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(54) **ADJUSTABLE MEZZANINE FLOOR**

(57) The invention relates to a mezzanine floor provided with a system for extending all of the components thereof, which allows the floor to be installed anywhere and moved to other locations, wherein one structure can be adapted to different spaces without any changes having to be made to said structure. The structure is formed by four extendable posts (1) which support two extendable beams (12) by means of a capital (7). Connectors are used to connect a series of extendable joists (17) to the aforementioned beams and the level floor (21) is installed on said joists. The invention also includes a staircase (22) secured to the top part of the structure by means of connectors.

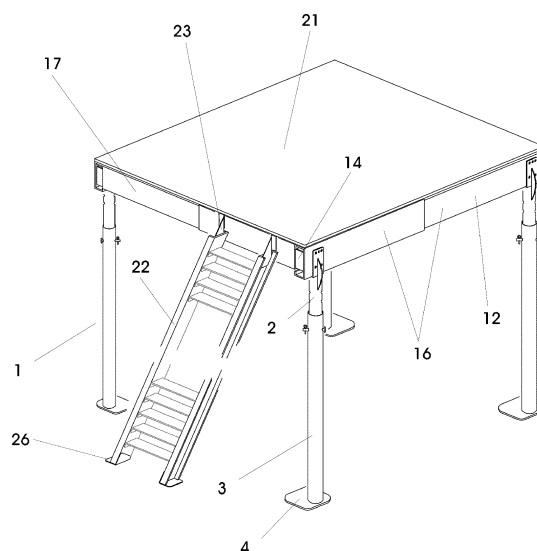


Fig. 1

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Description

[0001] The present invention relates to a mezzanine floor provided with an extension system in all its components, allowing its installation in any suitable place as well as changing location, the same structure being able to be adapted to other architectural spaces without needing to perform masonry works or changes in the structure.

[0002] The application field thereof is within the auxiliary components industry for construction and specifically in the auxiliary industry for mezzanine floors.

[0003] Effective developments specifically dedicated to the function in question, giving rise to a system that is easy to install, with low costs and technically considerable results take precedence in this technical sector. The features of the system presented in this invention are perfectly adapted to this concept, providing the state of the art with an embodiment that is novel, simple, and of a highly economical production cost.

[0004] Some models in this industrial sector which do not provide the state of the art with the novel features proposed by the present invention are known. The state of the art provides fixed mezzanine floors, custom-made according to the details of the location in which it is to be installed and another type of modular mezzanine floors consisting of fixed modules having preconceived sizes and which must be adapted to the location at the time of installation.

[0005] With respect to the novelty provided by the present invention, the known mezzanine floors have the following drawbacks: They can not be reused for other locations, for this reason in the event of moving to another place the installed mezzanine floor must be disregarded and a new one installed. Specialized staff is necessary for installing the known mezzanine floors. The transportation cost of these conventional mezzanine floors is greater than that proposed by the present invention, since it involves the use of trucks long enough to accommodate the components which have to have fixed measurements. More time needs to be dedicated to its installation. As they are made up of modules secured to one another, the modular mezzanine floors have firmness less than those proposed by the present invention. They are less versatile. Their installation is complicated. They are accompanied by masonry works.

[0006] Sending an operator to take measurements of the location where the mezzanine floor must be located implies the resulting economic cost. The manufacturing of these conventional mezzanine floors, due to the fact that it is necessary to produce them by units, is considerably more costly than those proposed by this invention. For the same reason an adequate stock cannot be kept, involving an increase in the service time.

[0007] The present invention relates to a mezzanine floor comprising a floor surface extended on beams supported by posts **characterized in that:**

at least one post made up of an upper post part and

a lower post part telescopically inserted into one another, wherein the lower post part has at least two lower portion holes and the upper post part has at least two upper portion holes located such that they coincide to attach both parts by means of a pin; at least one beam made up of beam parts telescopically inserted into one another and having beam holes coinciding in both parts for their attachment; and the post has a capital at its upper end, the beam securing face of which has capital holes coinciding with the beam holes for attaching the beam to the post.

[0008] In a preferred embodiment, the mezzanine floor comprises at least two assemblies each formed by two posts attached by means of the beam secured by means of the capital, said assemblies are attached to one another by means of a joist made up of parts telescopically inserted into one another and having holes coinciding in both parts for their attachment. Said joist incorporates at each of its ends a beam-to-joist connector having a joist-to-beam face and a connector face attached to the joist with the corresponding beam-to-joist holes coinciding, respectively, with beam holes and joist holes for attaching said assemblies.

[0009] In another preferred embodiment, the mezzanine floor comprises at least four posts, at least two beams and at least two joists.

