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(54) **SYSTEM FOR FASTENING ACOUSTIC PANELS AND CORRESPONDING SUPPORT STRUCTURE**

(57) The present disclosure relates to an acoustic panels fastening system and support structure thereof wherein the support structure for acoustic panel comprises: one or more fastening beams and one or more fastening elements; wherein the fastening element comprises a rail for attaching to the acoustic panel; a fitting-clip slidably connected to the rail along a first sliding axis; wherein the fitting-clip comprises a clip for slidably fastening to the fastening beam along a second sliding axis and wherein the fastening beam or beams are configured for being fastened to a plane surface.

Fig. 1

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Description

Technical field

[0001] The present disclosure relates to assembling systems, in particular acoustic panels fastening system and support structure thereof.

Background

[0002] Existing solutions for fastening acoustic panels to plane surfaces or affixing acoustic panels on vertical structures are divided into two main categories: chemical fastening and mechanical fastening by screwing said panels.

[0003] Chemical fastening consists of a glueing process, wherein various types of adhesive substances are used, in particular glues suitable to the two surfaces to be joined. The quality of the adhesive substances/glues depends on the respective features of the surfaces and requires a drying period, during which the panels may suffer dislocations. Once the glueing process is dried and finished, it becomes a permanent solution, requiring scraping and treatment of the surfaces prior to any change in the used panels.

[0004] Existing mechanical solutions are based on screw support, passing through the panel. Affixation quality is defined by the quality of the wall, and of the material used in the construction of the wall itself. Given the nature of acoustic panels, that suffer dilatation and expansion, and are inherently subject to constant micro-vibrations, a screw solution requires maintenance. Changing the assembling scheme requires changing the positioning of the wall fastenings; and dismantling the system completely, with the possible damages and implicit wears.

[0005] Mechanical solutions correspond to removable fastening systems, allowing substituting the panels and resorting to physical supports in direct or indirect contact with the surfaces. There is a great variety of solutions of mechanical fastening available on the market, ranging from direct fastening of the panel to the plane surface resorting to screws or a stapler gun to solutions using more or less complex parts or support structures. Most solutions involve using rails or profiles allowing panels, Z-shaped clip-clip or other gravity fastening systems to fit in. Suspension systems are preferably suited to the particular case of horizontal fastening (ceilings).

[0006] These solutions illustrate the technical problem to be solved by the present solution.

General description

[0007] The present disclosure relates to an acoustic panels fastening system simultaneously compatible with a vertical assembly and with fastening in horizontal plane surfaces, in particular ceilings, and vertical ones, in particular walls, this being therefore a universal system for all types of fastening: horizontal surfaces, vertical surfaces and vertical piling.

[0008] The disclosure herein presented comprises three particular advantages. The first advantage is allowing the assembly to be made easily; using a provided reference, plugs or fastening points are placed in key-spots in the desired surface. Therein fittings (clips or fitting-clip) are screwed. There is no more interaction with the surface. A beam is fitted in the fittings, in which the panels are subsequently fitted. The panels are fitted by means of two fittings, a "rail" and a fitting (clip or fitting-clip). The rail is screwed to the panel, having a groove for the fitting or fitting-clip. The panels are easily removed and reorganised.

[0009] For a suitable and effective installation it is necessary to guarantee a straight line between the two points. Therefore, the installation is independent of the state or level of the surface, allowing installation in curved surfaces and dihedral corners. The cavity created between the surface and the back of the panel creates an air gap, which not only increases the performance of the panel, but it also enables the possibility of assembling other utilities on the surface, in particular water and gas pipes, electrical cable trays, drastically decreasing the cost, time, and structural impact of an installation. The air gap also influences the thermal performance of the room.

[0010] The second advantage is the alignment between panels. After being assembled on the beam, a horizontal adjustment is possible, in particular sliding along the beam, and a vertical adjustment, in particular the fitting of the panel ensures a good junction between panels.

[0011] The third advantage is the uncoupling effect between panel and wall. Since there is no direct contact between the wall fitting and the panel fitting, there are several implications. There is a better performance with regards to low frequencies from the surface, since there is no mechanical transfer. There is also less wear in fastening the wall fitting, given the reduction in vibrations. Overall there is an improvement in the performance of the panels.

[0012] The fastening system herein disclosed is a durable system, user-friendly, it increases the performance of the adjunct system, that fulfils the requirements of international standards on construction and fire resistance, with possibility of being incorporated with other work aspects, reducing time, cost and impact of installations, as it can be incorporated with local materials, diminishing the necessary quantity to export, indirectly improving the environmental impact associated with the product.

[0013] The present disclosure thus ensures the alignment and fastening of acoustic panels on horizontal and vertical surfaces, in particular on walls and ceilings, respectively.

[0014] The present disclosure allows a faster assembling, with alignment adjustments in all directions and wherein the assembly quality is not dependent on the

quality of the surface, that is, this disclosure differs from the fastening systems disclosed in the state of the art.

[0015] The disclosure herein presented is a durable fastening system, resistant to mechanical wear; it uncouples the panel from the surface, increasing the performance; it allows changing the panel arrangement; it is universal, any product that can be screwed with a small screw is compatible; easy disassembly for maintenance purposes or substitution of damaged parts; it creates an air gap around the space, with the proper implications of thermal and acoustic insulation; it doesn't require expert tools; it is a unique solution for all different fastening situations and needs - vertical surfaces, horizontal ones or vertical piling, in particular constructing a wall or barrier with the panels themselves.

[0016] The present disclosure is an economical solution from the point of view of production, since it uses the same type of supports and clamps both for the panels and for the surfaces; in the case of the vertical piling of panels for creating an acoustic barrier, it allows using small segments of tube, facilitating the assembly and diminishing the expedition costs; the assembly of the panels is easily made, with a simple fitting movement; it is easy and simple to install, by simply aligning adequately the tubular structures; it allows horizontal adjustment, in particular sliding along the tube, and vertical adjustment, in particular sliding the clamp in the support fastened to the panel, ensuring a perfect alignment between panels.

