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(54) BEAM FOR ATTACHING A CANTILEVERED STRUCTURE

(57) Beam (10) for attaching a cantilevered structure (11, 17) comprising at least one elongated body (12) provided on at least one side (13) with a plurality of attachment bars (14) which are configured to be inserted into corresponding holes (15) made on at least one side (16) of the structure (11, 17); the bars (14) are provided with adjustment elements (18, 19) mobile along said bars (14) so as to vary at least one distance (D) of attachment of the structure (11, 17) with respect to the beam (10).

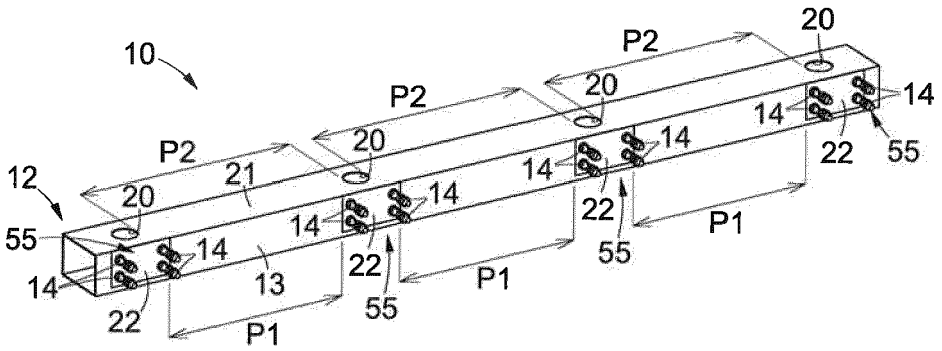

fig. 1

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Description

FIELD OF THE INVENTION

[0001] The present invention concerns a beam for attaching a cantilevered structure, in particular a self-supporting beam made of steel or mixed steel-concrete which can be used for the construction of self-supporting cantilevered terraces for buildings. The invention also concerns a self-supporting terrace comprising said beam.

BACKGROUND OF THE INVENTION

[0002] It is known that modular systems exist, which comprise mixed steel-concrete beams and pillars and which can be used in various fields of application and for the construction of various building works, for example in industry, infrastructures, in the construction of residential or commercial buildings, in the construction of health facilities, car parks or other.

[0003] These systems can be self-supporting and therefore the elements of which they consist are produced in the factory and assembled on site in a completely self-supporting capacity, in this way eliminating the need for temporary formworks and props, thus speeding up construction; in fact, the elements can be loaded from the day following casting, allowing the work steps to overlap, which speeds up the work on the construction site.

[0004] In this context, the construction of a cantilevered structure to be prepared in the work being built, for example a building, provides to connect this cantilevered structure to one of the edge beams of the load-bearing structure of the building.

[0005] However, the connection of a cantilevered structure to a self-supporting beam can entail various disadvantages, for example the fact that the position of the cantilevered structure is difficult to adjust with respect to the beam and therefore with respect to the facade of the building.

[0006] Another disadvantage lies in the lack of versatility of known beams, that is, the fact that normally a specific beam can be combined with a specific cantilevered structure, for example a simple structure of metal structural work or a prefabricated reinforced concrete structure, but it is only with difficulty that these solutions can be adopted with the same beam.

[0007] Furthermore, the beams used are mainly stressed by torsion stresses and their behavior, when subjected to torsion moments, as in the case of attaching cantilevered structures, can be improved.

[0008] Furthermore, in correspondence with the cantilevered structures of a building, heat differences can be created that reduce the durability of some parts of the building, such as finishes, plasters and masonry infills.

[0009] Document US3782057 is also known, which describes a concrete structure to which a slab, configured to cooperate with threaded attachment rods, is attached.

[0010] Finally, document EP3112541 is known which describes an assembly unit for a terrace which comprises a first assembly element suitable to be connected to the external part of a building and a second assembly element attached to the terrace and suitable to be attached to the first assembly element.

[0011] There is therefore a need to perfect a beam for a cantilevered structure which can overcome at least one of the disadvantages of the state of the art.

[0012] In particular, one purpose of the present invention is to provide a beam for a cantilevered structure, in particular a self-supporting beam, which is versatile and can therefore be used for any cantilevered structure, for example a cantilevered structure of metal structural work, concrete or other.

[0013] Another purpose of the present invention is to provide a beam for a cantilevered structure by means of which the position of the cantilevered structure can be adjusted quickly and precisely with respect to the beam.

