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(54) **LADDER**

(57) A ladder (1) comprising two vertical uprights (2) and a plurality of horizontal steps (3) supported by the uprights (2). Each upright (2) is a vertical section bar which branches off from at least one end of the two side walls (P2) and is parallel to the outer wall (P1). Each step (3) is a C-shaped section bar and has a horizontal upper wall (P5) and two vertical side walls (P6) which branch off from opposite ends of the upper wall (P5). The outer wall (P1) of each upright (2) is provided with a plurality of outer through-holes (4) which enable the insertion of the steps (3) therein. The inner wall (P3) of each upright (2) is provided with a plurality of inner through-holes (5) which enable the insertion of the steps (3) therein. The side walls (P6) of each step (3) are provided with slits (6) which enable the interlocking of the steps (3) with the inner walls of the uprights (2).

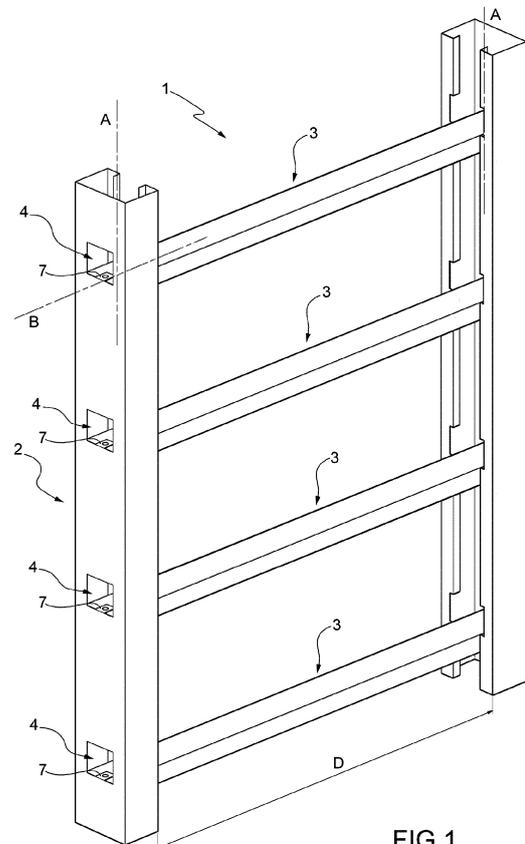


FIG.1

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**Description****CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This patent application claims priority from Italian patent application no. 102019000024307 filed on December 17, 2019.

**TECHNICAL FIELD**

[0002] The present invention relates to a ladder.

[0003] In particular, the present invention relates to a ladder of the type comprising two uprights on which a plurality of steps are applied crosswise and adapted to enable overcoming differences in height with a minimum horizontal bulk.

[0004] Furthermore, the present invention also relates to an assembly kit for the ladder wherein the steps and the two uprights are disassembled.

**STATE OF THE PRIOR ART**

[0005] As is known, ladders are provided by producers already assembled, and the plurality of steps are fastened to the two uprights by means of suitable irreversible fixing operations such as welding.

[0006] Unfortunately, this type of assembly procedure leads to an increase in manufacturing, maintenance and shipping costs.

[0007] Further ladders are known such as for example those described in DE 22 26 213 A, FR 819 114 A and US 4 204 587 A.

**OBJECT OF THE INVENTION**

[0008] The applicant has thus developed an assembly procedure of the components of the ladder of simple production, easy to carry out also by the end user. The procedure requires only the use of common tools/instruments such as hammers and/or screwdrivers, without having to resort to dedicated tools, thus enabling the shipping of the ladder dismantled, reducing the transportation costs thereof.

[0009] This object is achieved by the present invention as it relates to a ladder and to an assembly kit for the ladder, according to what defined in claim 1 and preferably, but not necessarily, in any one of the claims depending thereon.

**BRIEF DESCRIPTION OF THE DRAWINGS**

[0010] The present invention will be described with reference to the accompanying drawings, which illustrate a nonlimiting embodiment thereof, wherein:

- Figure 1 is a perspective view of a ladder manufactured according to the present invention;
- Figure 2 shows, on an enlarged scale for clarity, the

interlocking which is enabled between an end of a step and an upright illustrated in Figure 1;

- Figure 3 shows, on an enlarged scale for clarity, one of the outer holes obtained on the outer wall of each upright illustrated in Figure 1;

- Figure 4 shows, on an enlarged scale for clarity, one of the inner holes obtained on the inner walls of each upright for enabling the passage of the step illustrated in Figure 1;

- Figure 5 illustrates one of the steps, and shows the toothed slits made on both side walls of each step illustrated in Figure 1.

