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(54) Hangar

(57) A hangar, comprising: a bearing structure (2) having a plurality of arcades (5, 105) composed by one or more structural elements (6, 106) firmly associated to each other; one or more covering elements (3) associated to one or more of the structural elements (6, 106) and among which first covering elements (4, 104) are of rigid type; anchoring means (26) for anchoring the first rigid covering elements (4, 104) to the structural elements (6, 106). The anchoring means (26) comprise a hooking element (27, 127) wherein: the base portion (28, 128) is associated to the portion (29, 129), which faces the base portion, of the structural element (6, 106); the head portion (30, 130) comprises a box-like body (32) having one or more longitudinal grooves (33) for slidingly housing a longitudinal rib (23) present at the ends of the covering elements (3); an intermediate portion interposed between the head portion (30, 130) and the base portion (28, 128) defining a channel (31, 131) for the sliding insertion of side end areas of first rigid covering elements (4, 104).

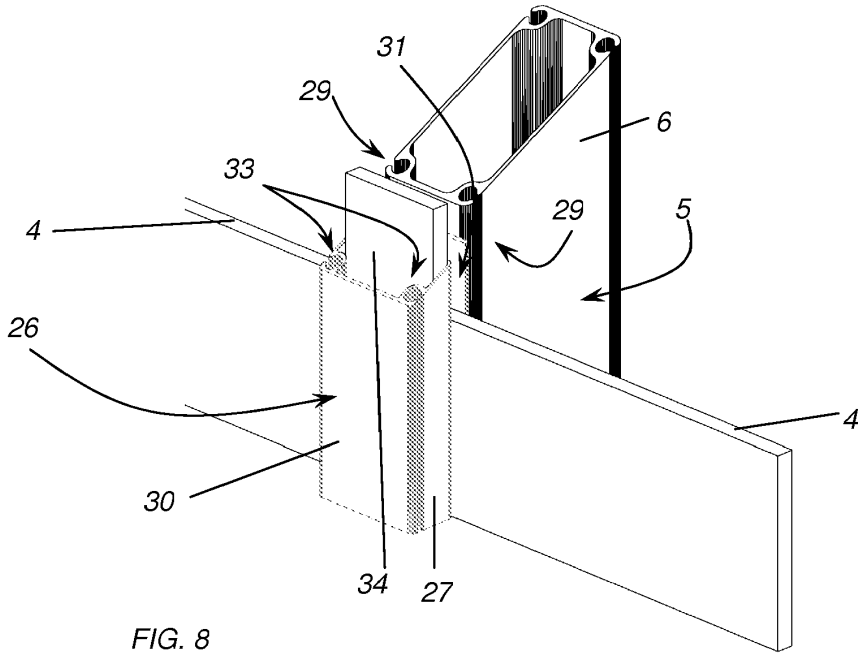


FIG. 8

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Description

Field of the invention

[0001] The present invention relates to the field of the hangar of civil and military aircraft and is therefore destined to airports, landing-strips, calls, air stations and maintenance or hangar areas for aircrafts.

[0002] More in detail, the present invention relates to a hangar particularly suitable to be employed for sheltering the above aircrafts.

Background of the invention

[0003] It is known that in airports or in landing-strips and more in general in air stations covered areas for the hangar and maintenance of aircrafts are present.

[0004] These covered areas, also called hangars, are generally fix structures having an inner space sufficient to house also big size aircrafts and provided with at least one main access opening, also particularly wide to allow the passage of the aircraft. Hangars are moreover provided with accessory areas destined to be used as office, archive, warehouse, laboratory, decontamination areas, etc.

[0005] All these areas have an access point from the inside of the main area, where airplanes and aircraft are sheltered, and often an access point from the outside of the hangar, too.

[0006] It is also known that there is often the need to manufacture transportable and removable hangars, or hangars. This happens in the case of civil airports of small sizes, perhaps made on difficult ground for building, or for the manufacturing of temporary heliports or airports, as often happens in case of military missions.

[0007] In this sense prefabricated and transportable hangars are known, having a bearing structure manufactured with structurals which can be assembled in place and to which the covering which obviously concerns the roof as well as the side walls is anchored. An example is described in the document GB 564,266 A.

[0008] It is however evident that such a hangar has to be modular, consisting of a small number of elements and designed t be assembled and possibly disassembled in very short times. The transport has to be easy to be carried out therefore the elements which make up the hangar must have small dimensions. The has to be quick and easy, too.

[0009] In this sense the embodiment described in the Italian patent IT1353435 in the name of the same applicant of the same application is known. In particular, a hangar structure comprising a plurality of modular arcades is presented in it. They consist of tubular elements typically with rectangular section and appropriate sizes, shake in the four angles so that the reinforced sides of the covering may be inserted, and easily make slide. Each section is built connecting more structural elements and all elements are modular and interchangeable with each other.

[0010] The covering is also modular and typically manufactured in fabric.

[0011] The structure rests on a series of feet formed by plates connectable to the ground and which allow to assemble the arcade on the ground, anchor it to the ground and lift it easily.

[0012] It is therefore evident that a so made hangar is easy to assemble and disassemble and to transport. However it has some drawbacks, too.

[0013] For example, there may be the need to employ, for the whole modular covering or only for some portions, rigid elements. A case of this type is the need, for military purpose, to use ballistic elements at least for some modules of the covering such as, for example, for the perimeter for safety reasons. The conformation of the pillars with the grooves to slidingly anchor the edges of the covering elements is particularly comfortable in case these elements are flexible, that is manufactured in fabric. In case of rigid elements, this conformation results uncomfortable and not employable. This obliges, upon the assembly, to drill and screw to each other the rigid panels and the arcades, complicating the assembling and disassembling of the hangar. This leads to higher manufacturing costs, longer assembling time and less stability of the rigid panels.

[0014] Moreover, following the disassembling, the replacement of the hangar might be not easy to carry out, because the drilling of beams and covering elements might be not uniform.

[0015] Also the document EP 0 155 202 is known, wherein a hooking element provided with suitable sliding channels-grooves for rigid coverings is described. However the same hooking element does not allow the use of flexible covering elements (for example camouflaged sheets) placed above the rigid ones. These flexible elements, as said, typically have side ribs suitable to insert themselves by sliding into fitting grooves made on the edges of the elements composing the arcades.