[0014] Another purpose of the present invention is to provide a beam for a cantilevered structure which supports torsion stresses more effectively and is more stable than known beams.

[0015] Another purpose of the present invention is to provide a beam for a cantilevered structure by means of which it is possible to improve the behavior of the work in which it is used, in particular in relation to the thermal stresses to which this work is subjected, in particular by means of providing effective thermal breaks.

[0016] The Applicant has devised, tested and embodied the present invention to overcome the shortcomings of the state of the art and to obtain these and other purposes and advantages.

SUMMARY OF THE INVENTION

[0017] The present invention is set forth and characterized in the independent claims. The dependent claims describe other characteristics of the present invention or variants to the main inventive idea.

[0018] In accordance with the above purposes, a beam for attaching a cantilevered structure, according to the present invention, comprises at least one elongated body provided on at least one side with a plurality of attachment bars which are configured to be inserted into corresponding holes made on at least one corresponding side of the structure; the bars are provided with adjustment elements mobile along such bars so as to vary at least one distance of attachment of the structure with respect to the beam.

[0019] Advantageously, the present beam for attaching a cantilevered structure, thanks to the presence of bars and adjustment elements, is extremely versatile, and therefore it can be used for any cantilevered structure whatsoever, for example a cantilevered structure made of metal structural work, made of concrete or other. Furthermore, by using the present beam, the position of the

structure attached cantilevered can be adjusted quickly and precisely with respect to the beam.

[0020] According to other aspects of the invention, the bars can be grouped on attachment plates distributed with a regular pitch along the side of the elongated body.

[0021] Each of the plates can comprise two pairs of bars disposed parallel.

[0022] The elongated body can be tubular and configured to be filled with reinforcing material, such as structural concrete or other.

[0023] The beam thus made supports the torsion stresses more effectively and is ultimately more stable than known beams.

[0024] According to one aspect of the invention, the bars are threaded, and the adjustment elements can comprise at least a first nut configured to be positioned, during use, on one side of a side of the cantilevered structure, and a second nut configured to be positioned, during use, on the opposite side of such side of the cantilevered structure.

[0025] The beam can also comprise a series of holes configured for the insertion of reinforcement structures or suchlike, and positioned on one side of the elongated body different from the side where the bars are positioned.

[0026] The holes can be distributed with a regular pitch along such side of the elongated body.

[0027] Furthermore, the beam can comprise at least one end shaped as a tooth or suchlike.

[0028] The present invention also concerns a self-supporting terrace comprising a structure attached cantilevered to a beam as defined above.

[0029] The structure attached cantilevered can be separated from the beam by a distance that defines a hollow space.

DESCRIPTION OF THE DRAWINGS

[0030] These and other aspects, characteristics and advantages of the present invention will become apparent from the following description of some embodiments, given as a non-restrictive example with reference to the attached drawings wherein:

- fig. 1 is a three-dimensional view of a beam according to the present invention;
- fig. 2 is a larger scale view of a part of the present beam connected to a cantilevered structure;
- fig. 3 is a three-dimensional view of the beam according to the present invention positioned between two pillars of a building;
- fig. 4 is a plan view of the beam of fig. 3;
- fig. 5 is a three-dimensional view of a first cantilevered structure connected to a building by means of the present beam;
- fig. 6 is a plan view of the cantilevered structure of fig. 5;
- fig. 7 is a three-dimensional view of another cantilevered structure connected to a building by means of the present beam;
- fig. 8 is a plan view of the cantilevered structure of fig. 7;
- fig. 9 is a plan view of a second embodiment of a beam in accordance with the present invention, associated with a cantilevered structure;
- fig. 10 is a section view of fig. 9.

[0031] To facilitate comprehension, the same reference numbers have been used, where possible, to identify identical common elements in the drawings. It is understood that elements and characteristics of one embodiment can be conveniently combined or incorporated into other embodiments without further clarifications.

DESCRIPTION OF SOME EMBODIMENTS

[0032] We will now refer in detail to the possible embodiments of the invention, of which one or more examples are shown in the attached drawings, by way of a non-limiting example. The phraseology and terminology used here is also for the purposes of providing non-limiting examples.

[0033] With reference to the attached drawings and with particular reference to figs. from 1 to 4 thereof, a beam 10 according to the present invention and configured for the attachment of a cantilevered structure 11 comprises at least one elongated body 12 and attachment means 55 for attaching the structure 11 to the elongated body 12.