**PREFERRED EMBODIMENT OF THE INVENTION**

[0011] The present invention will now be described in detail, with reference to the accompanying figures, so as to enable a person skilled in the art to manufacture it and use it. Various modifications to the described embodiments will be immediately apparent to those skilled in the art and the general principles described can be applied to other embodiments and applications without thereby departing from the scope of protection of the present invention, as defined in the appended claims. Therefore, the present invention is not to be understood as limited to a preferred embodiment described and illustrated, but it is to be understood as having the widest scope of protection compliant with the principles and with the characteristics described and claimed herein.

[0012] With reference to Figure 1, reference numeral 1 indicates, as a whole, a ladder.

[0013] The ladder 1 comprises two vertical uprights 2 parallel to one another and a plurality of horizontal steps 3 supported by the uprights 2.

[0014] The various steps 3 are arranged crosswise between the two uprights 2 and are preferably arranged at a constant step between one another.

[0015] In the example illustrated in Figure 1, each upright 2 has a vertical longitudinal axis A and each step 3 has a horizontal longitudinal axis B.

[0016] According to the preferred embodiment illustrated in Figures from 1 to 4, each upright 2 is composed of a section bar, i.e. a bar having a constant cross-section, preferably made of metal but optionally also of plastic material.

[0017] With reference to Figures from 2 to 4, each upright 2 is preferably formed by: a vertical outer wall P1, two vertical side walls P2 which branch off from opposite ends of the outer wall P1, and two vertical inner walls P3 which are parallel to the outer wall P1 and which branch off from the two distal ends of the side walls P2, and are arranged at a certain distance from one another. According to a different embodiment not illustrated, one single inner wall P3 is present which extends between the two distal ends of the side walls P2; i.e., in this embodiment, the two inner walls P3 are joined to one another in a seamless manner forming one single inner wall P3.

**[0018]** According to the preferred embodiment illustrated in Figures 2, 3 or 4, each upright 2 is provided with two vertical wings P4, which branch off from the two distal ends of the inner walls P3 and are parallel to the side walls P2.

**[0019]** According to the preferred embodiment illustrated in Figure 5, each step 3 is made by means of a constant C-shaped cross-section bar, preferably made of metal but optionally also of plastic material; each step 3 has a horizontal upper wall P5 and two vertical side walls P6 (thus parallel to the side walls P2 of the uprights 2) which branch off from opposite ends of the upper wall P5.

**[0020]** According to the preferred embodiment illustrated in Figure 3, each upright 2 is provided with a plurality of outer holes 4, made on the outer wall P1, which enable the insertion of the steps 3 therein.

**[0021]** Preferably, the outer holes 4 have a shape that reproduces in negative and by excess the cross-section (i.e. orthogonal to the longitudinal axis B) of each step 3.

**[0022]** According to the preferred embodiment illustrated in Figure 3 each outer hole 4 is further provided with a tongue 7, which branches off from the lower side L1 of each outer hole 4 and is adapted to prevent the accidental slipping out of the step 3, once bent, after having completed the interlocking between each step 3 and the two uprights 2. Preferably, each tongue 7 is initially parallel to the outer wall P1 of each upright 2; each tongue 7 is then bent by 90° with respect to the corresponding outer wall P1, so as to be in abutment against the upper wall P5 of the relative step 3, once completely assembled.

**[0023]** Furthermore, each tongue 7 is preferably provided with a hole 8, adapted to facilitate the bending operation of the tongue 7, favouring the deformation of each tongue 7 in the ideal point.

**[0024]** According to the preferred embodiment illustrated in Figure 4, the inner walls P3 and the wings P4 of each upright 2 are provided with inner holes 5 (open on one side, i.e. through holes, slots) which enable the insertion of the step 3 therein.

**[0025]** Preferably, each inner hole 5, made on the inner walls P3 and on the wings P4, is arranged at a height such that, once completely assembled, the upper wall P5 of the corresponding step 3 is at the same height of the lower side L1 of the outer hole 4 of each upright 2, as illustrated in Figure 2.

**[0026]** Preferably, each inner hole 5 is made in such a manner that the distance between the two vertical profiles L2 and L3 obtained on the inner walls P3 of each upright 2 is equal to the width of each step 3, so as to prevent the translation of the step 3 in a longitudinal direction, orthogonal to the plane defined by the longitudinal axis A of each upright 2 and to the longitudinal axis B of each step 3, once completed the interlocking between the components.

**[0027]** It is understood that the section bar of each upright 2 could have a closed section (i.e. could have one single inner wall P3 which extends between the two distal ends of the side walls P2) and thus the inner holes 5

could be closed.