[0016] Moreover, this hooking element represents a point of ballistic fragility, making the multipurpose structure unsafe especially in case of military uses.

Summary of the invention

[0017] A main object of this invention is to overcome, at least in part, to the above drawbacks, by providing a hangar, especially for aircrafts, easier to assemble and to disassemble than the prior art equivalent coverings.

[0018] Moreover, the covering has to allow assembling and disassembling times lower than the prior art equivalent coverings.

[0019] Possible replacements must be easy and quick to carry out, too.

[0020] The proposed covering has the purpose to easily allow the overlapped use of rigid elements (for example ballistic) and flexible elements (for example camouflaged sheets), yet ensuring structural and ballistic seal

in the junction between the covering elements.

[0021] These and other object, as better explained hereafter, are fulfilled by a hangar, especially for aircrafts, according to the following claims which are integrant part of the present description.

[0022] In particular, the hangar may comprise a bearing structure composed by a plurality of arcades placed parallel with each other and comprising one or more structural structural elements firmly associated with each other.

[0023] Moreover, the covering may comprise one or more plates anchorable to the ground and associable to the ends of the arcades for the anchoring thereof to the ground.

[0024] According to another aspect of the invention, also one or more covering elements may be present, at least one of which of rigid type, associable to one or more of the structural elements for covering the space inside the hangar. Anchoring means for anchoring the first rigid covering element to one or more of the structural elements of the arcades may be present, too.

[0025] According to another aspect the anchoring means may comprise at least one hooking element having a shaped body wherein the following parts can be located:

- a base portion removably associated to the portion of the structural element facing the base portion;
- a head portion comprising a box-like body having one or more longitudinal grooves developing along the longitudinal development axis of the box-like body in correspondence of one or more edges thereof to slidingly house at least one longitudinal rib present at the ends of the covering elements;
- an intermediate portion interposed between the head portion and the base portion and defining at least one channel for the sliding insertion of side end areas of the rigid covering elements.

[0026] In other words, the hangar may include a hooking element so shaped that possible first rigid covering elements may be slidingly assembled in fitting channels without need of any drilling and without having t use screws, bolts or the like. Moreover also flexible covering elements, such as sheets, may be used on the rigid covering elements.

[0027] This has advantageous repercussions also in the disassembling or maintenance steps, when the removal of each single first covering element may take place easily and quickly slipping it out of the channels and grooves where it is inserted.

[0028] The so structured hooking element has further advantages. The box-like body of the head portion constitutes a closed chamber which allows not only to create thermal insulations of the structure also in the junction points between the covering elements, but also to ensure ballistic safety in the same points. The box-like body can be further filled with materials suitable to increase the seal in the above cases.

Brief description of the drawings

[0029] Further features and advantages of the invention will appear more evident upon reading the detailed description of a preferred, non-exclusive embodiment of a hangar according to the invention, which is described as non limiting example with the help of the annexed drawings, in which:

FIG. 1 represents a hangar according to the invention in an axonometric view;
FIGS. 2 to 9 represent details of the hangar of FIG. 1;
FIGS. 10 to 12 represent an executive variation of details of a covering according to the invention.

Detailed description of some preferred embodiments

[0030] Referring to the above figures, and particularly to figs. 1 to 3, a hangar is described, especially for aircraft A, comprising a bearing structure 2 and one or more covering elements 3, at least a first 4 thereof of rigid type, associable to the bearing structure 2 to cover the space inside the hangar 1.

[0031] Appropriately the bearing structure is composed by a plurality of arcades 5 placed parallel to each other and each one divided in one or more structural elements 6 constituted by section bars firmly associated with each other. As it is necessary to ensure easy assembling and transport, the structural elements 6 necessary to the manufacturing of an arcade 5 are typically few and nevertheless of not excessive length. An example in this sense consists of a hangar 1 for military helicopters of big dimensions wherein the diameter of the blades may be even twenty meters. In this case the arcades 5 are particularly wide, but the structural elements 6 have nevertheless a length limited for example at 6 meters in order to ensure also the airfreight.

[0032] Typically a single arcade 5 has a single span and two or more slopes, so as to make the inner surface 7 of the hangar 1 completely useable. Each arcade 5 is made connecting with each other more curved and straight structural elements 6 for example by means of bolts.

[0033] In order to ensure stability and seal to the hangar 1 in transversal sense to the arcades 5, a plurality of purlins 8 are present, placed perpendicularly to the arcades 5. The purlins 8 are typically manufactured in tubular structurals placed between the arcades.

[0034] According to another aspect of the invention, also steel ropes 9 are present, whose unction is to contribute to the structural stability of the hangar 1 and which are typically, but not necessarily, manufactured with galvanized steel wires divided into strands, with the steel core and covered in PVC. The ropes 9 are placed between the arcades 5.

[0035] For the functionality of the hangar 1, inside it also a lifting group G is present for the moving of loads typically comprising one or more tackles P connected, by means of brackets, to the bearing structure 2. Appropriately the presence of a pair of sliding tracks B is provided for moving the tackles P.

[0036] According to a further aspect of the invention, the hangar 1 comprises one or more plates 10 anchorable to the ground and associable to the ends of the arcades 5.

[0037] In particular, the plates 10, which anchor the arcades 5 to the ground, have, as visible also in fig. 4, one or more holes for the connection to the ground by means of nails 11, pickets or the like. According to different not represented embodiments, the plates may include more rows of holes to allow the anchoring to surfaces different from those previously mentioned.

[0038] In the central part of the plates 10 two drilled vertical brackets 12 project, to which the ends of the arcades 5 are anchored. More in detail, the end of the arcade 5 has two passing through holes 13 suitable to dispose themselves in correspondence of corresponding holes 14 made on the vertical brackets. 12. The lowest of these passing through holes 13, and the lowest of the corresponding holes 14 are crossed by a pivot 15 by means of which the end of the arcade 5 is rotatably anchored to the plate 10. This allows to assemble the arcade 5 to the ground and to associate it to the plates 10, on their turn anchored to the ground. Later, as visible in the sequence of figs. 5 and 6, the arcade 5 is lifted being free to rotate on the pivot 15. When the upper passing through hole 13 is aligned to the corresponding holes 14, fixing elements 15a are placed in them, consisting for example in bolts and nuts, so as to block the rotation of the arcade 5 which is therefore firmly in its operating position.