[0010] With respect to the drawbacks described above, the present invention provides novel, simple and easy to execute solutions to the state of the art, resulting in the following advantages:

[0011] They can be reused for other locations, disregarding the installed mezzanine floor and installing a new one in the event of moving to another place not being necessary. Specialized staff is not necessary for installing the mezzanine floor proposed by the present invention. The transportation cost is lower than that of those conventional mezzanine floors since the use of large vehicles is not necessary. The time dedicated to its installation is considerably lower. The mezzanine floor proposed by the present invention is firmer than that of the modular mezzanine floors. It is more versatile. Its installation is not complicated. It is not accompanied by masonry works. The deployment of an operator for taking measurements of the location where the mezzanine floor must be located is not necessary with the resulting economic savings. The manufacturing has a lower cost since it is able to be manufactured in series, because the measurements of its components are always the same. For the same reason an adequate stock can be kept, involving a savings in the service time.

[0012] All these combined elements give rise to a final result in which significant differentiating features are provided with respect to the current state of the art.

[0013] Thus the invention is made up of four posts made of steel or of a material with the same characteristics formed by telescopic tubes. A metal flat bar, which

can be circular or another shape, with openings for securing it to the floor by means of screws, is preferably welded in an off-centered manner at the base of the lower tube, the largest area being oriented toward the inside of the structure and thus preventing the post from being too far away from the wall. The two tubes forming the post have coinciding holes which by means of a pin control the height of the structure. At the upper end of the post there is a capital, which can be made of the same material, formed by a flat bar bent essentially at a right angle, one of its sides welded to the post and the other side attached by means of screws to a beam described below. The flat bar bent essentially at a right angle which forms the capital has on the side welded to the post a reinforcing flat bar welded to the post and to the capital.

[0014] A beam made of steel or another resistant material the cross-section of which is rectangular-shaped is integrally attached by means of screws to the capital. One of the longer sides of the rectangle, outlining the section of the beam, has an aperture along the entire length of the beam large enough for housing a connector, formed by a plate which can be made of the same material as the previous components, bent essentially at a right angle. One of the sides of the connector is coupled by means of screws inside the rectangle formed by the beam, the other side of the connector is coupled in the same manner inside a joist, similar to the beam although having smaller size. On the side of the beam opposite to the side which is cut along its entire length, there are holes coinciding with the holes of the capital and of the connector, further having other larger holes acting as cable ducts.

[0015] The beams and joists are made up of two parts telescopically inserted into one another which, fixed by means of through bolts through their holes, will determine the width and depth of the mezzanine floor. Each beam is attached at its ends to a post, a beam and two posts forming an assembly and the mezzanine floor is formed by two assemblies, one front assembly and another back assembly, attached by means of the joists which in turn support the level floor, formed by sheets made of a hard material, screwed to the joists. The final floor is placed on this level floor according to the intended use of the mezzanine floor.

[0016] On the most convenient side of the structure there is a staircase made up of two stringers formed by extendable beams provided at their upper ends with a connector, formed by a plate bent two times at right angles, attached by means of screws, one side attached to the stringers and the other two sides attached to a beam or joist and to the level floor. The lower end of the beams forming the staircase incorporates other anchors formed by a flat bar bent at the suitable angle depending on the inclination of the staircase.

[0017] The landing steps made of a resistant material are attached by screws to the holes of both beams.

[0018] A different embodiment is manufactured with another type of material with sufficient resistance and

rigidity to support the design load.

[0019] Another different embodiment is made up of more than four posts.

[0020] Another different embodiment incorporates polygonal-shaped posts or posts of another shape.

[0021] The base flat bar located at the lower end of the post is either polygonal-shaped or another shape.

[0022] The reinforcing flat bar of the capital located at the end upper of the post is either polygonal-shaped or another shape.

[0023] In a different manner the section of the beams and joists are sigma-shaped, zeta-shaped, omega-shaped, u-shaped or the like.

[0024] Another different embodiment is made up of beams and joists of square-shaped section.

[0025] In other different form the mezzanine floor incorporates a side bar located on the upper portion.

[0026] The staircase has a side bar.

[0027] In another different embodiment, the staircase can be moved upwards, having the rotation shaft in its upper portion.

[0028] Alternatively the staircase is concealed under the beams of the mezzanine floor moving it horizontally towards the inside of the latter.

[0029] Without distinction, the staircase is secured by means of a leg which hangs from the lower portion of the staircase on one of its sides such that there is free passage below it.

[0030] In a different manner the staircase pivots toward one side having the rotation shaft in one of its stringers or in the support beam of the landing steps and the collapsible handrailings.

[0031] In another different embodiment the staircase is located inside the mezzanine floor, between two joists, opening up a hole on the floor of the upper floor for access.

[0032] In a different manner the adjustable elements are attached by means of flanges incorporated in the parts, such that the use of screws or other fixing elements is not necessary.