[0017] The acoustic panels of the present disclosure may be easily removed, substituted or reorganised, according to a possible need. The uncoupling between the panels and the wall brings several advantages, since the cavity created between the surface and the back of the panel creates an air gap allowing:

a better acoustic performance at low frequencies;
the use of rubber anti-vibration clamps, further improving the acoustic performance;
the application of aligned panels in irregular surfaces;
to assemble other utilities on the surface (pipelines and electrical cable trays), reducing the cost, time, and structural impact of an installation.

[0018] The disclosure is associated with a scale economy, with a single type of supports and clamps, both for panels and for surfaces; it allows using anti-vibration rubbers in the clamps.

[0019] The assembly of acoustic panels is characterised by an assembly is simple and quick, without needing to resort to specialised tools; it allows alignment adjustments in all directions; it allows changing the arrangement of panels; easy disassembly for purposes of maintenance or substitution of parts; it allows substituting the panels contrary to chemical fastenings; durable, not dependent on the quality of the surface; it allows the application to irregular surfaces; it uncouples the panel from the surface, increasing the acoustic performance; it allows the coexistence of other installations such as pipelines or electrical cable trays in the air gap between the panel and the surface.

[0020] The present disclosure comprises the use of a support tubular structure allowing clamps to fit in. On the other hand, these clamps are fitted in supports fastened, in particular with screws, to the acoustic panels, and to the surfaces that will receive the acoustic treatment. The same clamps are therefore the connecting element of the tubular structure both to the acoustic panel and to the walls.

[0021] A beam is a structural element functioning as a bar so that both terms may be used interchangeably.

[0022] The present disclosure relates to a support structure for acoustic panel comprising one or more fastening beams and one or more fastening elements wherein the fastening element comprises:

a rail for attaching to the acoustic panel;

a fitting-clip slidably connected to the rail along a first sliding axis;

wherein the fitting-clip comprises a clip for slidably fastening to a fastening beam along a second sliding axis and

wherein the fastening beam or beams are configured for being fastened to a plane surface. In an embodiment, the rail and the fitting-clip may be configured such that they can be attached together to the acoustic panel.

[0023] In an embodiment, the first sliding axis and the second sliding axis are in different directions, in particular from a plane parallel to the back of the acoustic panel.

[0024] In an embodiment, the support structure for acoustic panels herein disclosed may provide an air gap between the back thereof and the plane surface, the plane surface may be for example a wall.

[0025] In an embodiment, the beam and the fitting-clip may be fastened by a sliding male-female fitting.

[0026] In an embodiment, the rail and the fitting-clip may be connected by a sliding male-female fitting.

[0027] In an embodiment, the beam may be cylindrical or rectangular.

[0028] In an embodiment, the support structure may comprise 4 rails, 4 fitting-clips and 2 beams for each acoustic panel.

[0029] The disclosure also relates to a kit comprising a support structure of any of the previous claims and the acoustic panels thereof.

[0030] The present disclosure further relates to an acoustic panels fastening system to plane surfaces comprising a support structure according to any of the previous claims:

a plurality of beams;

a plurality of fastening elements of the panel to the

plane surface;

a plurality of acoustic panels;

wherein each beam is coupled to a fastening element and to an acoustic panel, and wherein each acoustic panel comprises and a fitting element to connect the rail to the beam, creating a air gap between the acoustic panel and the plane surface.

[0031] In an embodiment, each acoustic panel is removable.

[0032] In an embodiment, the plane surfaces may be horizontal plane surfaces or vertical plane surfaces, wherein the horizontal plane surfaces are ceilings and the vertical plane surfaces are walls.

[0033] In an embodiment, the fastening system may further comprise fastening means of the rail to the panel.

[0034] In an embodiment, the fastening means may be screws.

[0035] In an embodiment, each acoustic panel may comprise 4 rails arranged in vertexes of the panel, 4 screws and 4 elements for fitting in the rail and in the beam.

[0036] In an embodiment, the fastening element may be a plug.

[0037] Throughout the description and claims the word "comprises" and variations thereof, are not intended to exclude other technical features, as other components, or steps. Additional objects, advantages and features of the disclosure will become apparent to those skilled in the art upon examination of the description or may be learned by practice of the invention. The following embodiments are for illustrating the description and should not be seen as limiting the scope of the disclosure. Furthermore, the present disclosure covers all possible combinations of specific or preferential embodiments herein described.

Brief description of the drawings

[0038] The following figures provide preferred embodiments for illustrating the description and should not be seen as limiting the scope of the disclosure.

Figure 1: Schematic representation of a set of panels vertically arranged for creating an acoustic barrier, according to the disclosure herein presented.

Figure 2: Schematic representation of a fastening point/plug **1** screwed to a surface and of a beam **2.**

Figure 3: Schematic representation of the first step for placing an acoustic panels fastening system to horizontal or vertical surfaces.

Figure 4: Schematic representation of a step subsequent to placing an acoustic panels fastening system to horizontal or vertical surfaces.

Figure 5: Schematic representation of a step subsequent to placing an acoustic panels fastening system to horizontal or vertical surfaces and wherein two panels are placed side by side.

Figure 6: Representation of a fastening point/plug **3** and of a screw **4** that may be placed in key points of a surface.

Figure 7: Schematic representation of the fitting of a beam **5** to the set formed by the fastening points/plug **3** and screws **4** already previously fastened to a surface, the arrows representing the fitting direction of the beam **5.**

Figure 8: Schematic representation of the fastening of a beam **5** to the structure formed by the fastening point/plug **3** and screw **4** already previously fastened to a surface, wherein the arrows represent the fitting of the beam and wherein the beam is fitted to three sets of fastening points/plug **3** and screw **4.**

Figure 9: Schematic representation wherein A represents a rail **10** that may be screwed to an acoustic panel and in which a fitting/clip **11** is afterwards fastened; wherein B represents the fastening of the fitting/clip to the rail this set being afterwards screwed.

Figure 10: Schematic representation wherein A represents a rail **10** that may be screwed to an acoustic panel and in which a fitting/clip is afterwards fitted in.

Figure 11: Schematic representation of the application of acoustic panels according to the disclosure herein presented.