[0039] According to another aspect of the invention, the hangar 1 comprises, as said, also one or more covering elements 3 associable to the arcades 5. In particular, in order to render the hangar 1 of the invention modular, the covering elements 3 consist of modules of dimensions compatible to the interaxis between the arcades 5 ad associable to the structural elements 6 of the arcades 5 so that each of them covers only one portion of the hangar 1.

[0040] In this way, some parts may be left without covering elements 3 or covering elements 3 of different manufacturing may be used. For example flexible covering elements 3 typically manufactured in fabric or with PVC membranes, or polyester fabric spread on both sides with synthetic resins are generally used. The used membrane may be finished with a dimming treatment which can stop the sun rays and efficiently shade to avoid an excessive overheating of the room below. This kind of treatment further allows not to let the light of the lighting installation filter towards outside, during night works, for safety reasons for the operators above all in case of military use.

[0041] The covering may be constantly stretched by using adjustable stretching systems.

[0042] According to an aspect of the invention, the structural elements 6 generally consist, as visible in fig. 7, by a box-like body 20 having one or more grooves 21 developing along the longitudinal development axis of the box-like body 20 in correspondence of the edges 22 thereof. These grooves 21 provide to slidingly house and hold at least one longitudinal rib 23 present at the ends of covering elements 3. In other words the grooves 21 with the ribs 23 make the association between the covering elements 3 and the arcades 5.

[0043] It is evident that the proposed solution allows a quick assembling and disassembling of the covering elements 3 from the arcades 5.

[0044] As visible in the figure, all of the 4 edges 22 of the box-like body have grooves 21. This allows to manufacture false ceilings, that is to place outer and inner covering elements 3, creating an interspace which promotes the best running of the inner temperature, the smallest formation of humidity on the inner covering elements 3, the best running of the hangar 1 in case of atmospheric events such as strong rain or snow.

[0045] Covering elements 3 of rigid type are employable. In other words, for manufacturing the total or partial covering first rigid covering elements 4 can be used. In this case, however, it is evident that it is difficult to use the grooves 21 to associate the covering elements 4 to the arcades 5. Therefore anchoring means 26 of the first covering element 4 to the structural elements of the arcades 5 are present, as observable in fig. 8.

[0046] According to an aspect of the invention, the anchoring means 26 comprise, as observable also in the detail of fig. 9, a hooking element 27 having shaped body.

[0047] In particular, this shaped body comprises a base portion 28 removably associated to the portion 29, facing the base portion, of the relative structural element 6. It further comprises a head portion 30 so shaped as to form an intermediate portion interposed between the head portion 30 and the base portion 28 which defines a pair of channels 31 for the sliding insertion of side end areas of first rigid covering elements 4. In this way also the use of the first rigid covering elements 4 is simplified upon the assembling as well as upon the disassembling.

[0048] Also the maintenance is of course simplified: in case of damages to one or more first rigid covering elements 4 it is sufficient to slip them to replace them. A similar likelihood is clearly more probable in the case o military use where the first rigid covering element 4 is typically constituted by a ballistic panel the integrity of which is fundamental for the safety of objects and persons in the hangar 1.

[0049] It can be further observed that employing modular covering elements 3 the use of covering sheets is made independent from the ballistic protection or from rigid panels in general allowing to choose this last ones only in localized areas without having to protect a whole span.

[0050] According to another aspect of the invention the head portion 30 of the hooking element 27 consists of a

box-like body 32 having two longitudinal grooves 33 developing along the longitudinal development axis of the box-like body 32 in correspondence of the two upper edges. This allows to prearrange further covering elements 3 outside of the first rigid covering elements 4. Their clutch is particularly simplified by the fact that the grooves 33 are distinct and detached from each other so that the clutch of a covering element 3 is not hindered by the other clutch. Of course the presence of two grooves mustn't be considered as limiting for different embodiments of the invention for which the grooves are more than two.

[0051] The covering elements 3 outside of the rigid elements 4 are typically flexible. For example they may consist of camouflaged sheets which can "hide" the hangar 1 in a more convenient way than the camouflaged painting of the rigid covering elements 4. Moreover, they form a further false ceiling.

[0052] From the figures it can also be observed that the box-like body 32 constitutes an additional safety element for the hangar 1. The junction points between the covering elements 3 are particularly fragile points for the covering 1, above all in case of rigid elements 4 of ballistic type. The fragility of the junction point, furthermore, concerns the structural seal not only in respect to disruptive or traumatic events, but also against atmospheric events such as precipitations, temperature variations or the like. For example, the hooking element described in EP 0 155 202 has openings on inner compartments which in case of precipitations would see the precipitations accumulate within the hooking element with all the negative consequences this fact may have at a structural level as well as at the level of deterioration of the materials with particular reference to the flexible coverings.

[0053] The box-like body 32, on the contrary, with its extension constitutes a lung to protect the junction against traumatic and atmospheric events with particular reference to the thermal insulation. The box-like body 32, moreover, being closed does not allow accumulations of precipitations in it.

[0054] According to another aspect of the invention, the box-like body 32 houses in it rigid fillings 34 also of the ballistic type in order to improve the seal of the bearing structure 2 of the hangar 1 towards traumatic events. Other fillings which may be used as an alternative or in combination may also increase the thermal or acoustic insulation or other types of insulation of the hangar 1.

[0055] According to an executive variant visible in figs. 10 to 12, to increase the seal of the hooking element 127 on the arcade 105, the hooking element 127 has, in correspondence of its base portion 128, a laminar body 135 having substantially U shaped profile to embrace the faced portion 129 of the corresponding structural element 106.

[0056] The laminar body 135 has another utility, too. It often happens that one or more beams 136 transversally placed between the arcades 105 are present. In this case the ends of these beams 136 are directly associated to the side walls of the laminar body 135. To the beams 136 it is also possible to associate hooking elements 127 so that the head portion 130 thereof forms, with the faced portion of the beam 136, the channel 131 for the sliding insertion of the first rigid covering element 104.