**[0028]** According to the preferred embodiment illustrated in Figure 5, both side walls P6 of each step 3 are provided with two vertical slits 6 at their ends, adapted to enable the insertion and the interlocking of each step 3 with the inner walls P3 of each upright 2.

**[0029]** Preferably, the slits 6 made on the side walls P6 of each step 3 have a toothed profile, as illustrated in Figure 5; furthermore, the slits 6 made on the side walls P6 of each step 3 are press-fitted into the inner walls P3 of each upright 2.

**[0030]** Preferably, each slit 6 is made at a distance, measured parallel to the longitudinal axis B, from the corresponding end of each step 3, such that the end of each step 3 is in abutment against the inner surface of the outer wall P1 of each upright 2, once completely assembled.

**[0031]** Preferably, each section bar 6 is made at a distance, measured parallel to the longitudinal axis B, from the corresponding end of each step 3, such that the end of each step 3 presses against the corresponding inner wall P3, further away from the outer wall P1, thus causing a deformation of the inner wall P3.

**[0032]** The present invention further relates to an assembly kit for the ladder 1, wherein the steps 3 and the two uprights 2 are disassembled.

**[0033]** The present invention further relates to an assembly method of the assembly kit for the ladder 1.

**[0034]** The assembly method provides for arranging the two uprights 2 parallel to one another and spaced by a distance D equal to the length (longitudinal dimension) of each step 3, then for inserting each step 3 through a corresponding outer hole 4 of an upright 2 until reaching and engaging a corresponding outer hole 4 of the other upright 2, and lastly for interlocking each step 3 with the inner walls P3 of the two uprights 2 at the slits 6. Once carried out the interlockings of each step 3 with the inner walls P3 of the two uprights 2, the tongues 7 are bent inwards (with a plastic deformation of the material) until they are brought into abutment against the respective steps 3.

**[0035]** The ladder 1 described above has numerous advantages.

**[0036]** Firstly, the ladder 1 described above can be transported, stored and delivered disassembled thus occupying a minimum space (if compared to the space occupied by the assembled ladder 2).

**[0037]** Furthermore, the ladder 1 described above can be assembled by the end user in a simple (thus without requiring particular manual skills), intuitive (thus without requiring particular training), quick manner, and without requiring particular tools at disposal (if not a common hammer).

**[0038]** Lastly, the ladder 1 described above is of simple and cost-effective production since the uprights 2 and the steps 3 are easy to manufacture by means of the square bending (i.e. by 90°) of corresponding sheared flat plates.

LIST OF THE REFERENCE NUMERALS**[0039]**

|    |                          |
|----|--------------------------|
| 1  | ladder                   |
| 2  | uprights                 |
| 3  | steps                    |
| 4  | outer holes              |
| 5  | inner holes              |
| 6  | slits                    |
| 7  | tongue                   |
| 8  | hole                     |
| L1 | lower side               |
| L2 | left side of inner hole  |
| L3 | right side of inner hole |
| A  | longitudinal axis        |
| B  | longitudinal axis        |
| P1 | outer walls              |
| P2 | side walls               |
| P3 | inner walls              |
| P4 | wings                    |
| P5 | upper walls              |
| P6 | side walls               |

**Claims**

1. A ladder (1) comprising: two vertical uprights (2) and a plurality of horizontal steps (3) supported by the uprights (2), wherein each upright (2) is a section bar and has a vertical outer wall (P1), two vertical side walls (P2) which branch off from opposite ends of the outer wall (P1), and at least a vertical inner wall (P3) which branches off from at least one end of the two side walls (P2) and is parallel to the outer wall (P1), and wherein each step (3) is a C-shaped section bar and has a horizontal upper wall (P5) and two vertical side walls (P6) which branch off from opposite ends of the upper wall (P5), the outer wall (P1) of each upright (2) is provided with a plurality of outer through-holes (4) which enable the insertion of the steps (3) therein; the inner wall (P3) of each upright (2) is provided with a plurality of inner through-holes (5) which enable the insertion of the steps (3) therein; the side walls (P6) of each step (3) are provided with slits (6) which enable the interlocking of the steps (3) with the inner walls of the uprights (2).  
the ladder (1) is **characterised in that:**  
each outer hole (4) is provided with a tongue (7) which branches off from a lower side (L1) of the outer hole (4), is initially parallel to the corresponding outer wall (P1), and is bent by 90° with respect to the corresponding outer wall (P1) so as to be in abutment against the corresponding step (3).