[0033] To better understand this specification drawings describing a preferred embodiment of the invention by way of non-limiting example are attached :

Figure 1 - View of the assembly

Figure 2 - Post

Figure 3 - Capital

Figure 4 - Beam

Figure 5 - Joist-to-beam connector

Figure 6 - Staircase

Figure 7 - Staircase-to-mezzanine floor connector

Figure 8 - Staircase base flat bar

[0034] In said figures the following numbered elements are highlighted:

1.- Post

2.- Upper post part

- 3.- Lower post part
- 4.- Post base flat bar
- 5.- Lower part holes
- 6.- Upper part holes
- 7.- Capital
- 8.- Capital face welded to the post
- 9.- Beam securing face
- 10.- Capital holes
- 11.- Reinforcing flat bar
- 12.- Beam
- 13.- Longitudinal beam section
- 14.- Beam-to-joist connector
- 15.- Beam holes
- 16.- Beam parts
- 17.- Joist
- 18.- Joist-to-beam face
- 19.- Beam-to-joist holes
- 20.- Connector face attached to the joist
- 21.- Level floor
- 22.- Staircase
- 23.- Staircase connector
- 24.- Slide holes
- 25.- Staircase connector flat bar
- 26.- Staircase securing flat bar
- 27.- Welded flat bar holes
- 28.- Staircase beams
- 29.- Staircase base connector
- 30.- Base connector-to-beam face
- 31.- Base connector-to-floor face
- 32.- Base connector-to-floor hole
- 33.- Landing steps
- 34.- Pin

[0035] A preferred embodiment of the invention is made up of four steel cylindrical posts 1 formed by two parts, upper post part 2 and lower post part 3, one fitted inside another, one located at the upper portion 2 and having a smaller diameter, which is slid inside the other 3 located at the lower portion and having a greater diameter, with the sufficient tolerance for allowing the sliding thereof. The lower post part 3 has at one end a round post base flat bar 4 made of the same material, with several holes, welded to the post in an off-centered manner. The lower post part 3 has at least two lower post part holes 5 at the same level facing one another located at the other end in which the post base flat bar 4 described above is located. The upper post part 2 having diameter smaller than that of the part post lower 3, has along its entire length and spaced from one another upper post part holes 6 similar to that of the lower post part 3. The height of the mezzanine floor is obtained by attaching the holes of the lower post part 3 with holes made in the upper post part 2 with a pin 34. At the upper end of the upper post part 2 having smaller diameter there is located a capital 7 made of the same material, formed by a flat bar bent at a right angle such that it has two faces vertical to one another, a capital face welded to the post 8 having width equal to the upper post part 2, is welded to the

latter, the other beam securing face 9 having width equal to the beam 12, described below, has capital holes 10 coinciding with others made in the beam 12. On the outer part of this same beam securing face 9 there is at least one arc-shaped reinforcing flat bar 11, the flat part of which is jointly welded to the capital 7 and to the upper post part 2.

[0036] A rectangular-shaped beam 12 made of the same material as the previous components with a longitudinal beam section 13 on one of the longer sides of the rectangle made along its entire length with sufficient amplitude for housing a beam-to-joist connector 14 described below is attached to the already described capital 7 by means of screws. On the face opposite this longitudinal beam section 13 there are beam holes 15 along the entire length of the beam 12 coinciding with the capital holes 10.

[0037] These beams 12, like the posts 1, are made up of two beam parts 16 inserted into one another, with sufficient tolerance for allowing their sliding and which, fixed by means of through bolts through their holes 15, will determine the width and depth of the mezzanine floor.

[0038] A joist 17 of the same shape, material and composition as the beams 12, of the same length and somewhat having smaller cross-section, the extensibility of which controls the depth of the structure, is attached by means of screws to the aforementioned beam-to-joist connector 14 which is described below. Incorporated at each of its ends is a beam-to-joist connector 14 formed by a flat bar made of the same material as the previous components, bent at a right angle, two faces being perpendicular to one another. One of these faces, which is the joist-to-beam face 18 has the dimension sufficient to be coupled inside the rectangle formed by the beam and with the necessary beam-to-joist holes 19, coinciding with those made in the beam 12 and attached to the latter by screws. The other face, the connector face attached to the joist 20, has the measurements necessary to be coupled in the same manner as the above at the end of the joist 17. Each of its ends is coupled to the corresponding beam 12 by means of the beam-to-joist connector 14 described above, sufficient joists 17 being arranged along the entire length of the beams 12 for supporting the weight for which the structure is intended.

[0039] Each beam 12 is attached at its ends to a post 1, a beam 12 and two posts 1 forming an assembly and the mezzanine floor is formed by two assemblies, one front assembly and another back assembly attached by means of the joists 17 which in turn support the level floor 21, formed by sheets made of a hard material, screwed to the joists 17. The final floor is placed on this level floor 21 according to the intended use of the mezzanine floor.