[0057] As known, the hangars 1 often have, as observable in fig. 3, side service areas 40 in respect to the main area 41 where aircrafts A are generally placed. These service areas 40 are generally dedicated to be used as office, archive, warehouse, laboratory, decontamination areas, etc. They are manufactured by means of one or more semi-arcades 42 to which further covering elements 3 are associable. In this case, the semi-arcades may be provided with the above anchoring means 26 so as to be able to use also for parts thereof first rigid covering elements 4.

[0058] The side service areas 40 may be furthermore provided with accessories as lighting elements, shower diffusers, hooks for the suspension of objects, hoods, all necessary to the type of service they have to house. In this case the accessories are firmly associable to the semi-arcades 42, or to the arcades 5, by means of fitting brackets with all-purpose connection so that the bracket is useable for any of the accessories. Also in this case, therefore, the assembling and disassembling speed of the hangar 1 is improved.

[0059] The above description clearly shows that the hangar of the invention overcomes the drawbacks of the prior art being its assembling and disassembling easier in respect to the equivalent known coverings.

[0060] Moreover, the covering allows lower assembling and disassembling times than the equivalent known coverings. Possible replacements are quick and easy to carry out, too.

[0061] The hangar of the invention is susceptible of a number of changes and variants, within the inventive concept disclosed in the appended claims. All the details thereof may be replaced by other technically equivalent parts, and the materials may vary depending on different needs, without departing from the scope of the invention, as defined by the claims.

[0062] While the hangar has been described with particular reference to the accompanying figures, the numerals referred to in the disclosure and claims are only used for the sake of a better intelligibility of the invention and shall not be intended to limit the claimed scope in any manner.

Claims

1. Hangar, especially for aircrafts (A), comprising:

- a bearing structure (2) composed by a plurality of arcades (5; 105) placed parallel to each other;
- one or more structural elements (6; 106) firmly associated to each other to form said arcades (5; 105);
- one or more plates (10) anchored to the ground

to which said ends of said arcades (5; 105) are associated;
- one or more covering elements (3), at least one (4; 104) of which of rigid type, associated to one or more of said structural elements (6; 106) to cover the space inside (7) of said hangar (1);
- anchoring means (26) for anchoring said at least one first rigid covering element (4; 104) to one or more said structural elements (6; 106) of said arcades (5; 105),
characterized in that said anchoring means (26) comprise a least one hooking element (27; 127) having a shaped body wherein the following parts can be located:
- a base portion (28; 128) removably associated to the portion (29; 129) of said structural element (6; 106) facing said base portion (28; 128);
- a head portion (30; 130) comprising a box-like body (32) having one or more longitudinal grooves (33) developing along the longitudinal development axis of said box-like body (32) in correspondence of one or more edges of the box-like body (32) to slidingly house at least one longitudinal rib (23) present at the ends of said covering elements (3);
- an intermediate portion interposed between said head portion (30; 130) and said base portion (28; 128) and defining at least one channel (31; 131) for the sliding insertion of side end areas at least of said first rigid covering element (4; 104);

2. Hangar according to claim 1, **characterized in that** said base portion (28; 128) of said hooking element (27; 127) has a laminar body (35; 135) having substantially U shaped profile to embrace said faced portion (29; 129) of said structural element (6; 106).

3. Hangar according to claim 1 o 2, **characterized by** comprising one or more beams (136) placed transversally between said arcades (105).

4. Hangar according to claim 3, **characterized in that** one or more of said hooking elements (127) are associated to one or more beams (136), said head portion (129) of said hooking element (127) forming, with the faced portion (129) of said beam (136), said channel (131) for the sliding insertion of said side end areas at least of said first rigid covering element (104).

5. Hangar according to one or more of the preceding claims, **characterized in that** said structural elements (6; 106) of said arcades (5; 105) comprise a box-like body (20) having one or more grooves (21) developing along the longitudinal development axis of said box-like body (20) in correspondence of one or more edges (22) of said box-like body (20) for slidingly housing at least one longitudinal rib (23) present at the ends of said covering elements (3).

6. Hangar according to one or more of the preceding claims, **characterized by** including at least one main central area (41) and one or more side service areas (40) detachable from said main area (41) by means of one or more covering elements (3).

7. Hangar according to claim 6, **characterized by** comprising one or more semi-arcades (42) to which said anchoring means (26) of said at least one first rigid covering elements (4; 104) are associable and a first end of which is firmly associated to a side portion of one of said arcades (5; 105), the second end being associated to one of said plates (10).

8. Hangar according to claim 7, **characterized by** comprising supporting brackets of accessories firmly associable to said structural elements (6; 106) of said arcades (5; 105) or to said semi-arcades (42).

9. Hangar according to claim 8, **characterized in that** said accessories comprise lighting elements, shower diffusers, hooks for the suspension of objects, hoods.

10. Hangar according to one or more of the preceding claims, **characterized in that** said grooves (33) are two and are placed in correspondence with the upper edges of said box-like body (32).