2. The ladder (1) according to claim 1, wherein the slits

(6) made on the side walls (P6) of the steps (3) have a toothed profile.

3. The ladder (1) according to claim 1 or 2, wherein the slits (6) made on the side walls (P6) of the steps (3) are press-fitted into the inner walls (P3) of the uprights (2).

4. The ladder (1) according to one of the claims from 1 to 3, wherein each upright (2) is an open cross-section bar, and has two inner walls (P3) which are parallel to the outer wall (P1), branch off from the two distal ends of the side walls (P2), and are arranged at a certain distance from one another.

5. The ladder (1) according to claim 4, wherein each upright (2) has two wings (P4) which branch off from the distal ends of the inner walls (P3) and are parallel to the side walls (P2).

6. The ladder (1) according to one of the claims from 1 to 5, wherein the outer holes (4) reproduce in negative and by excess the cross-section of the steps (3).

7. The ladder (1) according to one of the claims from 1 to 6, wherein the inner holes (5) have a rectangular or square shape and have the same width as the steps (3).

8. The ladder (1) according to one of the claims from 1 to 7, wherein the inner holes (5) are made so that, once completely assembled, the upper wall (P5) of each step (3) is located at the same height as the lower side (L1) of the relative outer hole (4).

9. The ladder (1) according to one of the claims from 1 to 8, wherein the end of each step (3) is in abutment against a corresponding outer wall (P1).

10. The ladder (1) according to claim 9, wherein, in each upright (2), each step (3) pushes the corresponding inner wall (P3) further away from the outer wall (P1) causing a deformation of the inner wall (P3).

11. An assembly kit for a ladder (1) defined according to any one of the preceding claims, wherein the steps (3) and the two uprights (2) are disassembled.

12. An assembling method of an assembly kit for a ladder defined according to claim 11, providing for the steps of:

arranging the two uprights (2) parallel to one another and spaced by a distance (D) equal to a length of each step (3);  
inserting each step (3) through a corresponding outer hole (4) of an upright (2) until reaching and engaging a corresponding outer hole (4) of the

other upright (2);  
interlocking each step (3) with the inner walls  
(P3) of the two uprights (2) at the slits (6), the  
outer holes (4) are provided with tongues (7)  
which branch off from the lower side (L1) of each  
outer hole (4), and  
there is provided the further step of bending the  
tongues (7) inwards until they are brought into  
abutment against respective steps (3), after hav-  
ing interlocked each step (3) with the inner walls  
(P3) of the two uprights (2) at the slits (6).

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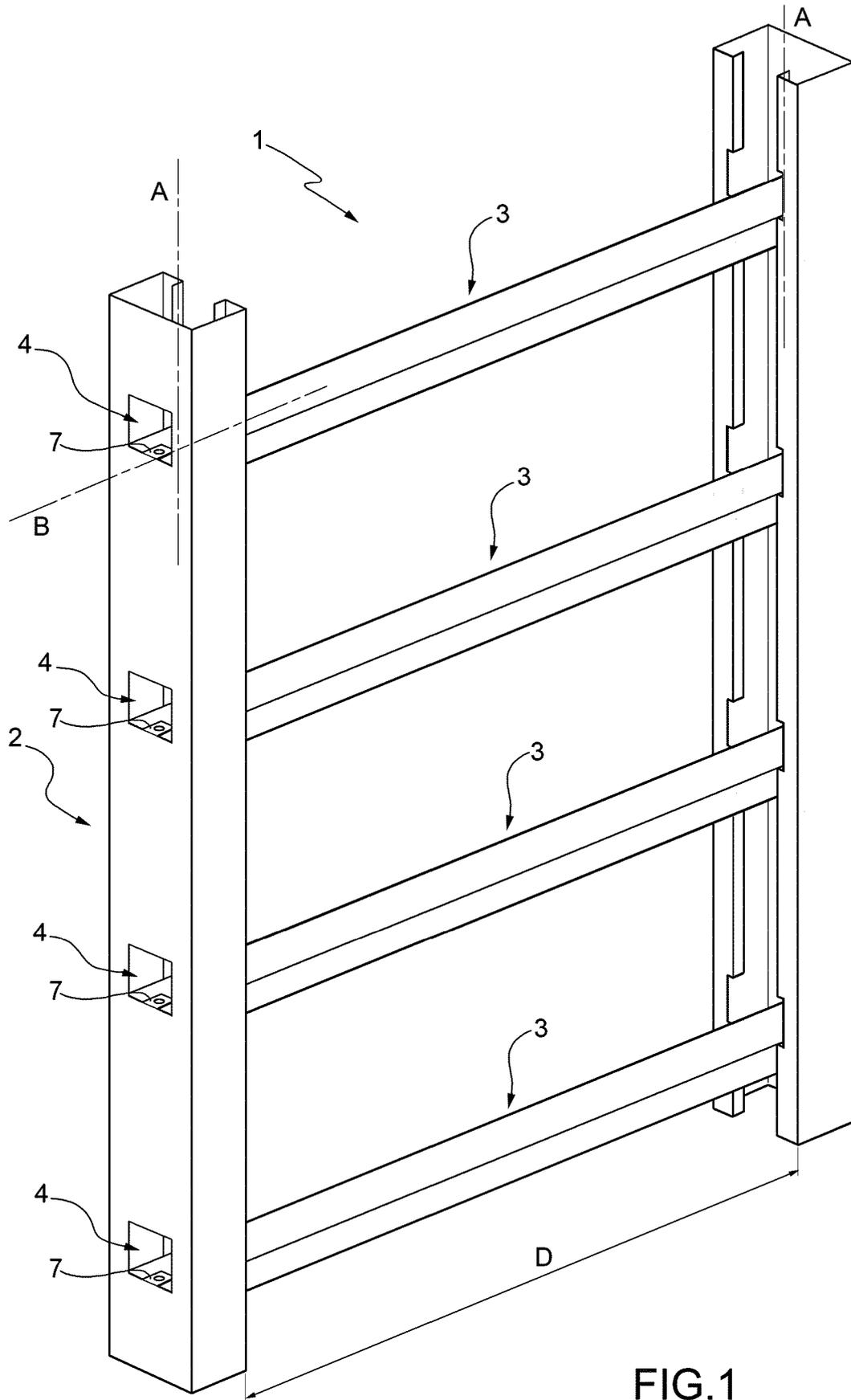