[0040] On the most convenient side of the structure there is a staircase 22 formed by two extendable staircase beams 28 provided at their upper ends with a staircase connector 23, formed by a staircase securing flat bar 26 bent at a right angle, in which each of its faces it incorporates a slide hole 24 which is screwed to a beam

12 or joist 17 using the holes provided thereon and to the level floor 21. Another staircase connector flat bar 25 is incorporated to this flat bar and welded to the edge of one of its faces in the vertical direction, forming an angle greater than 90° with the previous one and determining the inclination of the staircase 22, this staircase connector flat bar 25 has welded flat bar holes 27 coinciding with the holes of the staircase beams 28 supporting and forming the staircase 22 to which they are secured by means of screws. The other end of the staircase beams 28 forming the staircase 22 incorporate staircase base connectors 29 formed by a flat bar bent at a right angle in which one of its faces, the base connector-to-beam face 30, is screwed to each of the staircase beams 28. The other face of the flat bar, which is the base connector-to-floor face 31, has at least one base connector-to-floor hole 32 whereby the staircase 22 is attached to the floor by an expansion anchor.

[0041] The landing steps 33 made of a resistant material are attached by screws to the holes of both staircase beams 28.

Claims

1. A mezzanine floor comprising a floor surface extended on beams supported by posts, **characterized in that** at least one post (1) made up of an upper post part (2) and a lower post part (3) telescopically inserted into one another, wherein the lower post part (3) has at least two lower part holes (5) and the upper post part (2) has at least two upper part holes (6) located such that they coincide to attach both parts (2, 3) by means of a pin (34);
at least one beam (12) made up of beam parts (16) telescopically inserted into one another and having beam holes (15) coinciding in both parts for their attachment;
and the post (1) has a capital (7) at its upper end, the beam securing face (9) of which has capital holes (10) coinciding with the beam holes (15) for attaching the beam (12) to the post (1).
2. The mezzanine floor according to claim 1, **characterized in that** it comprises at least two assemblies each formed by two posts (1) attached by means of the beam (12) secured by means of the capital (7), said assemblies are attached to one another by means of a joist (17) made up of parts telescopically inserted into one another and having holes coinciding in both parts for their attachment; said joist (17) incorporates at each of its ends a beam-to-joist connector (14) having a joist-to-beam face (18) and a connector face (20) attached to the joist with the corresponding beam-to-joist holes (19) coinciding respectively with beam holes (15) and joist holes (17) for attaching said assemblies.

3. The mezzanine floor according to claim 1 or 2, **characterized in that** it comprises at least four posts (1), at least two beams (12) and at least two joists (17).
4. The mezzanine floor according to any of the preceding claims, **characterized in that** said assemblies attached by means of the joists (17) support the level floor (21).
5. The mezzanine floor according to any of the preceding claims, **characterized in that** the capital (7) has at least one reinforcing flat bar (11) in its beam securing face (9).
6. The mezzanine floor according to any of the preceding claims, **characterized in that** the lower post part (3) has at one end a post base flat bar (4) with holes for its attachment to the floor.
7. The mezzanine floor according to claim 6, **characterized in that** the post base flat bar (4) is attached to the post (1) in an off-centered manner, the largest area being oriented toward the inside of the structure.
8. The mezzanine floor according to any of the preceding claims, **characterized in that** the upper post part (2) and the lower post part (3) are made of a resistant steel material and are cylindrical-shaped, polygonal-shaped or the like.
9. The mezzanine floor according to any of the preceding claims, **characterized in that** the beam (12) or the joist (17) are made of a resistant steel material and their sections are rectangular-shaped, square-shaped, sigma-shaped, zeta-shaped, omega-shaped, U-shaped or the like.
10. The mezzanine floor according to any of the preceding claims, **characterized in that** it comprises a staircase (22) formed by the staircase beams (28), each staircase beam (28) is made up of parts telescopically inserted into one another having holes coinciding in both parts for their attachment, said staircase incorporates steps (33) attached to the staircase beams (28) by means of their holes.
11. The mezzanine floor according to claim 10, **characterized in that** the staircase beams (28) have a staircase connector (23) at their upper ends.
12. The mezzanine floor according to claim 11, **characterized in that** the staircase connector (23) is formed by a staircase securing flat bar (26) adapted to the shape of the beam (12) or joist (17) and having in each of its faces a slide hole (24) for its attachment to the beam (12) or joist (17), said staircase connector (23) incorporates a staircase connector flat bar

(25) having flat bar holes (27) coinciding with the holes of the staircase beams (28) for attaching the staircase (22) to the mezzanine floor.