Figure 12: Representation of a fitting detail of two acoustic panels arranged side by side.

Figure 13: Representation of a detail of the rail and fitting sliding between each other.

Figure 14: Detail of the fastening system.

Detailed description

[0039] The disclosure herein presented comprises an acoustic panels fastening system, and support structure thereof, the fastening system being simultaneously compatible with a vertical assembly and with fastening in horizontal plane surfaces, in particular ceilings, and vertical ones, in particular walls, this being a universal system for all types of fastening: horizontal surfaces, vertical surfaces and vertical piling.

[0040] Figure 7 represents an embodiment wherein 4 acoustic panels may be placed, their placement being

made at height.

[0041] Figure 8 represents an embodiment wherein 8 acoustic panels may be placed, 4 of these panels being placed at height, as figure 7 shows and the remaining 4 panels are also placed at height and to the side of the first 4 panels previously arranged.

[0042] In an embodiment, each acoustic panel comprises a rail, fastening means of the rail to the panel and a fitting element to the rail and to the beam creating an air gap between a surface of the acoustic panel and the plane surface or wall.

[0043] In an embodiment, the fittings necessary to fasten acoustic panels are male-female fittings.

[0044] In an embodiment, the rail may be of metal or plastic.

[0045] In an embodiment, the fitting/clip/element, in particular fitting-clip, for fitting may be of plastic or metal.

[0046] In an embodiment, the rail may be screwed to the acoustic panel and afterwards the fitting/clip/element for fitting may be inserted in the rail.

[0047] In an embodiment, the rail and the fitting/clip/element, in particular fitting-clip, for fitting may be coupled to each other and afterwards this set may be screwed to the acoustic panel.

[0048] In an embodiment, the set of rail, fitting/clip/element, in particular fitting-clip, for fitting and screw may be distributed along the panel, in particular each set may be placed in a vertex of the acoustic panel.

[0049] In an embodiment, each acoustic panel comprises 4 sets of rail, fitting/clip/element, in particular fitting-clip, for fitting and screw positioned in the respective vertexes of the panel.

[0050] Although only particular embodiments of the present disclosure have been represented and described herein, those skilled in the art will know how to introduce modifications and replace some technical features with equivalent ones, depending on the requisites of each situation, without departing from the scope of protection defined by the appended claims.

[0051] The presented embodiments are combinable. The following claims set out particular embodiments of the disclosure.

Claims

1. Support structure for acoustic panel comprising one or more fastening beams and one or more fastening elements wherein the fastening element comprises:

   a rail for attaching to the acoustic panel;
   a fitting-clip slidably connected to the rail along a first sliding axis;
   wherein the fitting-clip comprises a clip for slidably fastening to a fastening beam along a second sliding axis and
   wherein the fastening beam or beams are configured for being fastened to a plane surface.

2. Support structure according to the previous claim wherein the rail and the fitting-clip are configured such that they can be attached together to the acoustic panel.

3. Support structure according to any of the previous claims wherein the first sliding axis and the second sliding axis are in different directions, in particular from a plane parallel to the back of the acoustic panel.

4. Support structure according to any of the previous claims able to provide an air gap between the back of the acoustic panel and the plane surface.

5. Support structure according to any of the previous claims wherein the beam and the fitting-clip are fastened by a sliding male-female fitting.

6. Support structure according to any of the previous claims wherein the rail and the fitting-clip are connected by a sliding male-female fitting.

7. Support structure according to any of the previous claims wherein the beam is cylindrical or rectangular.

8. Support structure according to any of the previous claims comprising 4 rails, 4 fitting-clips and 2 beams for each acoustic panel.

9. Kit comprising the support structure of any of the previous claims and the acoustic panels thereof.

10. Acoustic panels fastening system to plane surfaces comprising a support structure according to any of the previous claims:

    a plurality of beams;
    a plurality of fastening elements of the panel to the plane surface;
    a plurality of acoustic panels;
    wherein each beam is coupled to a fastening element and to an acoustic panel,
    and wherein each acoustic panel comprises a fitting element able to connect the rail to the beam, creating an air gap between the acoustic panel and the plane surface.

11. Fastening system according to the previous claim wherein each acoustic panel is removable.

12. Fastening system according to the previous claims wherein the plane surfaces are horizontal plane surfaces or vertical plane surfaces.

13. Fastening system according to the previous claims wherein the plane surfaces are horizontal plane surfaces are ceilings.

14. Fastening system according to the previous claims wherein the vertical plane surfaces are walls.

15. Fastening system according to the claims further comprising fastening means of the rail to the panel.

16. Fastening system according to the previous claims wherein the fastening means are screws.

17. Fastening system according to the previous claims wherein each acoustic panel comprises 4 rails arranged in vertexes of the panel, 4 screws and 4 elements for fitting in the rail and in the beam.