FIG.1

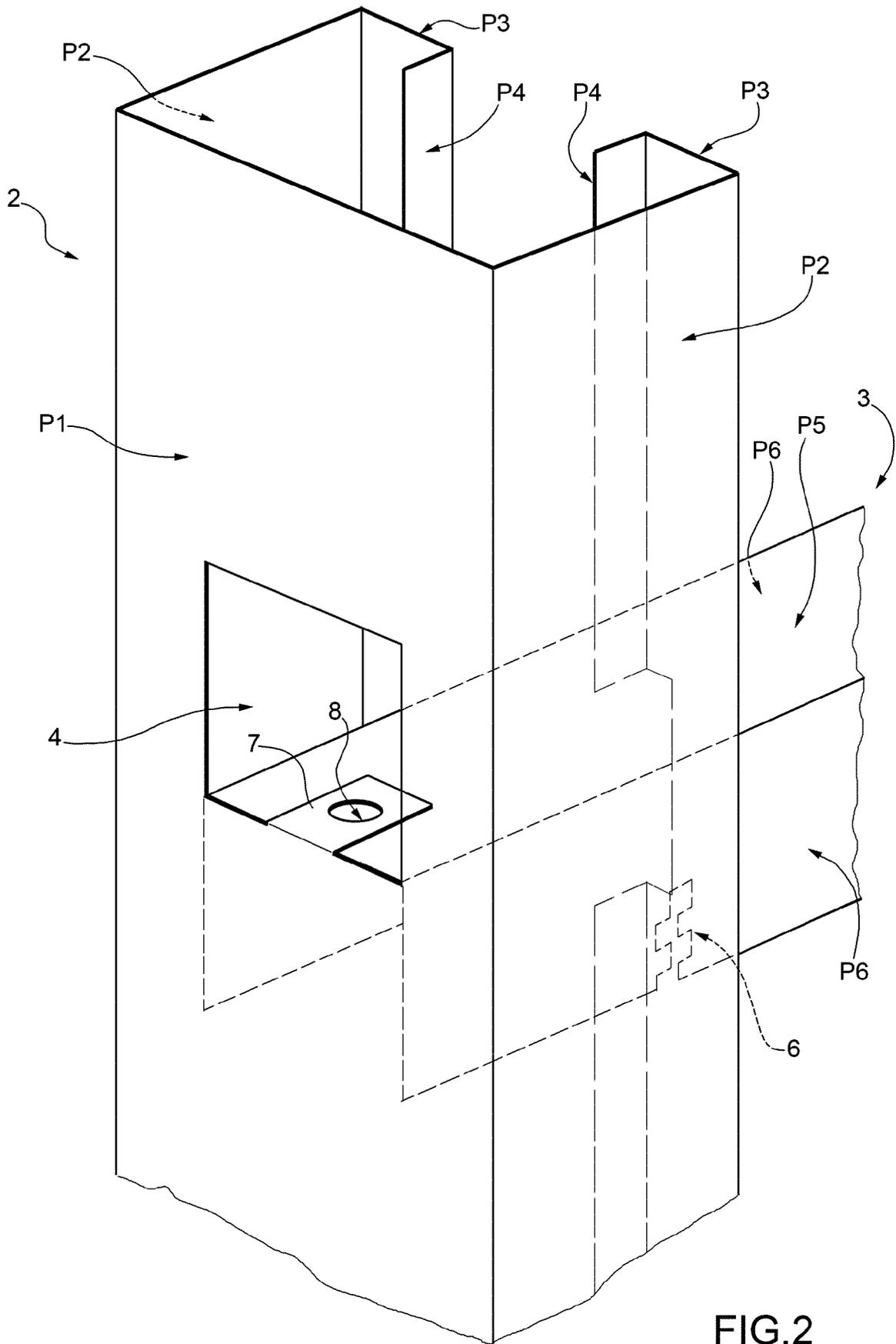


FIG.2

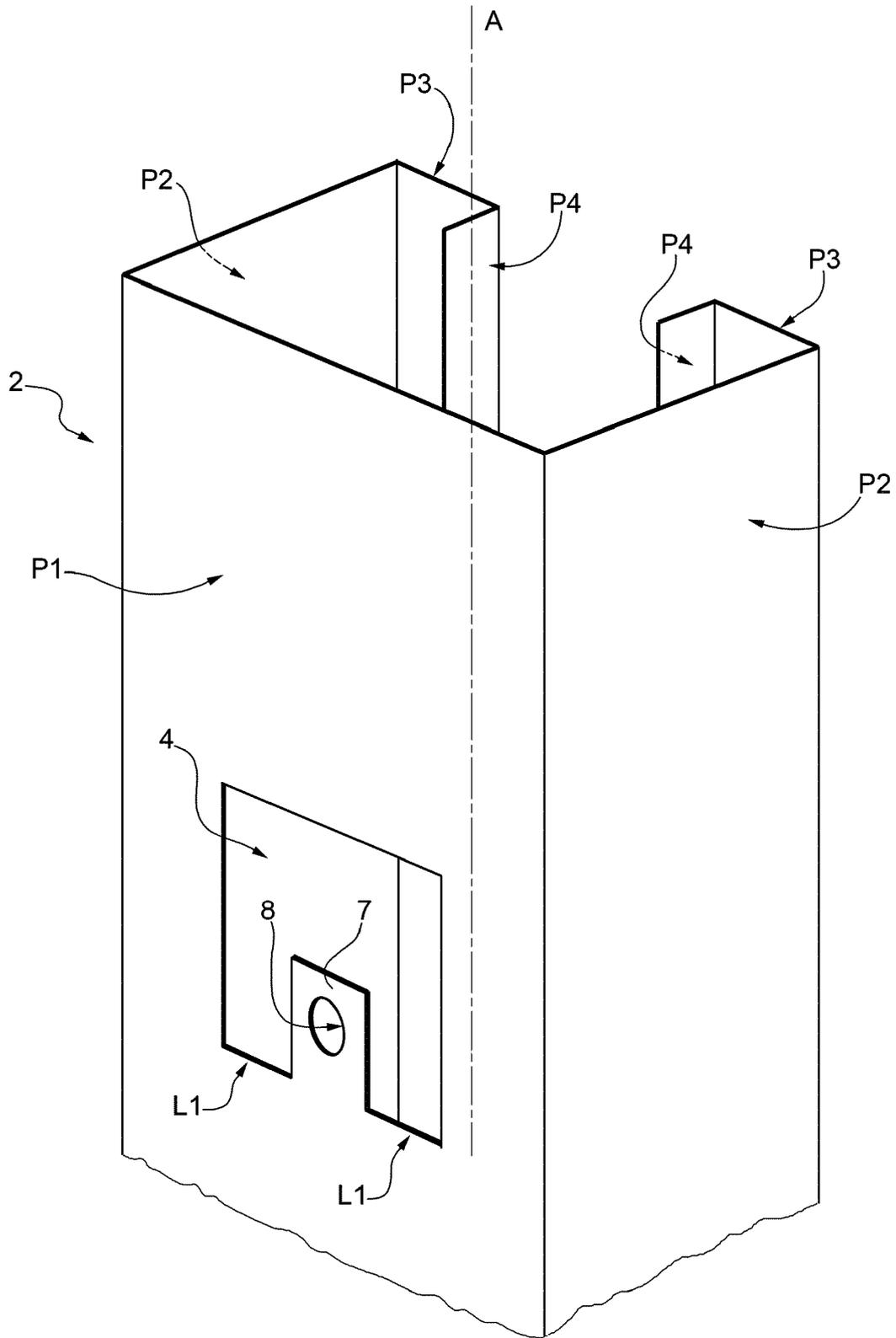


FIG.3

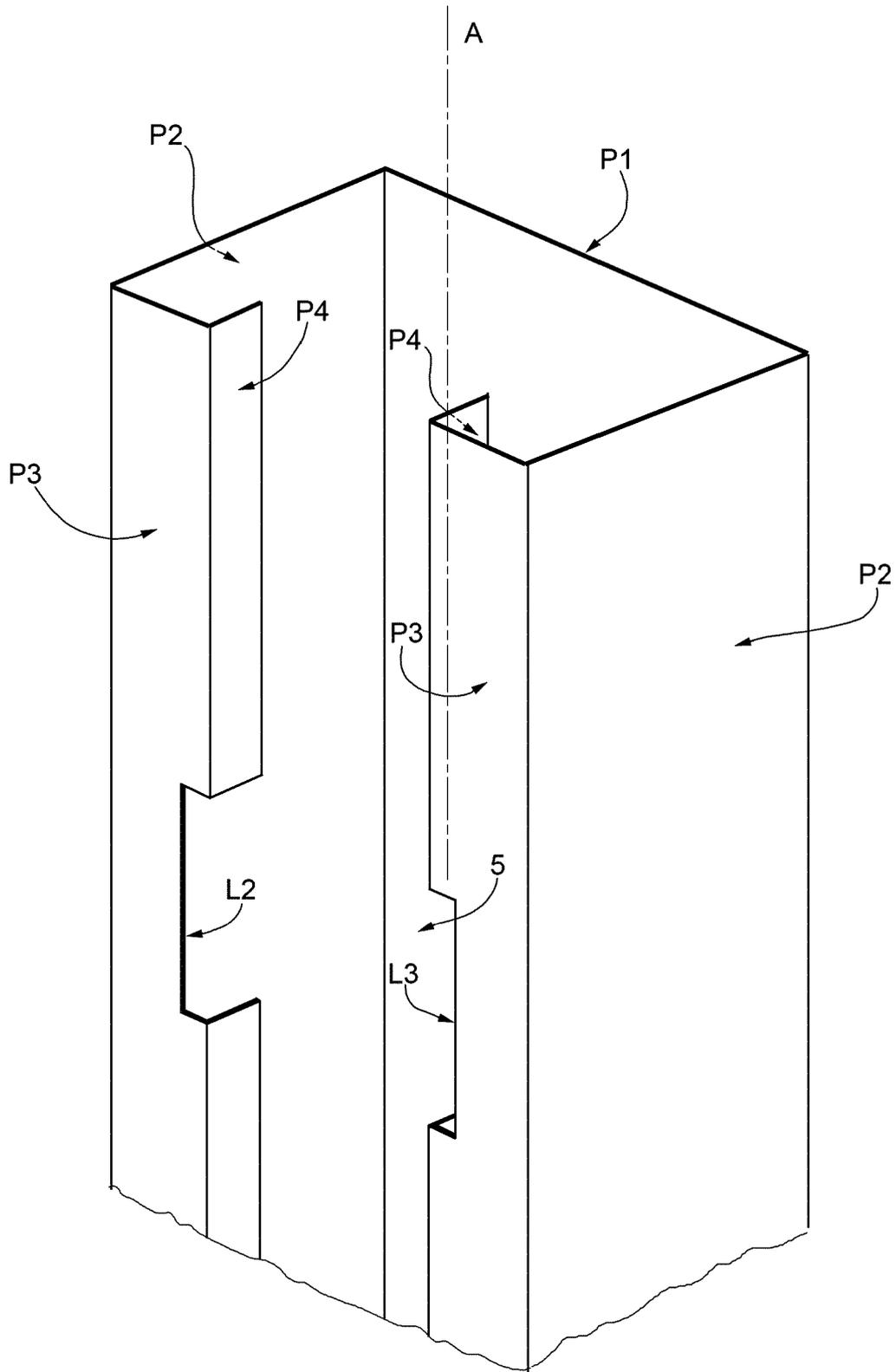


FIG.4

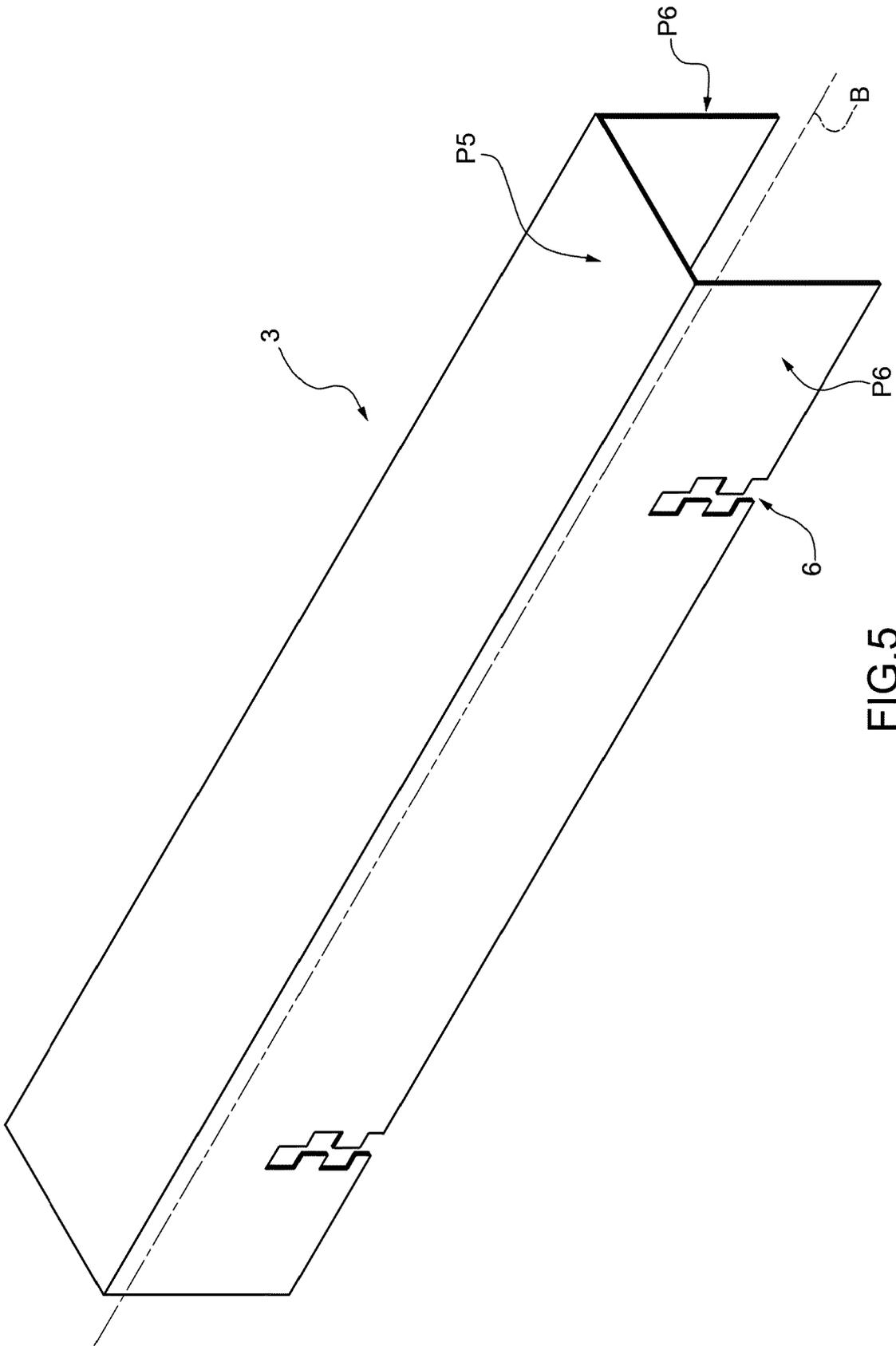


FIG.5



EUROPEAN SEARCH REPORT

Application Number  
EP 20 21 5200

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| DOCUMENTS CONSIDERED TO BE RELEVANT  |   |   |   |
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| Category   | Citation of document with indication, where appropriate, of relevant passages           | Relevant to claim   | CLASSIFICATION OF THE APPLICATION (IPC) |
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| The present search report has been drawn up for all claims                       |   |   | TECHNICAL FIELDS SEARCHED (IPC)         |
|  |   |   | E06C                                    |
| Place of search  |   | Date of completion of the search  | Examiner                                |
| The Hague  |   | 14 April 2021   | Bauer, Josef                            |
| CATEGORY OF CITED DOCUMENTS  |   |   |   |
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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**REFERENCES CITED IN THE DESCRIPTION**

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