13. The mezzanine floor according to claims 10 to 12, **characterized in that** the staircase beam (28) incorporates a staircase base connector (29), formed by a base connector-to-beam face (30) having holes coinciding with the holes of the staircase beam (28) for securing it, and by a connector-to-floor face (31) having at least one base connector-to-floor hole (32) for attaching the staircase (22) to the floor. 5 10
14. The mezzanine floor according to any of the preceding claims, **characterized in that** the adjustable elements are attached by means of flanges incorporated in the parts, such that the use of screws or other fixing elements is not necessary. 15

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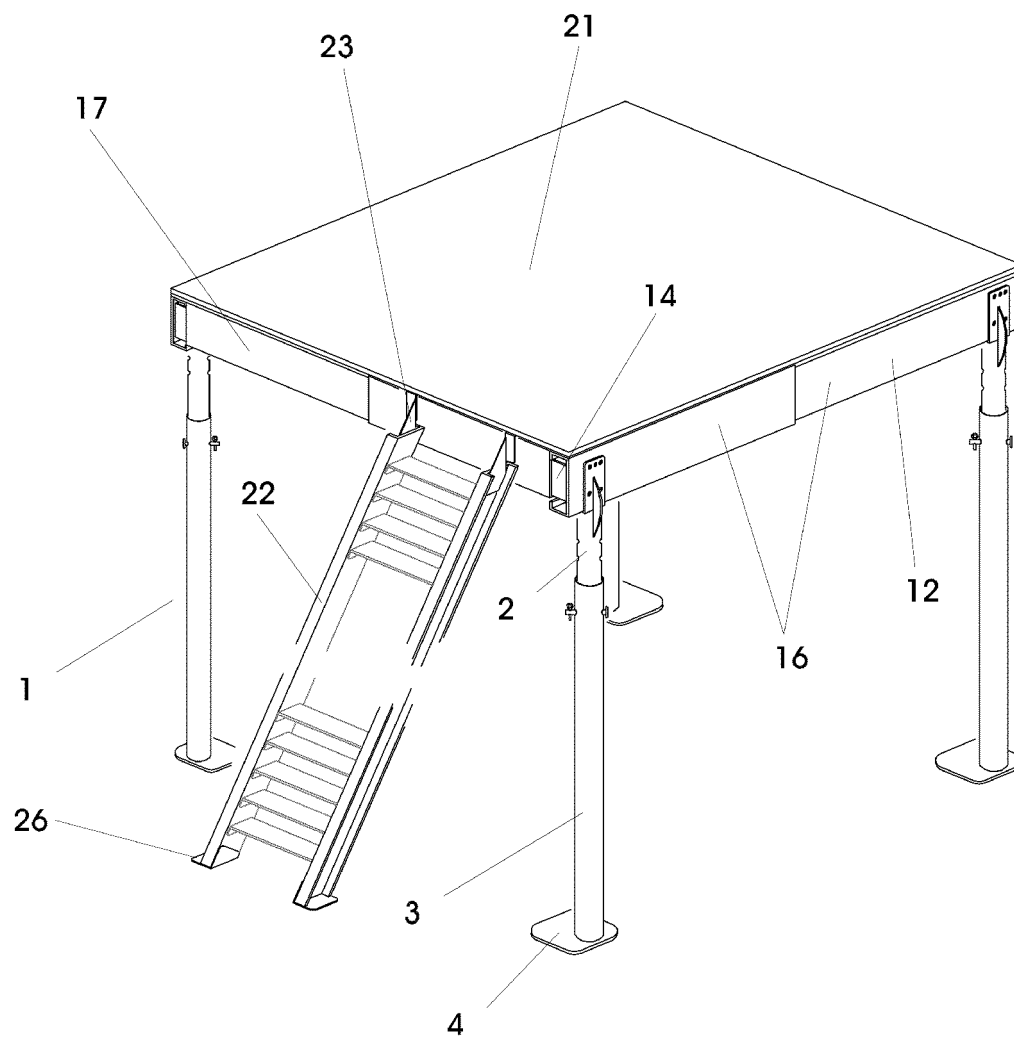