18. Fastening system according to the previous claims wherein the fastening element is a plug.

Fig. 1

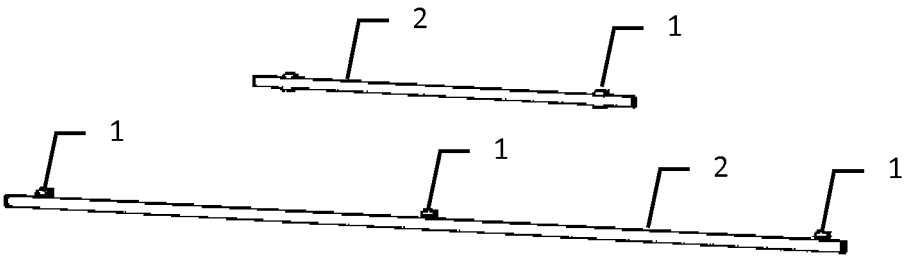

Fig. 2

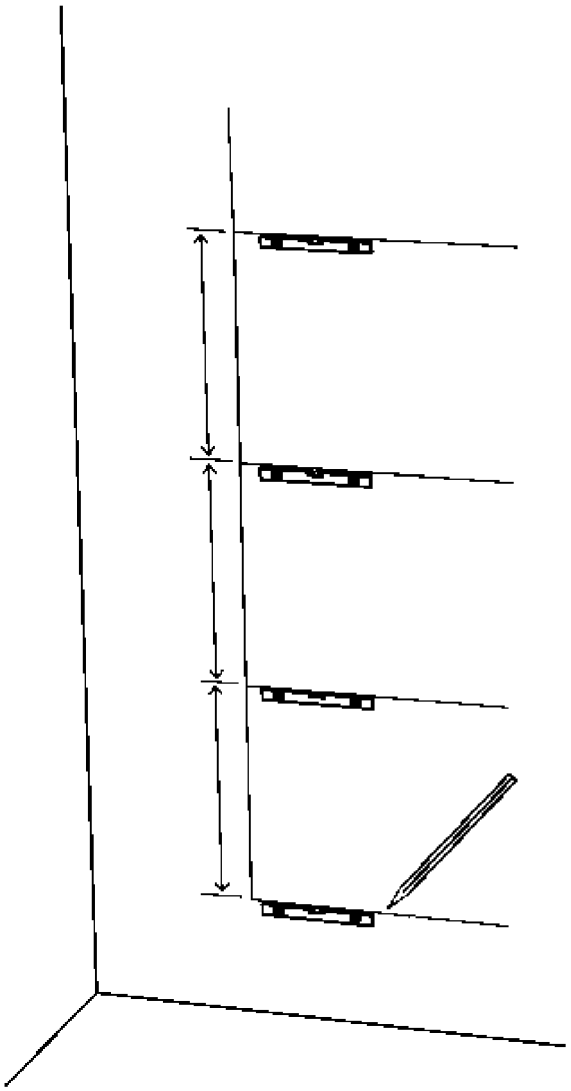

Fig. 3

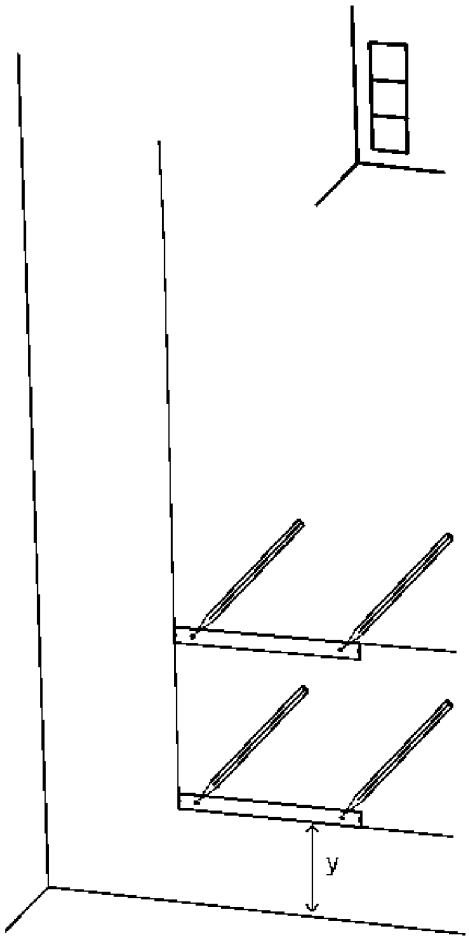

Fig. 4

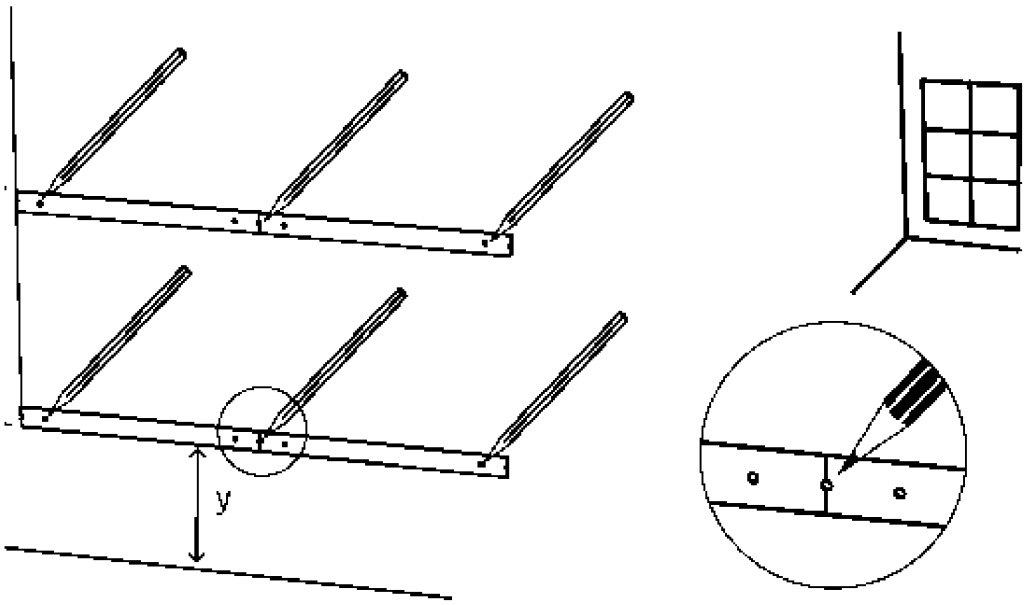

Fig. 5

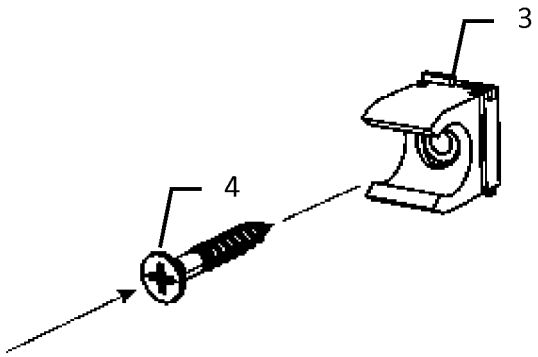

Fig. 6