[0034] In an embodiment shown schematically in figs. from 1 to 8, the attachment means 55 are disposed on at least one side 13 of the elongated body 12 and they comprise a plurality of attachment bars 14, for example threaded bars, configured to be inserted into corresponding holes 15 made on at least one side 16 of the structure 11. The bars 14 are provided with adjustment elements 18 and 19 which can be screwed or unscrewed along the bars 14 so as to vary at least a distance D of attachment of the structure 11 with respect to the beam 10.

[0035] The bars 14 can be grouped on attachment plates 22 distributed with a regular pitch P1 along the side 13 of the elongated body 12.

[0036] Each of the plates 22 can comprise two pairs of bars 14 disposed parallel. The adjustment elements 18 and 19, see in particular fig. 2, can comprise at least a first nut 18 configured to be positioned, during use, on one side of the side 16 of the structure 11, and a second nut 19 configured to be positioned, during use, on the opposite side of the side 16 of the structure 11. By varying the position of the nuts 18 and 19 along the threaded bar 14, it is possible to vary the position of the side 16 positioned between them.

[0037] Alternatively, in another embodiment, shown schematically in figs. 9 and 10, the attachment means 55 comprise an attachment member 56 able to be removably associated with the outside of the elongated

body 12 and configured to be attached, in turn, to the structure 11.

[0038] In the example provided here, the attachment member 56 comprises a bracket 57 in the shape of an inverted U configured to be disposed straddling the elongated body 12.

[0039] The bracket 57 comprises an upper side 59 and two parallel lateral sides 60, 61 which develop from the upper side 59. The structure 11 is connected to one of the two lateral sides 60, 61 by means of attachment elements (not shown) of a known type and which will not be described in detail.

[0040] Purely by way of example, the attachment elements can comprise screws, bolts, threaded bars, interlocking portions, or welded connections.

[0041] Furthermore, the distal ends of the two lateral sides 60, 61 are connected to each other, beneath the elongated body 12, by a connection element 62 suitable to keep the bracket 57 adhering to the elongated body 12.

[0042] The elongated body 12 can be tubular and configured to be filled with reinforcing material M, such as structural concrete or other. The shape of the elongated tubular body 12 can be any shape whatsoever, it can have for example a square or rectangular section, as shown by way of example, or also a different polygonal section or even a circular or elliptical section.

[0043] The choice of a closed tubular section, notoriously more suitable for the circulation of tensions caused by a torsion moment, and the filling of this section with structural concrete in order to stabilize its statics more, are two aspects that combined together allow to resolve a static problem that otherwise would have had to be resolved by reinforcing part of the internal deck of the building facing the structure 11, making the structure heavier.

[0044] As an additional safeguard against the torsional resistance of the beam 10, especially as regards the step that precedes the final concrete casting, the end of the beam 10 can be shaped with a toothed shape that resembles a rack, or suchlike, which fixes to a similar profile that is integrally welded to a pillar that supports the beam itself. By combining this solution with a bolted end joint that prevents its translation on the surface of the deck, the self-supporting capacity of the beam 10 can be guaranteed even in the assembly steps of the cantilevered structure.

[0045] The beam 10 can also comprise a series of holes 20, made on the elongated body 12, configured for the insertion of reinforcement structures or suchlike and positioned on one side 21 of the elongated body 12.

[0046] In the embodiment in which the attachment means 55 comprise the bars 14, the holes 20 are made on a side of the elongated body 12 which is different from the side 13 where the bars 14 are positioned.

[0047] The holes 20 can be distributed with a regular pitch P2 along the side 13 of the elongated body 12. The pitch P2 can be the same as the pitch P1.

[0048] Figs. 5 to 8 show two examples of structures 11 and 17, each comprising a projecting part 34 which can be attached to the present beam 10. The beam 10, as can be observed, can be positioned at the ends on supports 23 which are associated with a pair of pillars 24, also visible in figs. 3 and 4.

[0049] The pillars 24 can be parts of a building 25 that comprises other beams 26, for example steel beams or mixed steel-concrete beams.

[0050] The structure 11 or 17 can comprise a hollow space 27 with an adjustable extension made between the beam 10 and the side 16 of the projecting part 34 which is attached to the beam 10.

[0051] By means of the hollow space 27 it is possible to substantially make a thermal break with an adjustable thickness, thus improving the thermal behavior of the building 25. In the hollow space 27 there can be interposed layers of insulating material, possibly shaped around the point connections.