Fig. 1

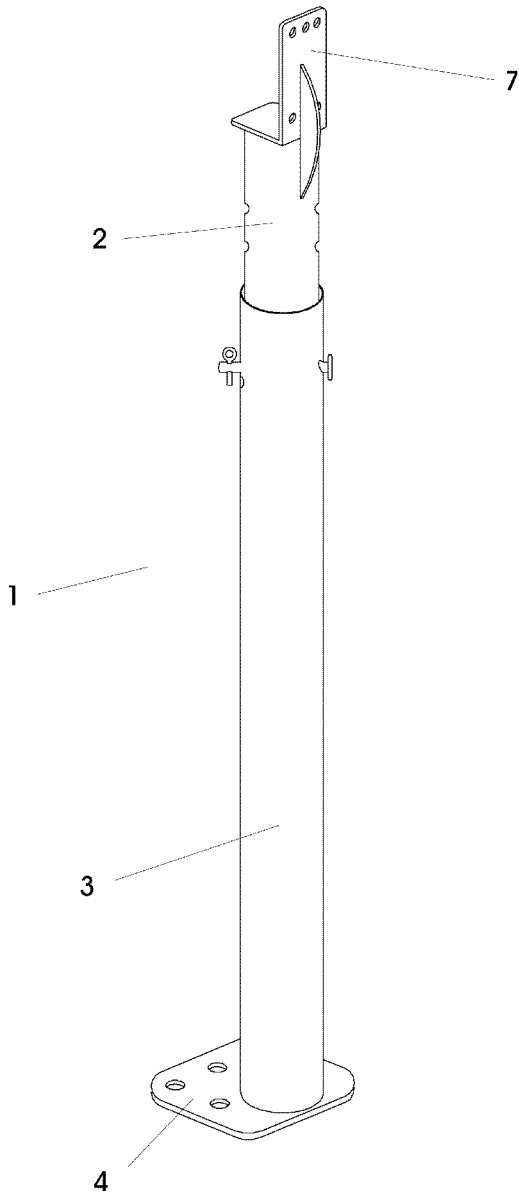


Fig. 2

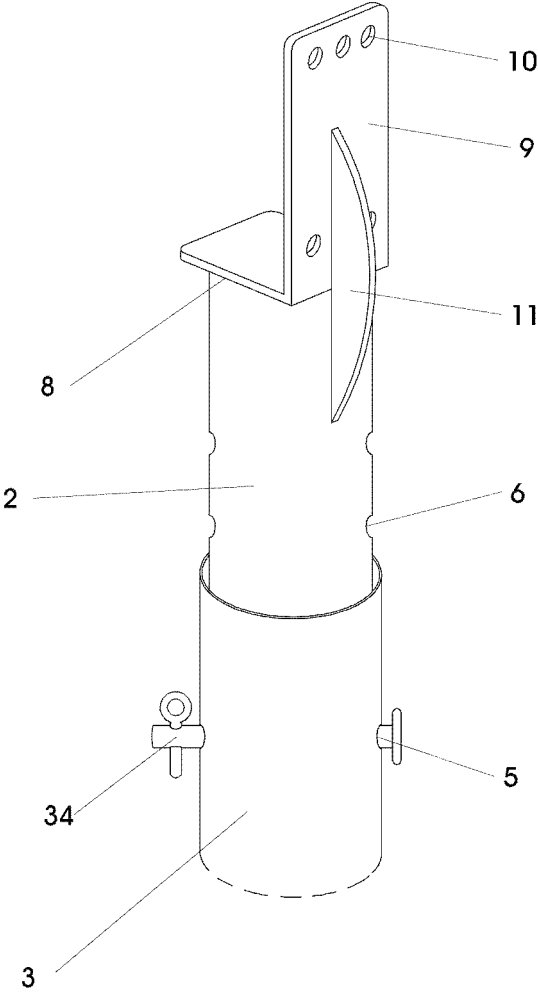


Fig. 3

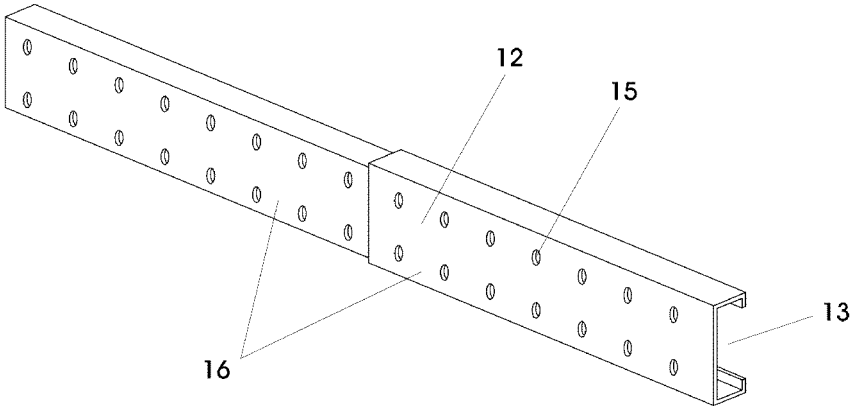


Fig. 4

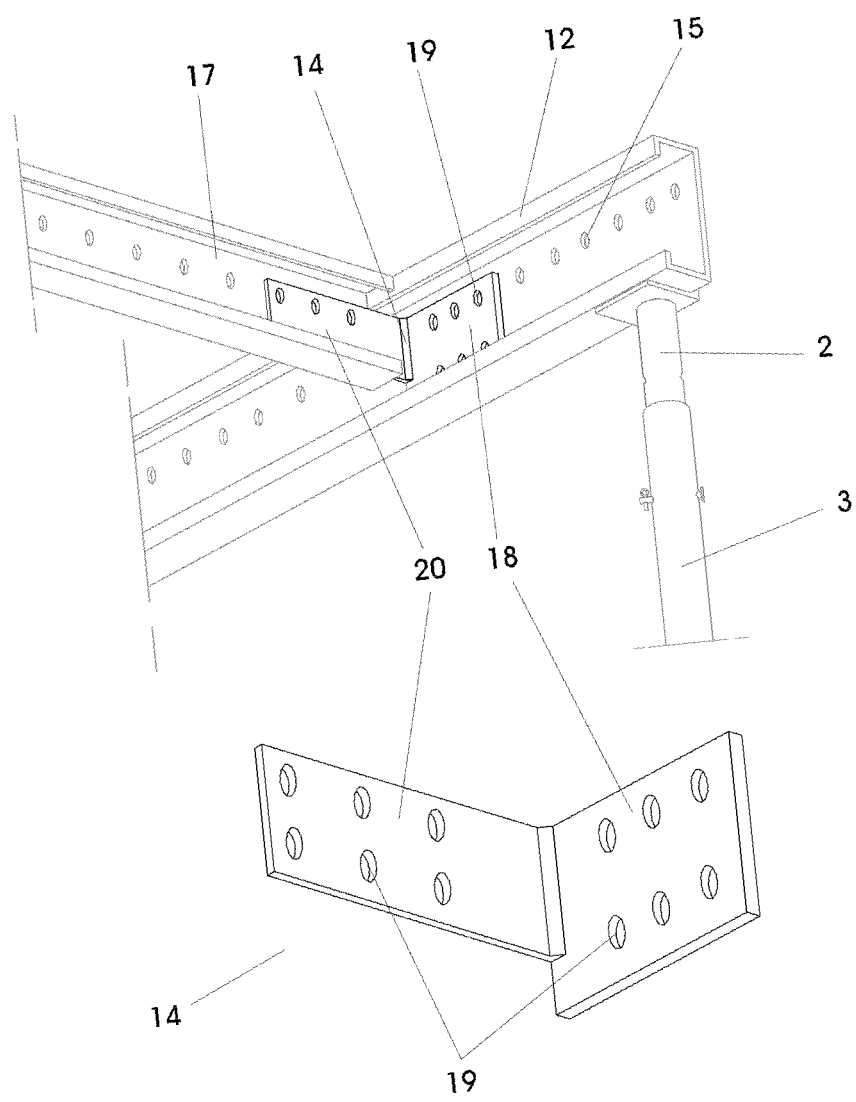


Fig. 5

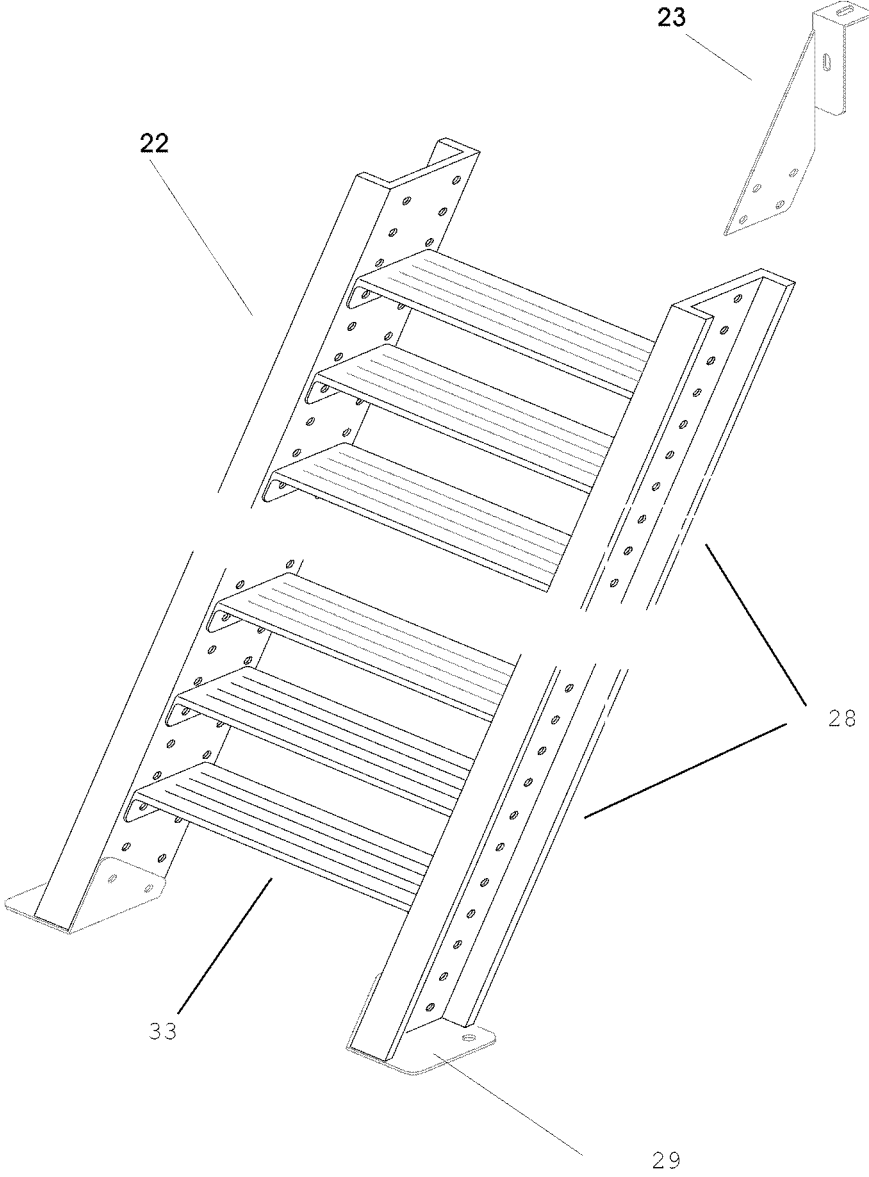


Fig. 6

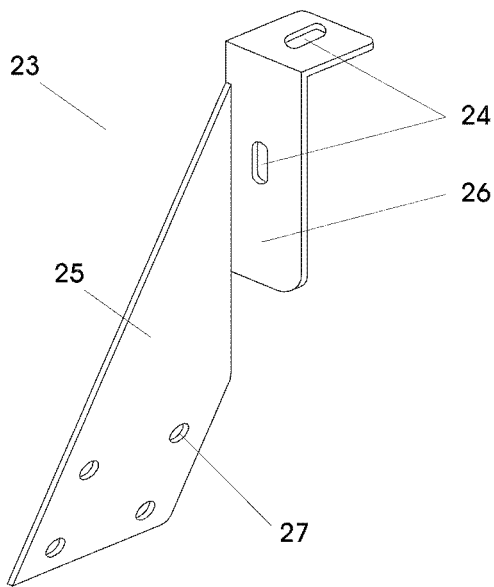


Fig. 7

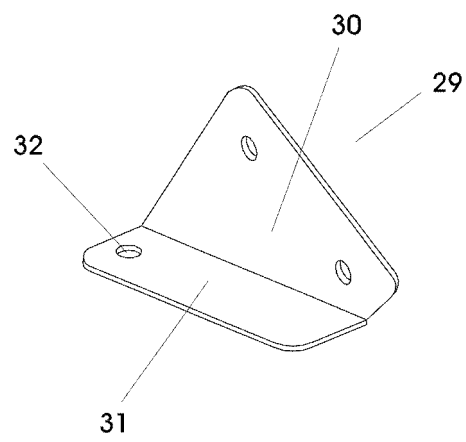


Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/ ES 2010/000218

A. CLASSIFICATION OF SUBJECT MATTER

see extra sheet

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E04G 1/22, E04B 1/343, E04B1/24

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

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