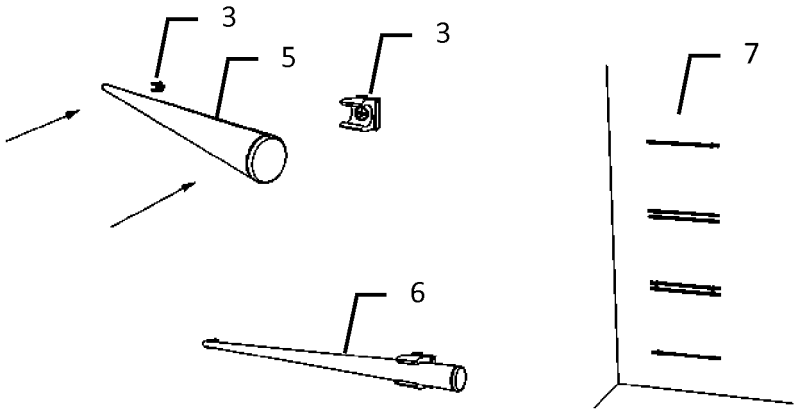

Fig. 7

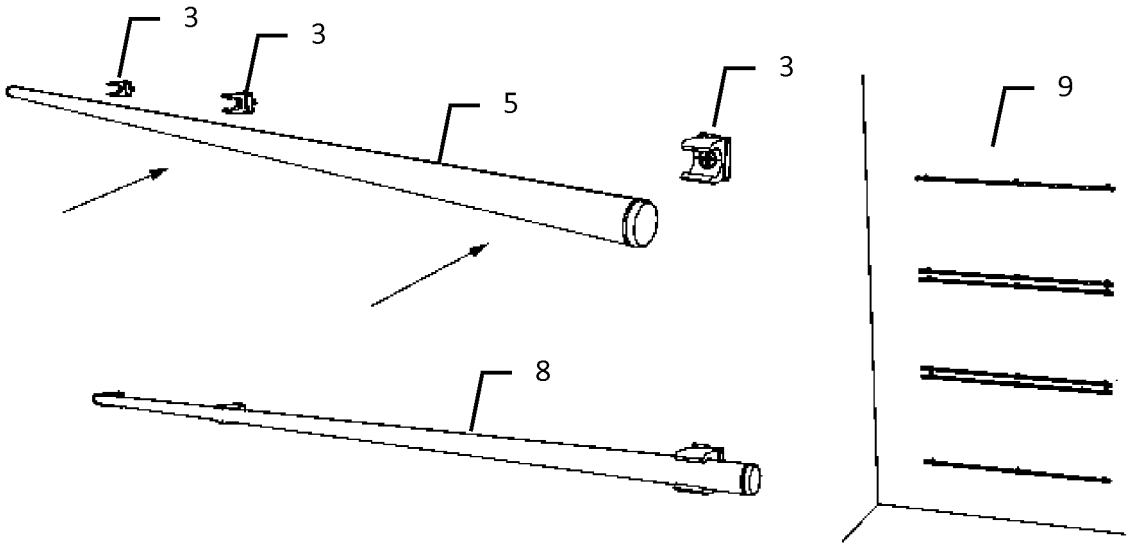

Fig. 8

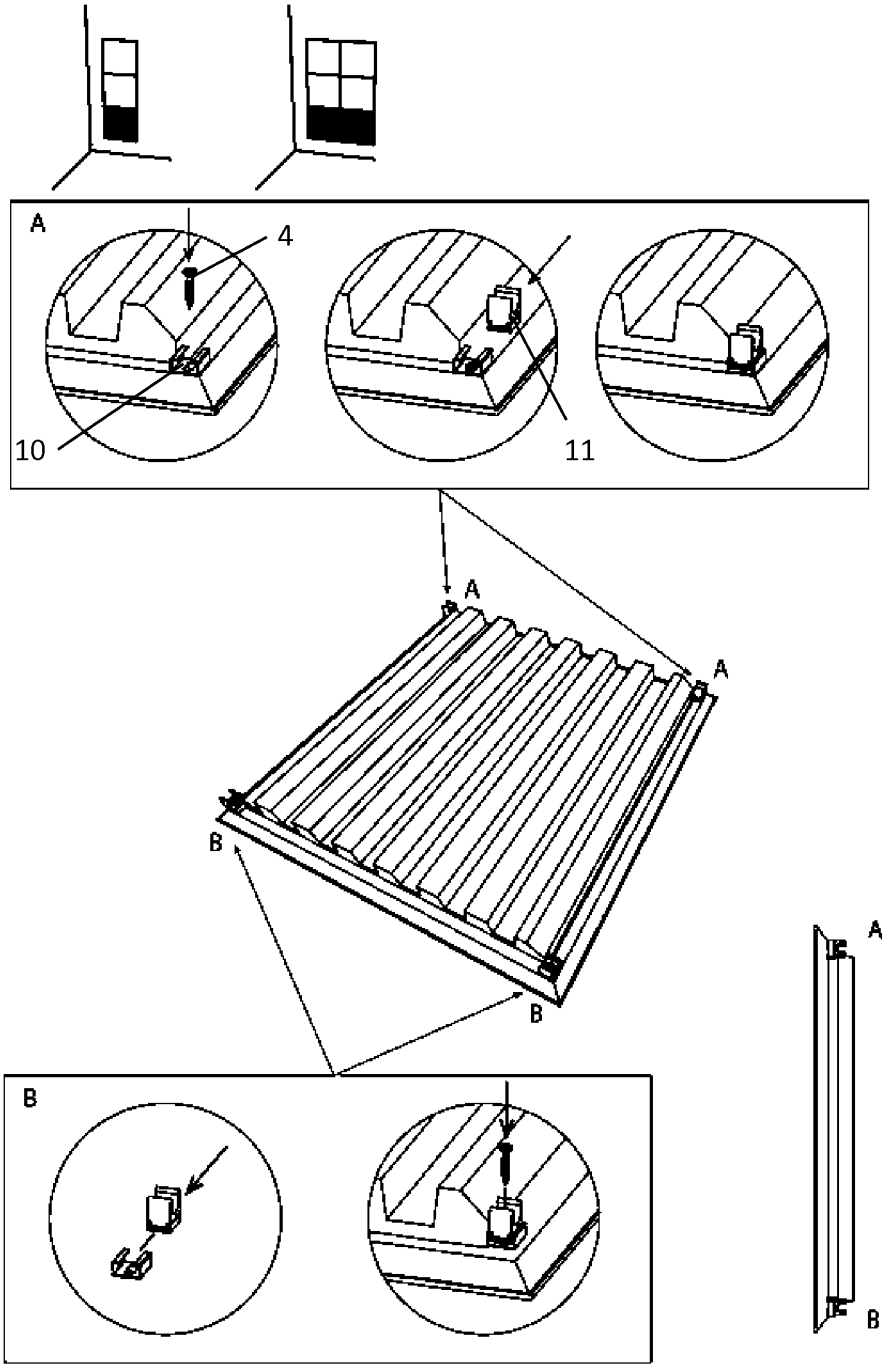

Fig. 9

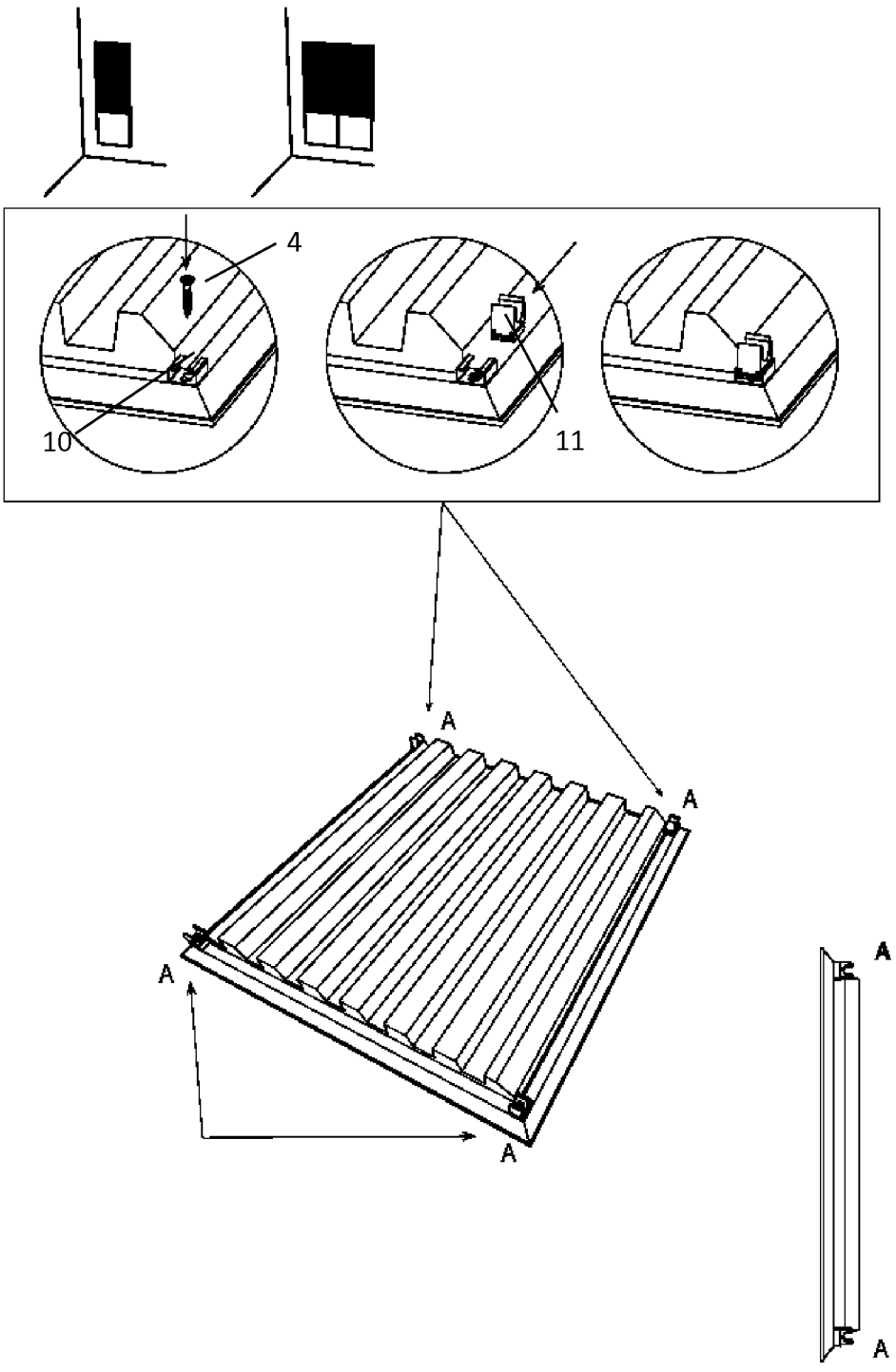

Fig. 10

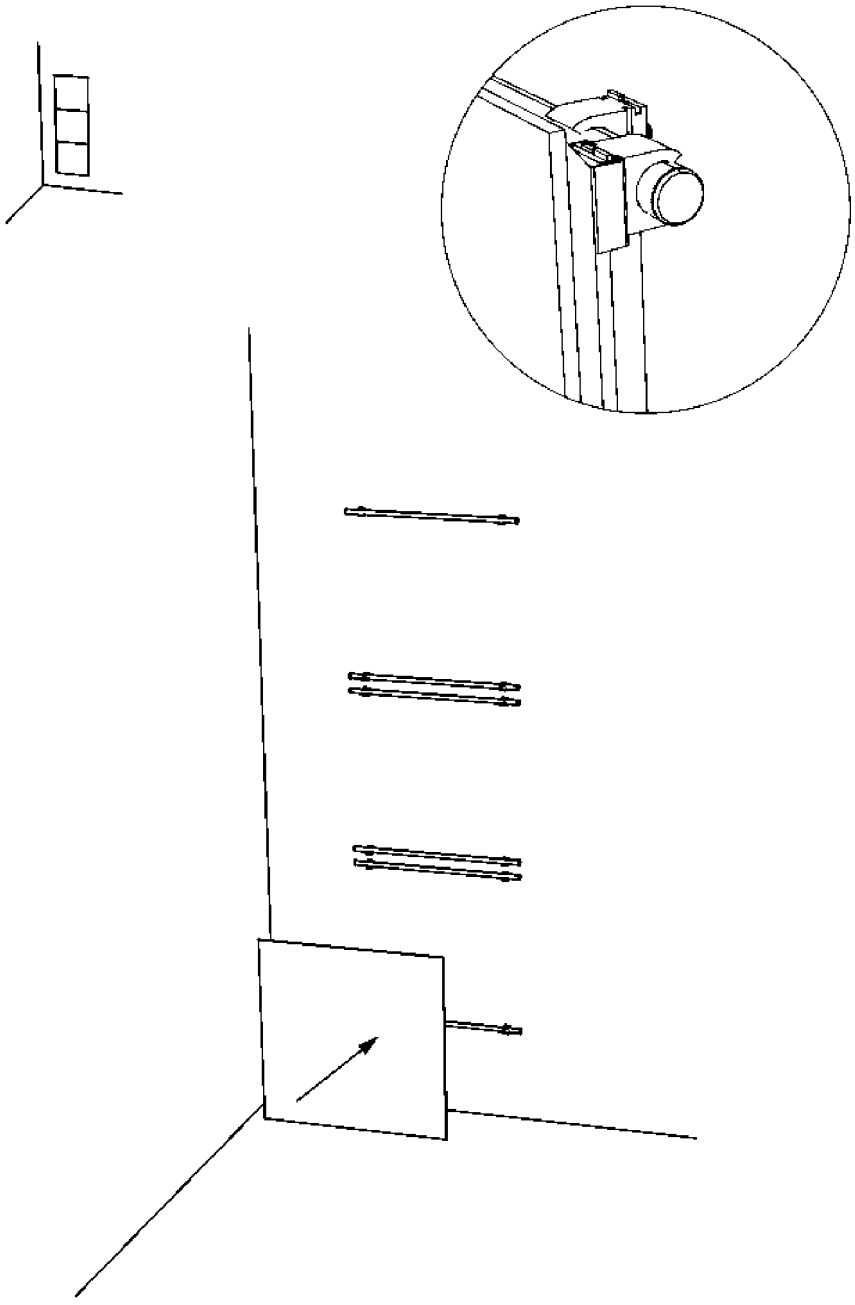

Fig. 11

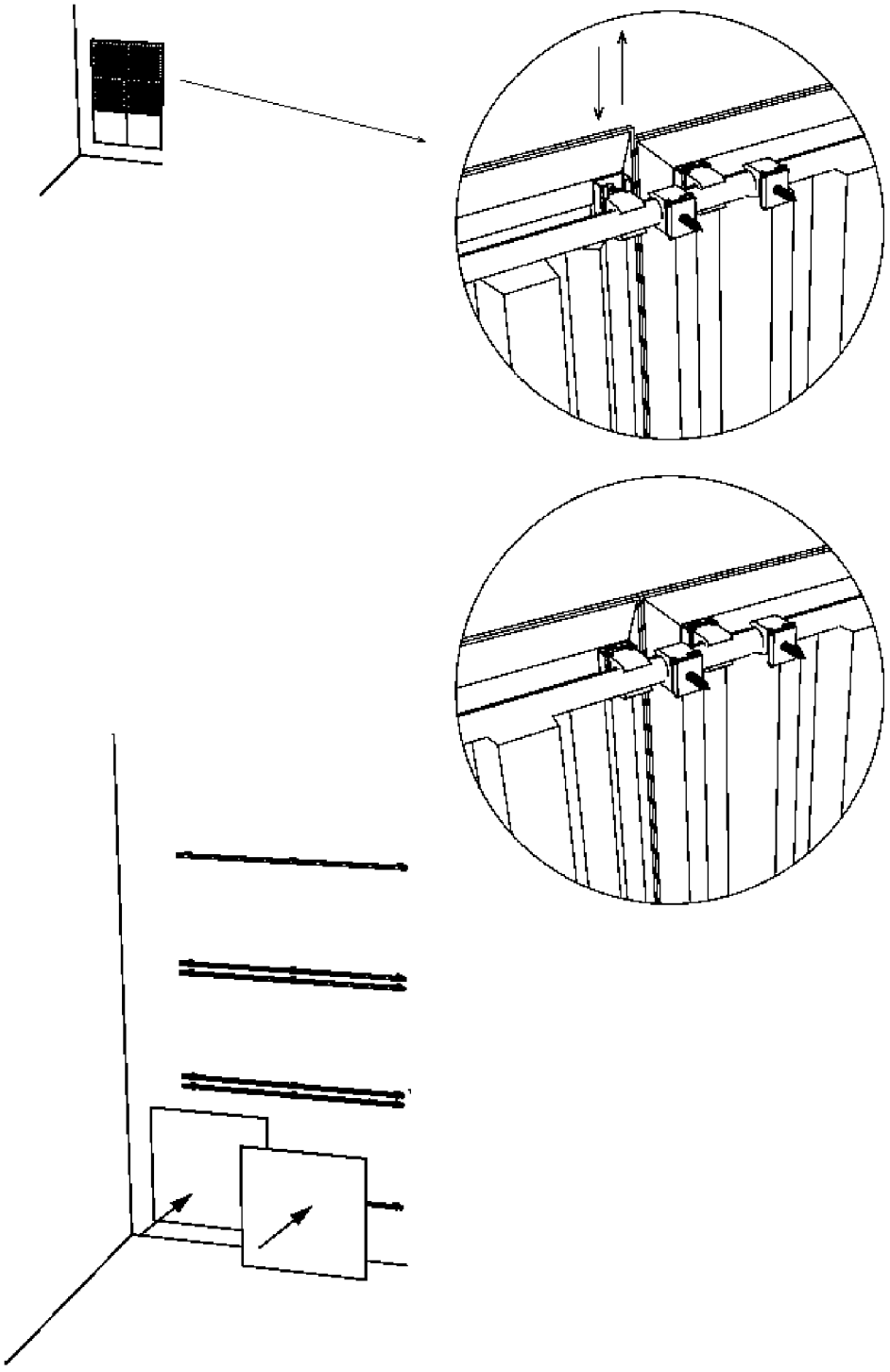

Fig. 12

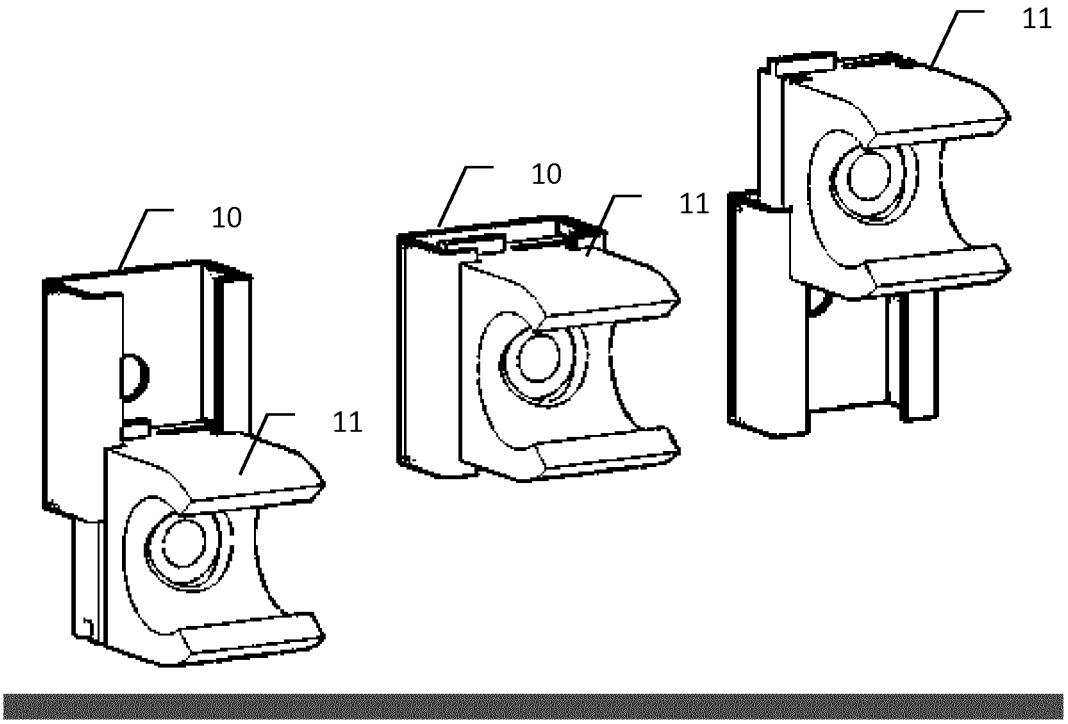

Fig. 13