[0052] The structure 11, see figs. 5 and 6, can comprise a lower panel, a covering 28 and an upper fretted panel 29.

[0053] The structure 17, see figs. 7 and 8, can comprise a lower panel, a covering 30 and an upper fretted sheet 31.

[0054] The use of the bars 14 and of the adjustment elements 18 and 19 allows for a great versatility of application of the present beam 10; in fact, it is possible to make the structure 11 or 17 either with simple metal structural work or with more traditional prefabricated solutions in reinforced concrete and terracotta coated intrados, such as "predalles" type slabs or suchlike.

[0055] The pairing and attachment of the cantilevered structure 11 or 17 therefore occurs in correspondence with the bars 14, which are preferably located at a regular pitch PI, and their disposition is designed to allow the alignment and adjustment of the terrace both in a direction X and also in a direction Y, see for example fig. 5, with respect to the facade of building 25.

[0056] In the current state of the art this represents a major innovation since, in the assembly of industrialized structures such as the modular systems in question, the manufacturing and assembly tolerances may not guarantee an aesthetic result that meets expectations - even if this deviation is statically admissible under the product standards - regarding finishing work such as window/door frames and terraces, therefore requiring posthumous interventions to mask the defects detected. Therefore, the use of the present beam 10 also allows to be able to adjust and correct any alignment and finishing defects as the structure is gradually built.

[0057] The beam 10 can be made of steel or mixed steel-concrete and, unlike the solutions available on the market, offers the possibility of being designed with a desired number of bars 14 along its length, so as to substantially have no limits in capacity load.

[0058] The present invention also concerns a method for attaching a structure 11, 17 cantilevered to a beam 10.

[0059] The method provides a step of filling the elon-

gated body 12, in which the latter is filled with reinforcing material M.

[0060] Furthermore, the method also provides an attachment step, in which the structure 11, 17 is attached to the elongated body 12 by means of the attachment means 55.

[0061] In the embodiment in which the elongated body 12 is provided with bars 14, the attachment step provides to attach the latter to the structure 11, 17.

[0062] Alternatively, in the embodiment in which the attachment means 55 comprise the attachment member 56, the attachment step provides both to attach the latter to the structure 11, 17 and also to associate the attachment member 56 with the elongated body 12.

[0063] It is clear that modifications and/or additions of parts may be made to the beam 10 for a cantilevered structure as described heretofore, without departing from the field and scope of the present invention as defined by the claims.

[0064] In the following claims, the sole purpose of the references in brackets is to facilitate reading and they must not be considered as restrictive factors with regard to the field of protection claimed in the specific claims.

Claims

1. Beam (10) for attaching a cantilevered structure (11, 17), in particular for building self-supporting terraces for buildings, **characterized in that** it comprises at least one tubular elongated body (12) configured to be filled with reinforcing material (M), such as structural concrete or other, and attachment means (55) configured to attach said structure (11, 17) to said elongated body (12).

2. Beam (10) as in claim 1, **characterized in that** said attachment means (55) comprise a plurality of attachment bars (14) associated with at least one side (13) of said tubular body (12) and configured to be inserted into corresponding holes (15) made on at least one side (16) of the structure (11, 17), said bars (14) being provided with adjustment elements (18, 19) mobile along said bars (14) so as to vary at least one distance (D) of attachment of said structure (11, 17) with respect to said beam (10).

3. Beam (10) as in claim 2, **characterized in that** said bars (14) are grouped on attachment plates (22) distributed with a regular pitch (P1) along said side (13) of said elongated body (12).

4. Beam (10) as in claim 3, **characterized in that** each of said plates (22) comprises two pairs of bars (14) disposed parallel.

5. Beam (10) as in claim 2 or 3, **characterized in that** said bars (14) are threaded and said adjustment elements (18, 19) comprise at least a first nut (18) configured to be positioned, during use, on one side of said side (16) of the structure (11, 17), and a second nut (19) configured to be positioned, during use, on the opposite side of said side (16) of the structure (11, 17).

6. Beam (10) as in claim 1, **characterized in that** said attachment means (55) comprise at least one attachment member (56) able to be removably associated with said elongated body (12) and configured to be attached to said structure (11, 17).

7. Beam (10) as in claim 5, **characterized in that** said attachment member (56) comprises a bracket (57) in the shape of an inverted U, configured to be positioned straddling said elongated body (12).