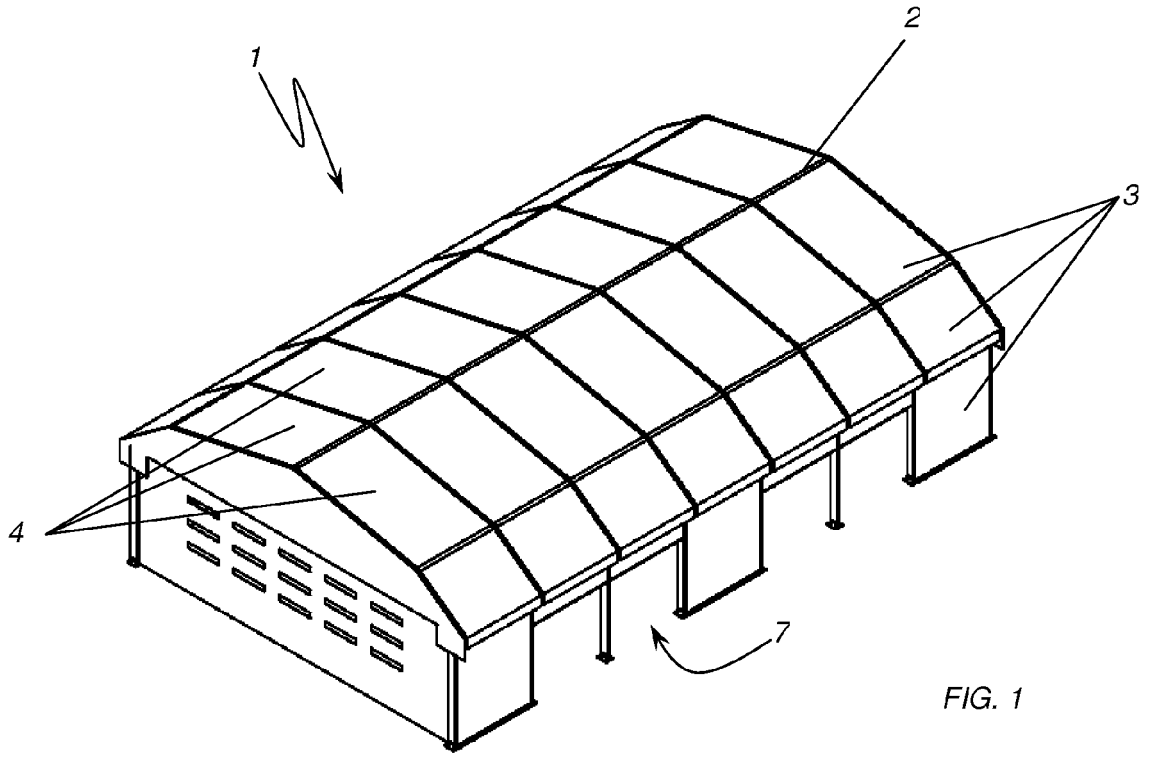


FIG. 1

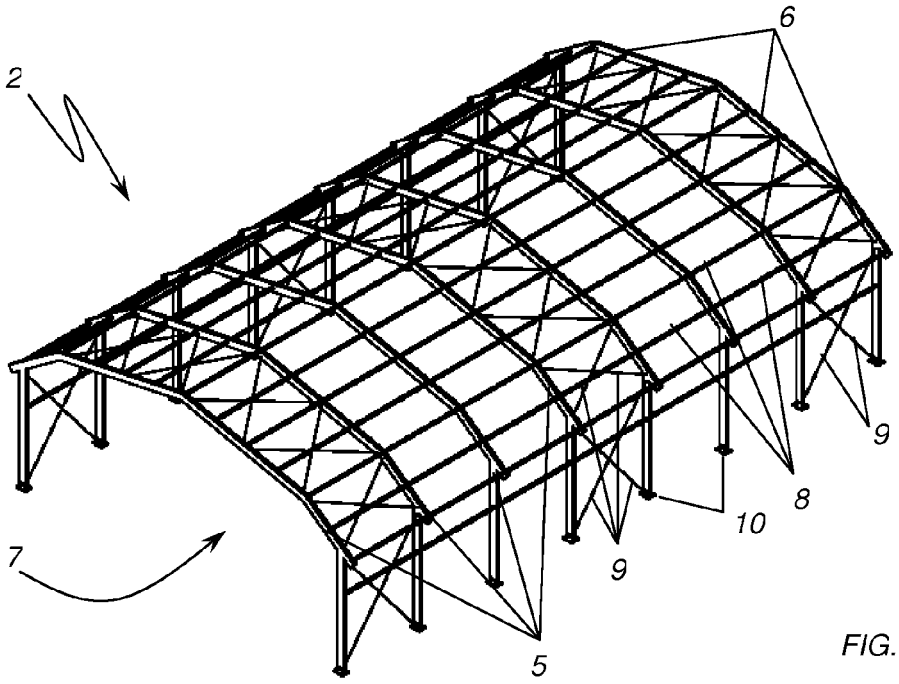


FIG. 2

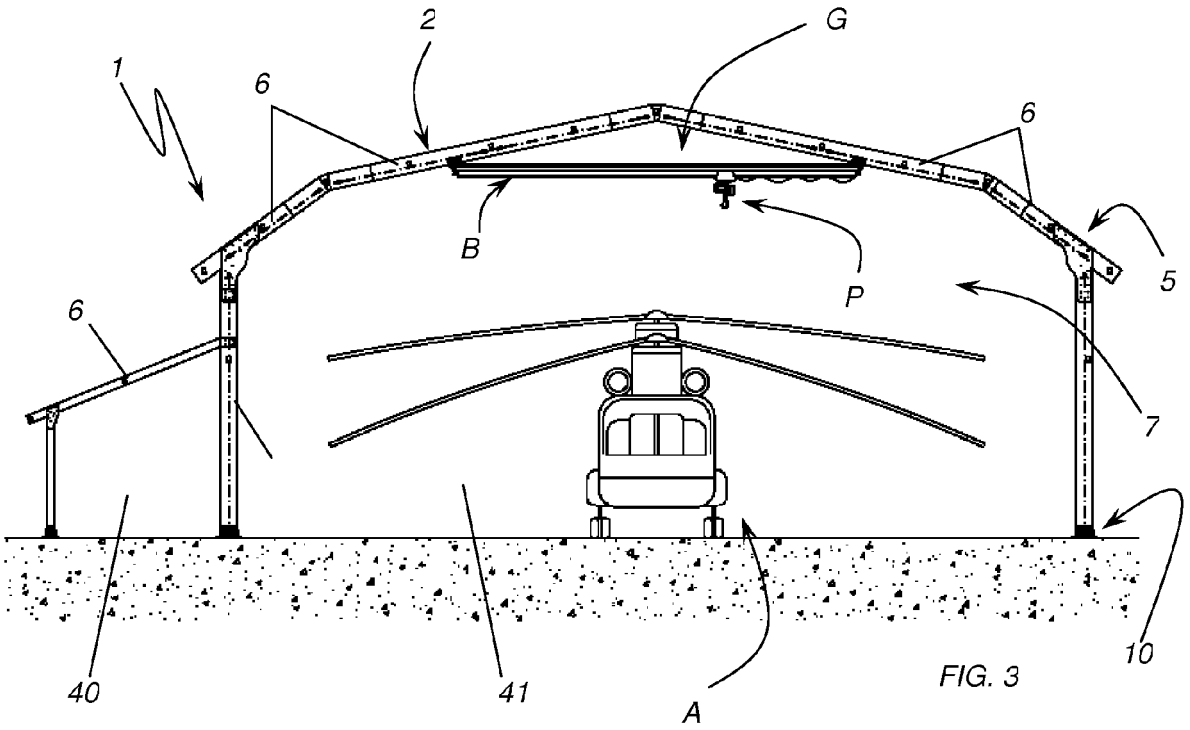


FIG. 3

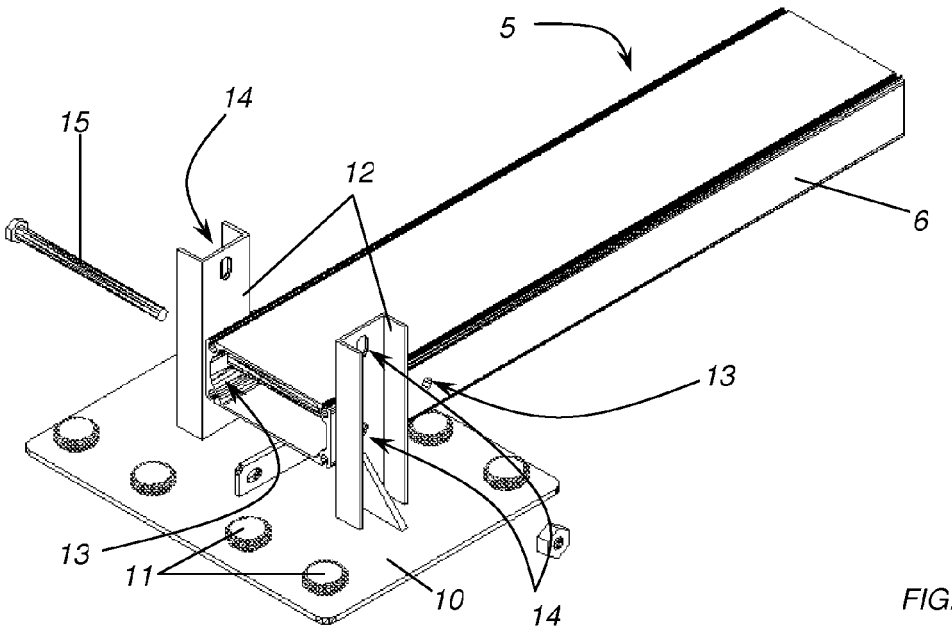


FIG. 4

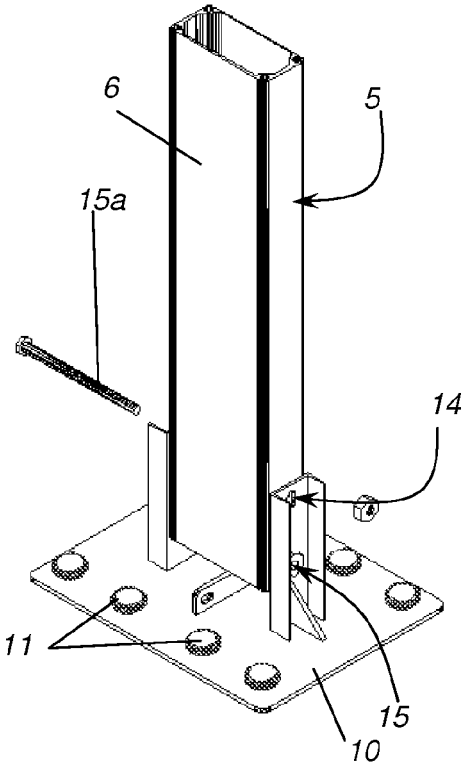


FIG. 5

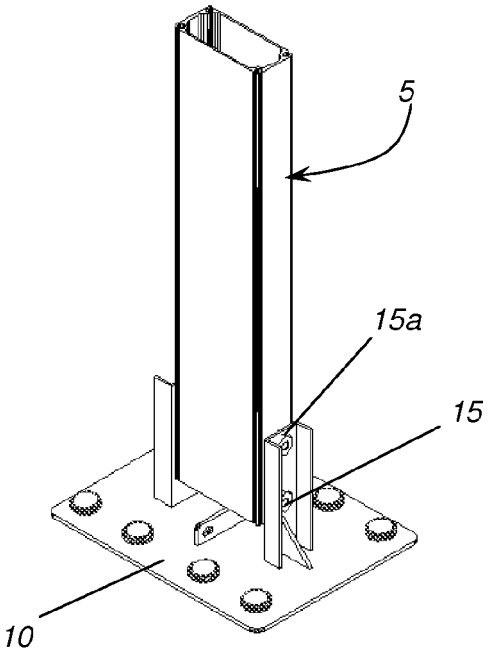


FIG. 6

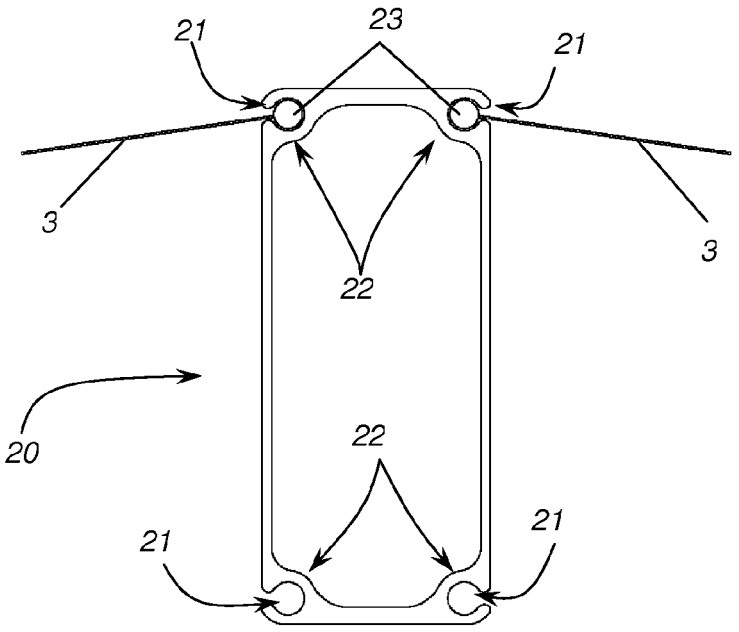


FIG. 7

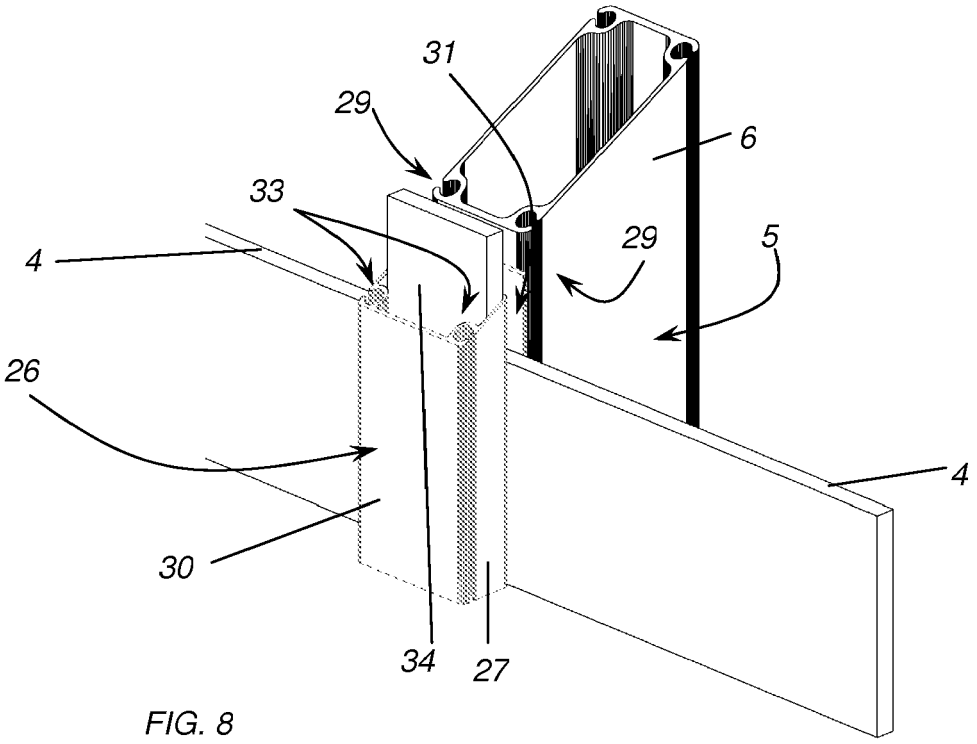


FIG. 8

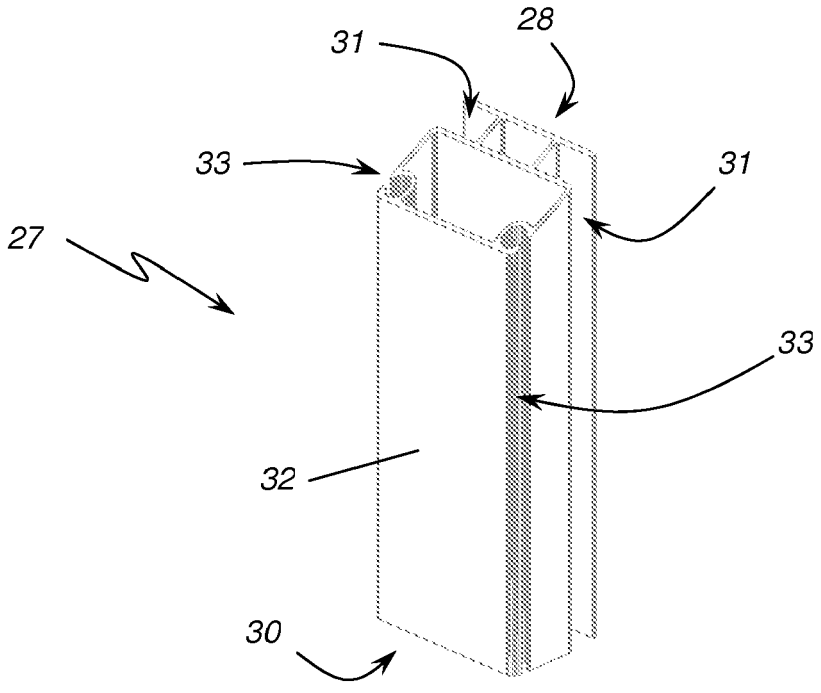