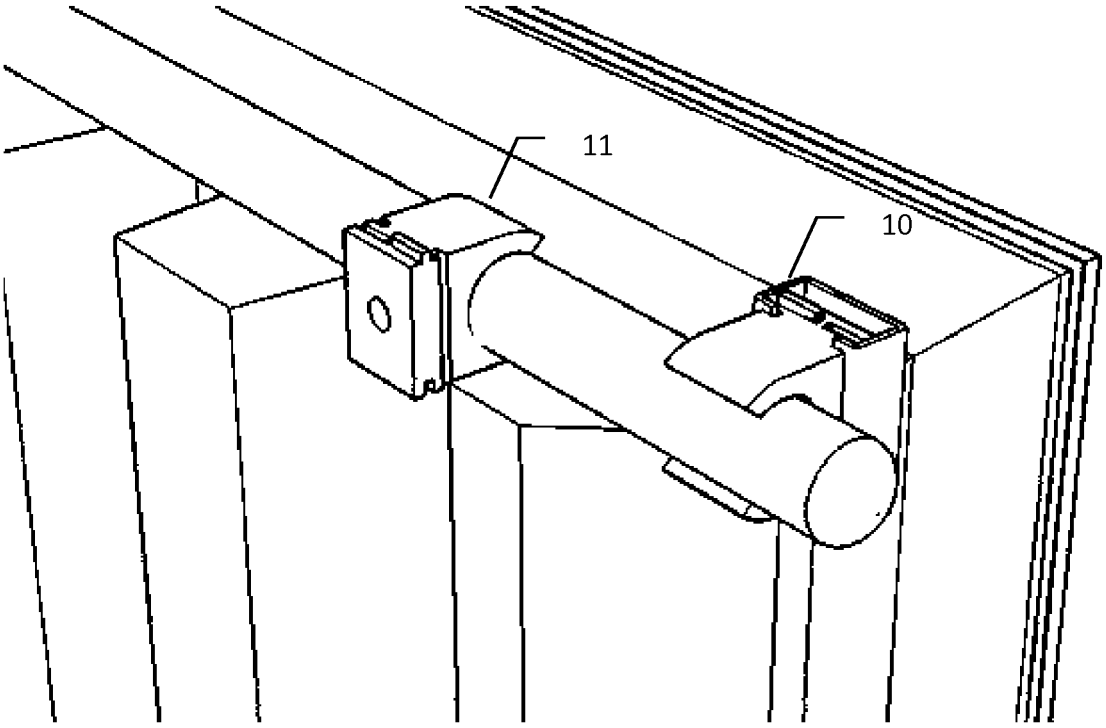

Fig. 14

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2017/050724

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04B1/86 E04F13/08
ADD. E04B1/82 E04B1/84

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)
E04B E04F

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)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3 903 671 A (CUIN DAVID ERNEST ET AL) 9 September 1975 (1975-09-09) column 2, line 48 - column 3, line 45; figure 1	1-18
X	EP 0 541 958 A1 (RADEX HERAKLITH [AT]) 19 May 1993 (1993-05-19) column 18, lines 28-50; figures 2, 3	1-13,15, 16,18
A	WO 2015/150616 A1 (CONTROL Y DESARROLLO EMPRESARIAL S L [ES]) 8 October 2015 (2015-10-08) abstract; figures 1-8	1

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

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
4 May 2017	16/05/2017

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Couprie, Brice

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2017/050724

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