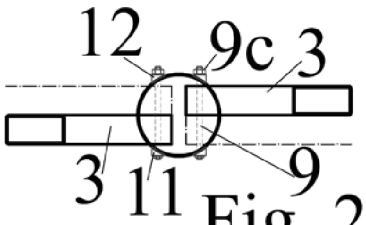


Fig. 23

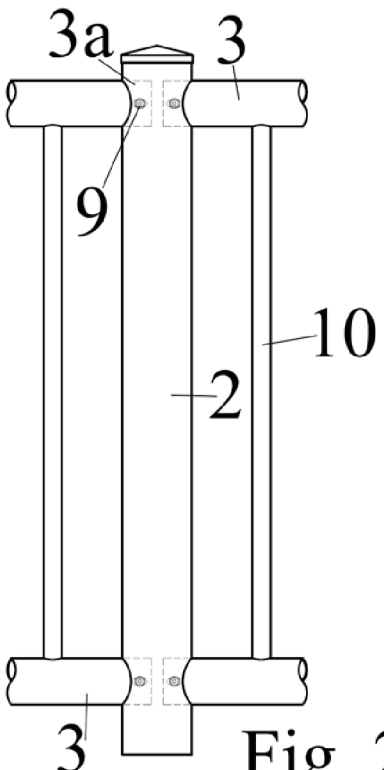


Fig. 24

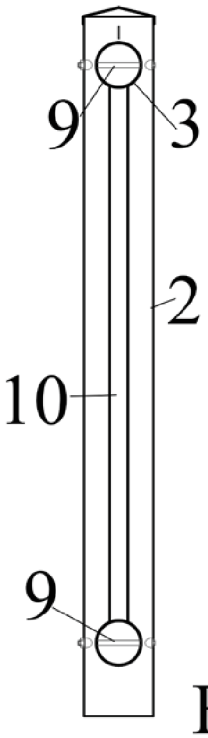


Fig. 25

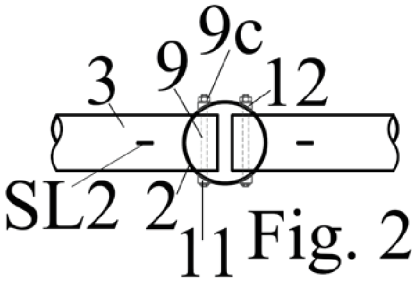


Fig. 26

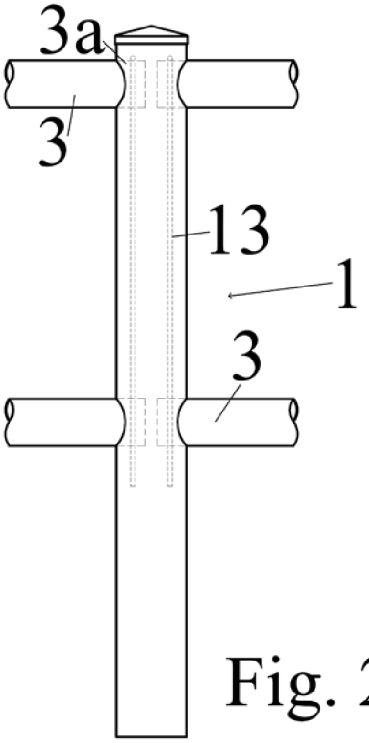


Fig. 27

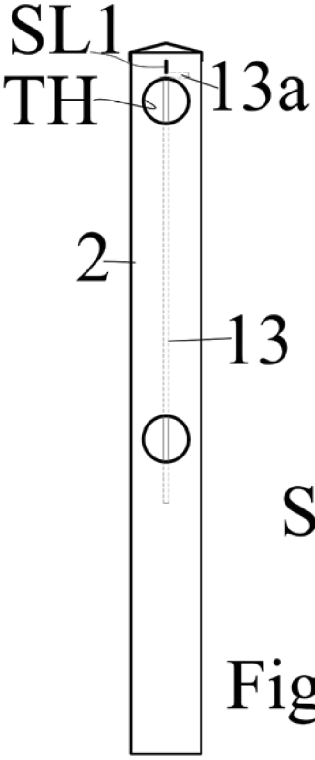


Fig. 28

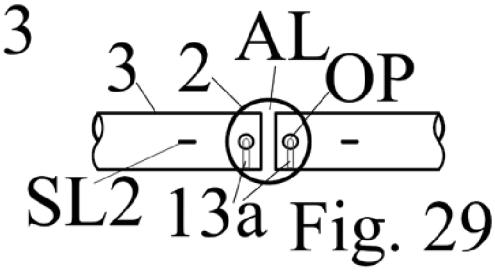


Fig. 29

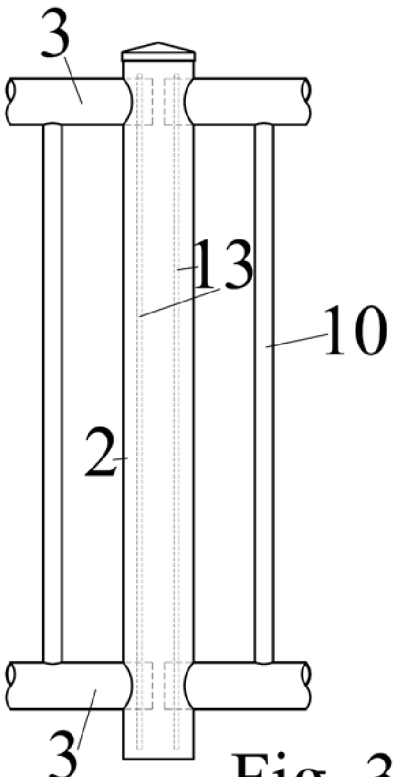


Fig. 30

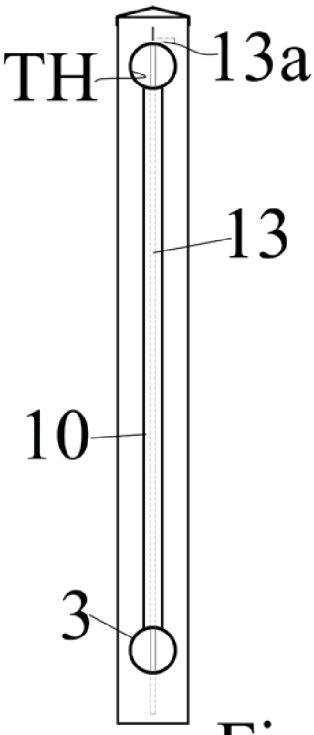


Fig. 31

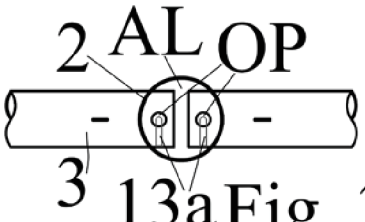


Fig. 32

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 26 16 7506

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D A	EP 3 054 066 B1 (CRACCO S R L [IT]) 2 September 2020 (2020-09-02) * column 3, line 11 - column 8, line 42; figures 1-16 *	1,2,4-8, 11,15 12-14	INV. E04H17/14
X,D A	AU 2023 200 681 A1 (SIDC PTY LTD [AU]) 24 August 2023 (2023-08-24) * page 4, paragraph 24 - page 5, paragraph 28; figures 1-7 *	1,2,4-8 12-14	
X,D A	US 6 499 725 B2 (MEIS WILLIAM J [US] ET AL) 31 December 2002 (2002-12-31) * column 2, line 31 - column 4, line 30; figures 1-10 *	1-3 4-8	
X,D	JP 2016 180275 A (WING:KK; SAITAMA TEKKIN CONCRETE KK; OUCHI MASAYUKI) 13 October 2016 (2016-10-13) * paragraph [0024] - paragraph [0043]; figures 1,2,4,5 *	1,8-11	

TECHNICAL FIELDS SEARCHED (IPC)

E04H
E04F
A01K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 September 2026	Stefanescu, Radu

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 26 16 7506

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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08-09-2026

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3054066 B1	02-09-2020	EP 3054066 A1	10-08-2016
		IT VI20150004 U1	09-08-2016
AU 2023200681 A1	24-08-2023	NONE	
US 6499725 B2	31-12-2002	NONE	
JP 2016180275 A	13-10-2016	JP 6558677 B2	14-08-2019
		JP 2016180275 A	13-10-2016

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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Patent documents cited in the description

- EP 3054066 B1 **[0003] [0007]**
- AU 2023200681 A1 **[0008]**
- US 6499725 B2 **[0008]**
- JP 2016180275 A **[0008]**