FIG. 9

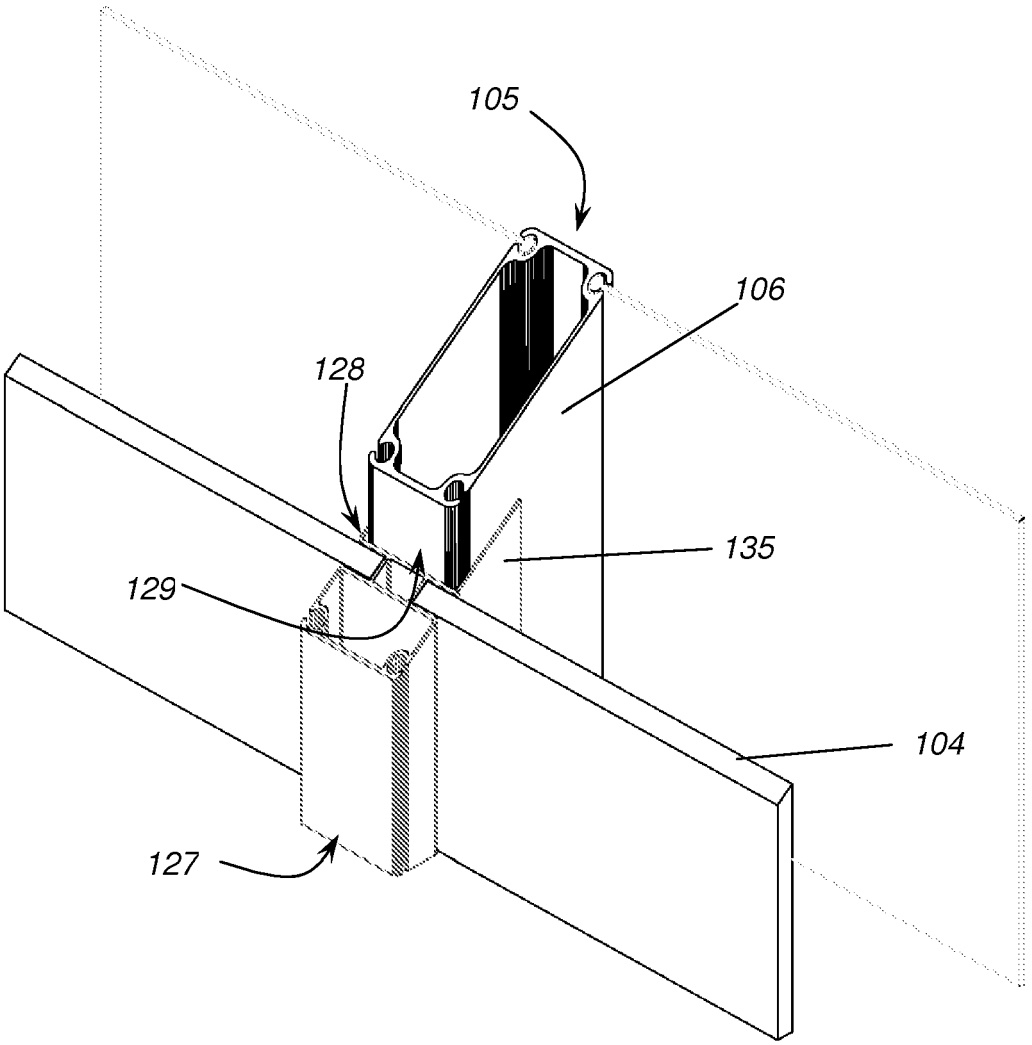


FIG. 10

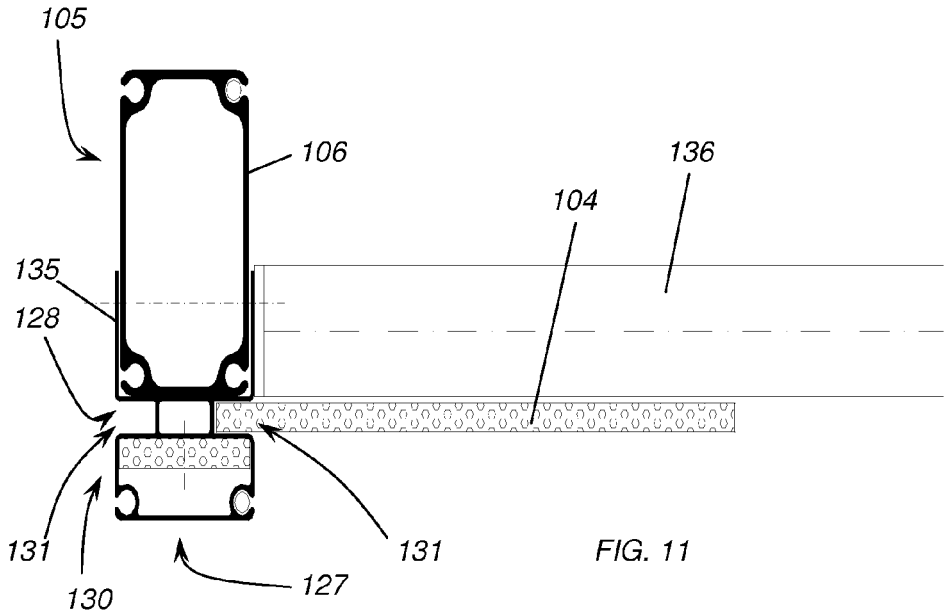

105
106
136
104
135
128
131
130
127
131

FIG. 11

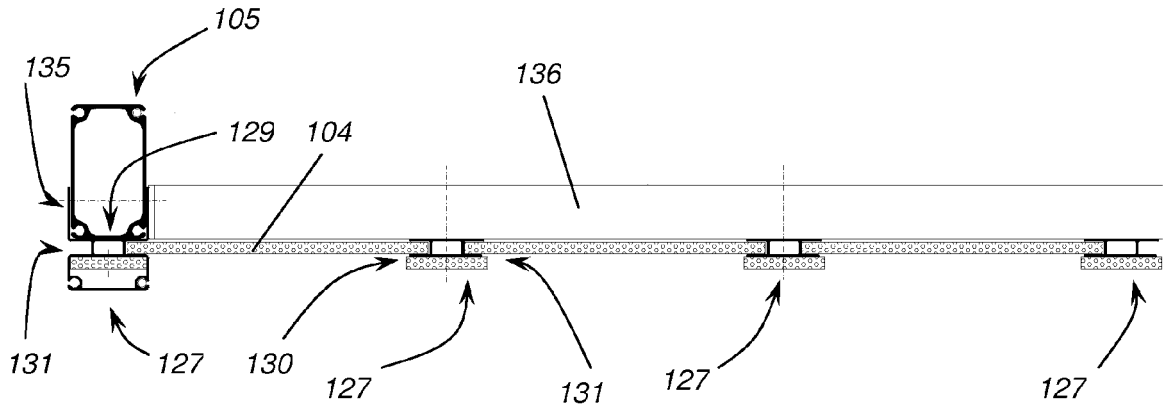

105
135
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FIG. 12

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EUROPEAN SEARCH REPORT

Application Number
EP 11 17 2443

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y,D	GB 564 266 A (ARCHIBALD MILNE HAMILTON; BRITISH INSULATED CALLENDERS) 20 September 1944 (1944-09-20) * figures 1, 8 and 10 *	1-10	INV. E04H6/44 E04H15/18
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			E04H E04B E04C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	3 November 2011	Bauer, Josef

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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A : technological background
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E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 17 2443

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03-11-2011

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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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- IT 1353435 **[0009]**
- EP 0155202 A **[0015] [0052]**