8. Beam (10) as in any claim hereinbefore, **characterized in that** said elongated body (12) comprises one or more holes (20) configured to allow the insertion of reinforcement structures or suchlike.

9. Beam (10) as in claim 8, **characterized in that** said holes (20) are positioned on a side (21) of the elongated body (12) different from the side (13) where said bars (14) are positioned.

10. Beam (10) as in claim 9, **characterized in that** said holes (20) are distributed with a regular pitch (P2) along said side (21) of said elongated body (12).

11. Beam (10) as in any claim hereinbefore, **characterized in that** it comprises at least one end shaped as a tooth or suchlike.

12. Self-supporting terrace comprising a beam (10) in accordance with the previous claims and a structure (11, 17) attached cantilevered to said beam (10) by said attachment means (55).

13. Self-supporting terrace as in claim 12, **characterized in that** said structure (11, 17) is separated from said beam (10) by a distance (D) that defines a hollow space (27).

14. Method for attaching a structure (11) cantilevered to a beam (10), comprising at least one elongated tubular body (12) configured to be filled with reinforcing material, such as structural concrete or other, and attachment means (55) configured to attach said structure (11, 17) to said elongated body (12), wherein said method comprises the following steps:

    - filling said elongated body (12) with said reinforcing material (M);
    - attaching said structure (11, 17) to said elongated body (12) by means of said attachment

means (55).

