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(54) **A set of ceiling panels and a method of installing said set of ceiling panels**

(57) The invention includes a set of ceiling panels comprising a plurality of substantially identical panels, each panel being substantially rectangular, each edge having one or more lengthwise protruding lips and/or one or more lengthwise grooves along substantially the whole length of the edge, said four edges two and two being substantially identical to each other and the one

or more lengthwise lips and/or one or more lengthwise grooves along substantially the whole length of the edges of a first pair of said pairs of edges being substantially complementary to the one or more lengthwise lips and/or one or more lengthwise grooves along substantially the whole length of the edges of the second pair of said pairs of edges. The invention also includes a method of installing said set of ceiling panels.

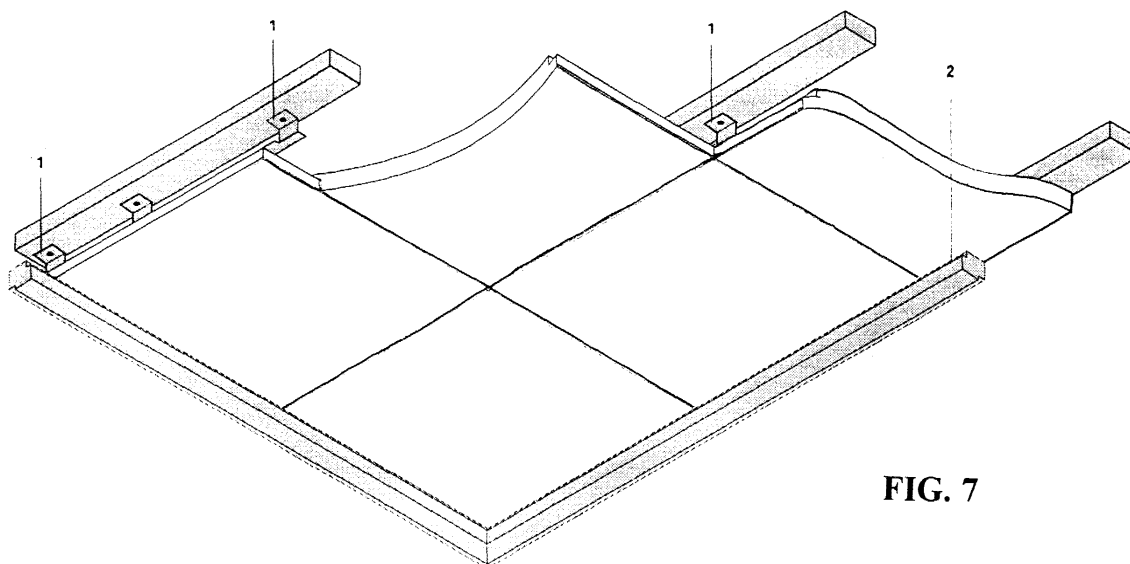


FIG. 7

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Description

[0001] The present invention relates to a set of ceiling panels comprising a plurality of substantially identical panels. The invention also relates to a method for mounting a set of ceiling panels.

[0002] Covering of basic ceilings with ceiling panels is well known and widely used. Especially suspended ceilings, where ceiling panels are installed in grid systems, are common, mainly because they are relatively easy to install and because suspended ceilings have large sound reducing effects. However, suspended ceilings are generally weak, particularly with regard to fire resistance, and generally such suspended ceilings are not able to resist fire for 30 min. or more. Due to low fire resistance such suspended ceilings are in general not accepted for use in public areas such as theatres, schools, day-care centers, hospitals, etc.

[0003] The only known type of ceilings with ceiling panels which is sufficiently fire resistant to be accepted in almost any type of rooms, is non-suspended ceilings, wherein the panels are directly attached to the basic ceilings with suitable fastening means. In general, there must be no orifices or gaps between the panels that allow direct contact from the room to the ceiling in such non-suspended ceiling systems, if it should exhibit an acceptable fire resistance. Such orifices can be eliminated, either by use of fire retardant plaster or mortar or by use of specially designed sections.