INVENES, EPODOC, MEZZANINE, ENTREPLANTA, AJUSTABLE, TELESCOPI+, ADJUST+,

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	Entreplanta ajustable(Tecro, S.L)29-01-2008. Retrieved from Internet. URL: <http://www.tecro.es/archivos/CATÁLOGO_ENTREPLANTA_AJUSTABLE.pdf>	1-5,8-11 14 6,12,13
Y	GB 2014686 A (WILSON) 30.08.1979, Pag.1,line.20-pag. 20,line.104;figures.	14
A	EP 720121 A1 (JAPAN STEEL INTERNATIONAL INC) 20.03.1996, column.3,line.33-column.8,line. 43;figures.	1-3
A	US 6749041 A (HUTCHING) 15.06.2004, column. 1,line.38-column.2line. 21;claims;figures	10-13
A	FR 1381954 A (BETONBAU GMBH) 14.12.1964, abstract; figures.	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

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Date of the actual completion of the international search

02 August 2010 (02.08.2010)

Date of mailing of the international search report

(06/08/2010)

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Form PCT/ISA/210 (second sheet) (July 2009)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/ ES 2010/000218

Patent document cited in the search report	Publication date	Patent family member(s)	Publication date
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US 6749041 B	15.06.2004	NONE	-----
FR 1381954 A	14.12.1964	NONE	-----

Form PCT/ISA/210 (patent family annex) (July 2009)

INTERNATIONAL SEARCH REPORT

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