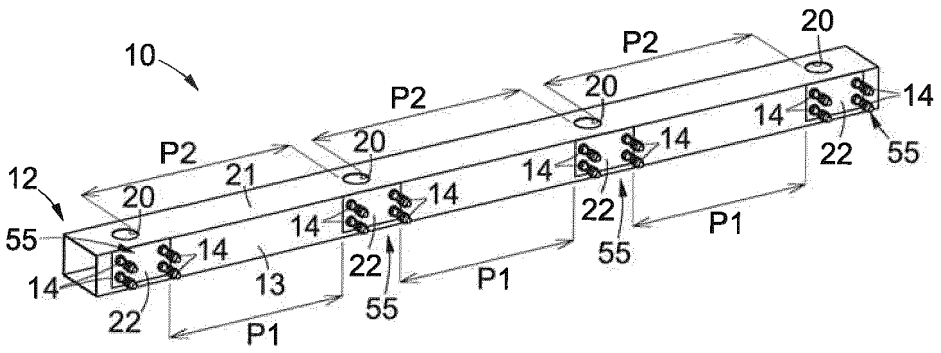

fig. 1

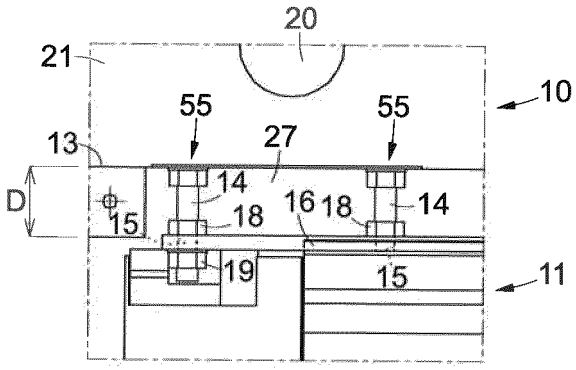

fig. 2

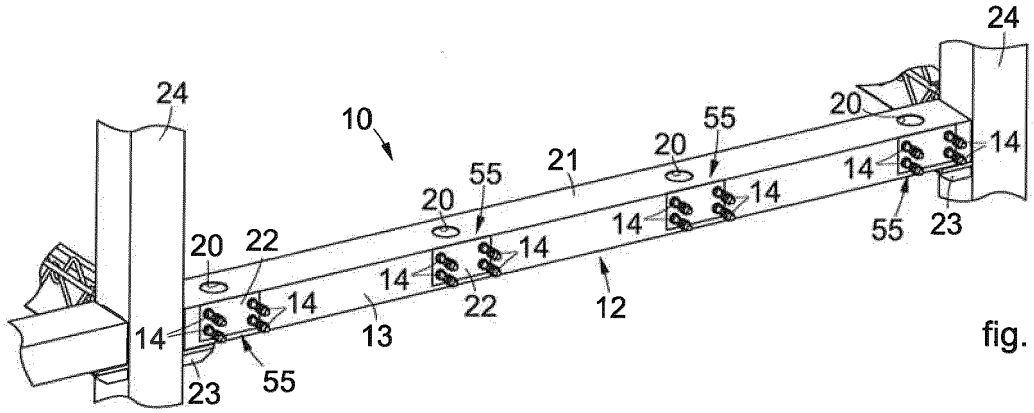

fig. 3

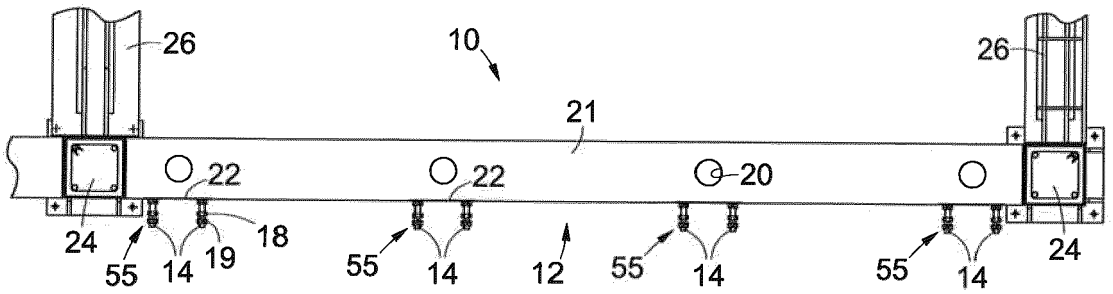

fig. 4

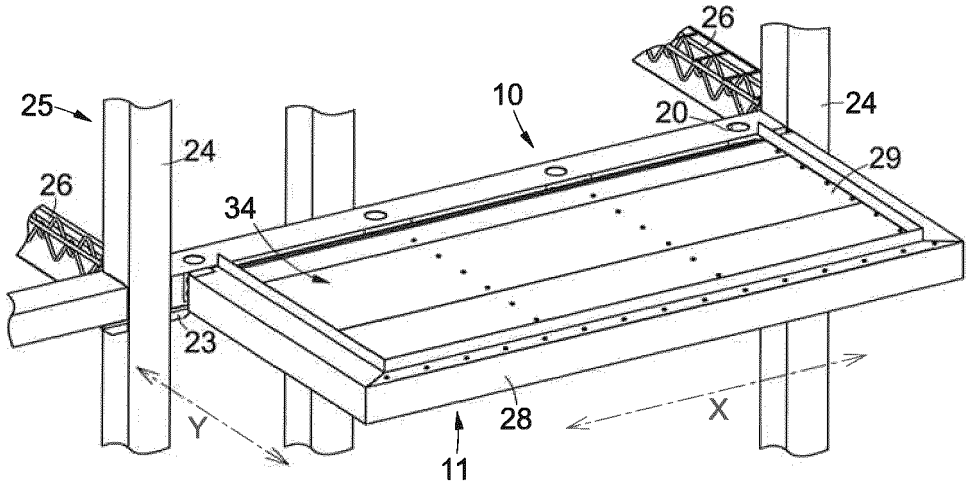
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fig. 5

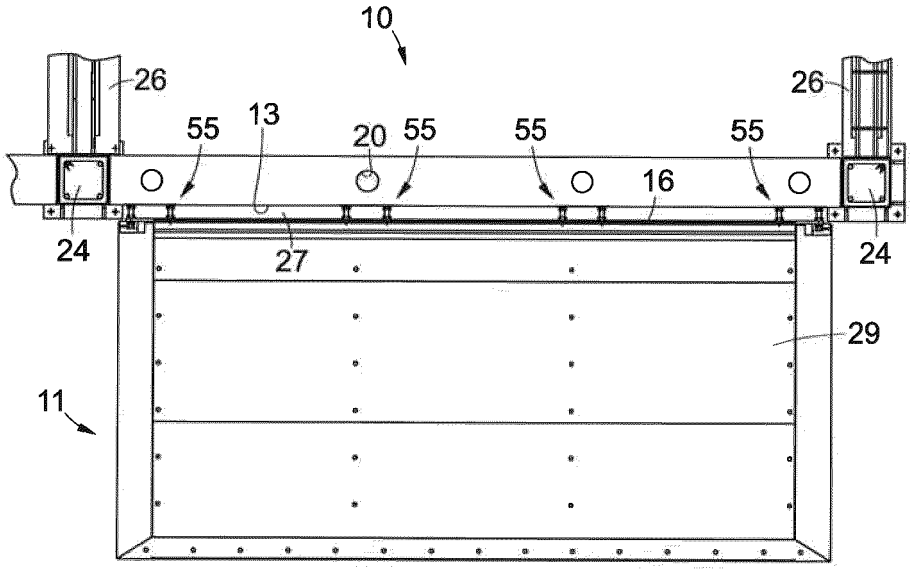
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fig. 6

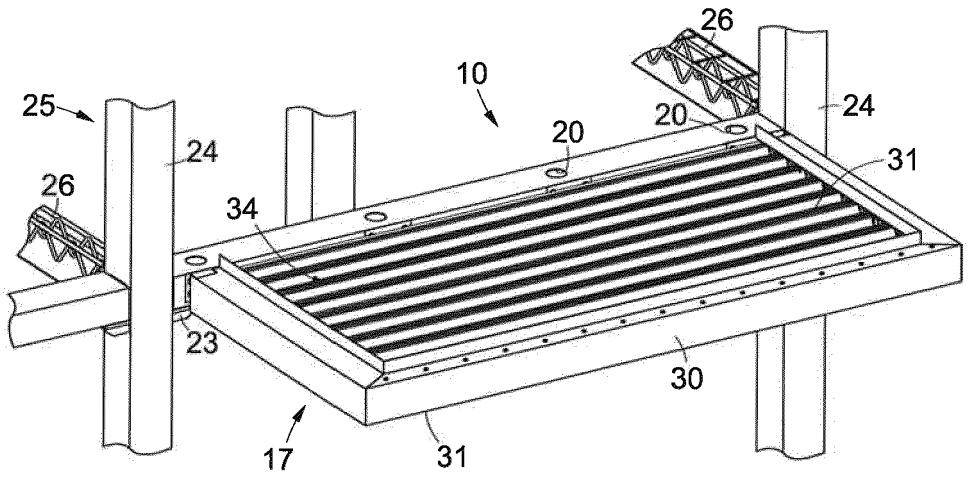
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fig. 7

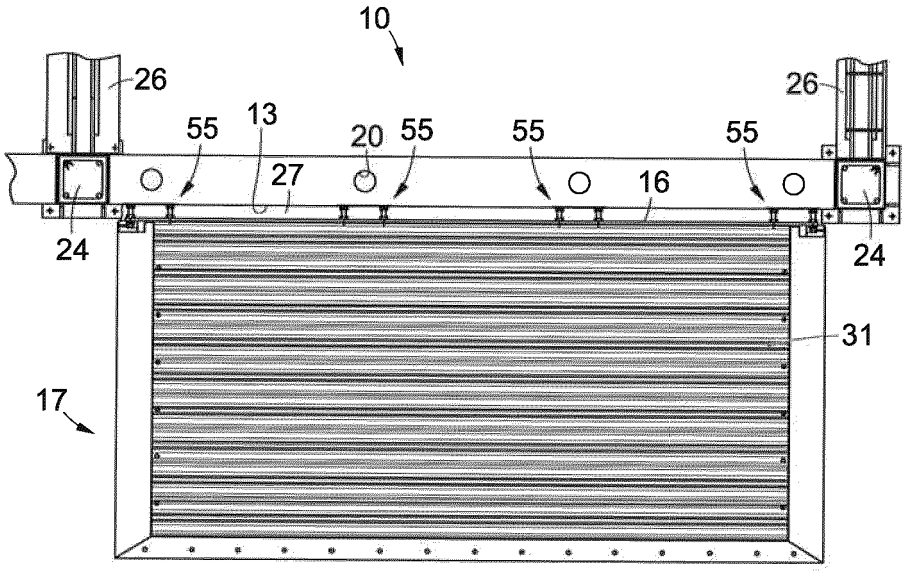
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fig. 8

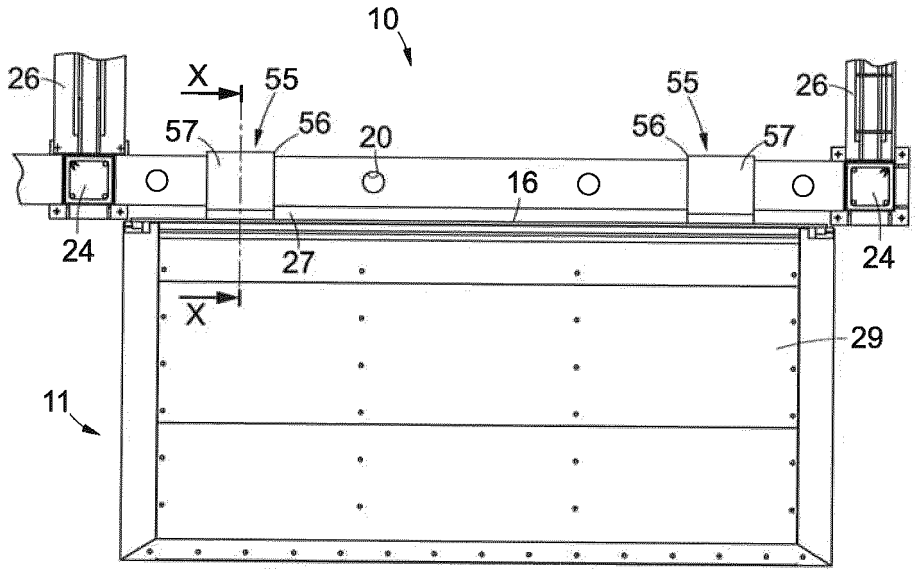
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fig. 9

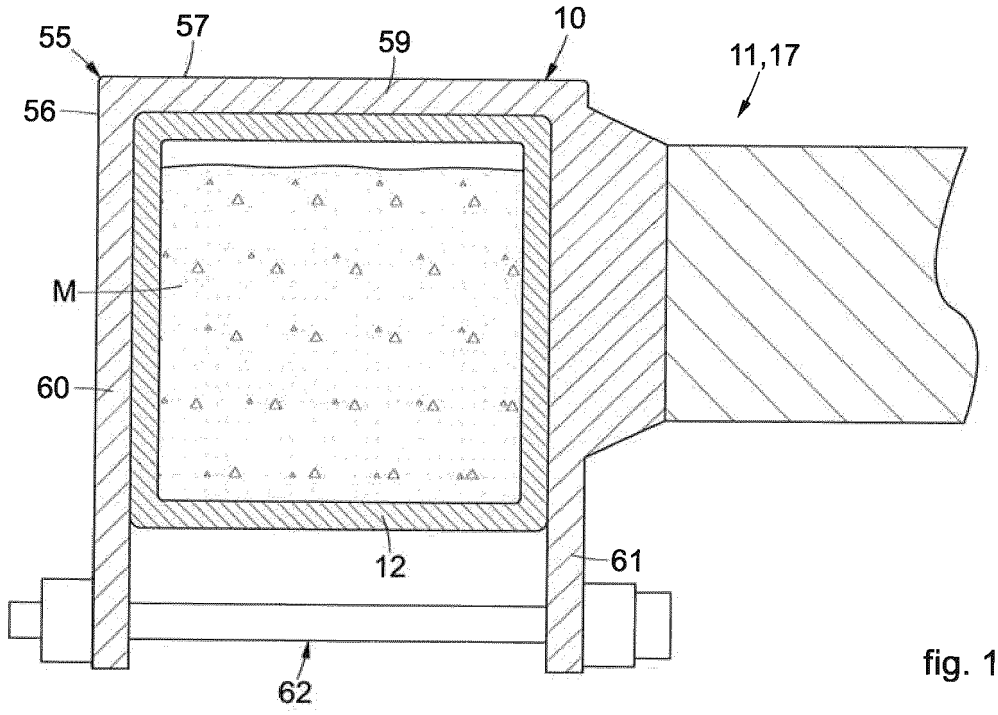
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fig. 10

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EUROPEAN SEARCH REPORT

Application Number
EP 22 17 2825

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 3 112 541 A1 (H J J EVERS BEHEER B V [NL]) 4 January 2017 (2017-01-04) * abstract; figures 1-2C * -----	1-14	INV. E04B1/00 ADD. E04B1/24
X A	KR 2015 0130817 A (CHANGEI ARCHITECTURE R&D [KR]) 24 November 2015 (2015-11-24) * abstract; figures 1-7 * -----	1,2,5,6, 8-11,14 3,4,7, 12,13	

TECHNICAL FIELDS SEARCHED (IPC)

E04B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 October 2022	Couprie, Brice

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 22 17 2825

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03-10-2022

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3112541 A1	04-01-2017	NONE	
KR 20150130817 A	24-11-2015	NONE	

EPO FORM P0459

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

REFERENCES CITED IN THE DESCRIPTION

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