[0004] In a known technique for covering a basic ceiling with fire retardant ceiling panels, the panels are shaped with two neutral opposing edges, defined as edges with a substantially plane surface, and two opposing edges of which the one edge has an upper protruding lip and the opposed edge has a lower protruding lip, which lips are designed to overlap each other, and thereby eliminating any gap or orifices between the edges when the panels are arranged in side by side relationship. The other edges are covered with additional sections which are applied after the ceiling panels have been mounted to the basic ceiling, and which also serve to eliminate the orifice or gaps between the panels. The panels are normally fastened to a basic ceiling with screws. Six or more screws may be used to fasten such a ceiling panel. As the screws are screwed directly into the ceiling panels, this has a negative influence on the strength and the durability of the panels. It may therefore be necessary to reinforce the areas, where the screws are mounted.

[0005] Because of lack in known technology there has been a need for fire resistant ceiling panels with improved qualities.

[0006] The object of the present invention is to provide a set of panels which do not exhibit the above-mentioned drawbacks.

[0007] A second objective of the present invention is to provide a set of panels which is easy to mount to the basic ceiling, and which can be applied using a minimum

of fastening means and work.

[0008] A third objective of the present invention is to provide a set of panels, which panels can be mounted to a basic ceiling using a simple and efficient method which does not necessarily include closing gaps and orifices with additional sections, and whereby the resulting ceiling has a high fire resistance.

[0009] It has now unexpectedly appeared that the above-mentioned objectives can be achieved by the set of ceiling panels as defined in the claims.

[0010] The set of ceiling panels according to the invention presents a totally new and safe way of eliminating orifices and due to the unique design of the edges on the ceiling panels gaps between the ceiling panels without using additional sections or other lapping means. Furthermore, the set of ceiling panels can be attached to the ceiling very easily and with a minimum of fastening means and work.

[0011] The invention also comprises a method for mounting a set of ceiling panels as defined in claim 5.

[0012] According to the present invention a set of ceiling panels that not only satisfies the more strict requirements for fire safe insulation of basic ceilings, but also besides the excellent fire insulation provides a ceiling with fine aesthetic qualities is provided, and which furthermore can be installed easily and with a minimum of work.

[0013] To be able to create a ceiling consisting of panels mounted without gaps or orifice between the panels, the set of ceiling panels according to the invention comprises a plurality of substantially identical panels, where each panel is substantially rectangular and has a first and a second major surface opposite to each other. Each of the panels has four edges having a length defined as the distance between the two corners of the panel separating the edge from other edges. Each edge has one or more lengthwise protruding lips and/or one or more lengthwise grooves along substantially the whole length of the edge. The four edges are in pairs substantially identical to each other and the one or more lengthwise lips and/or one or more lengthwise grooves along substantially the whole length of the edges of a first pair of said pairs of edges being substantially complementary to the one or more lengthwise lips and/or one or more lengthwise grooves along substantially the whole length of the edges of the second pair of said pairs of edges, respectively, being substantially perpendicular to each other.

[0014] In a preferred embodiment of the set of ceiling panels according to the invention each ceiling panel is shaped substantially as a rectangle having four edges. Each of the edges has an upper portion and a lower portion, where the upper portion is the part of the edge being closer to the surface that faces the basic ceiling than the lower portion. A first and a third edge of the four edges are preferably substantially mutually parallel and a second and a fourth edge of said four edges are prefer-

ably substantially mutually parallel. Preferably, the first and the second edge, respectively, have a protruding lip in the longitudinal direction on the lower portion of the edge, and the lip is shaped to substantially overlap with a protruding lip preferably in the longitudinal direction on the upper portions of the third and fourth edge, respectively, of another panel of said set of panels.

[0015] For the purpose of making the panels easy to install the set of ceiling panels according the invention in a preferred embodiment of the ceiling panels comprises panels where the first edge of the ceiling panels further comprises a mounting groove substantially in the middle of the edge in the longitudinal directions. The mounting groove serves for mounting a fitting when the panels are attached to the basic ceiling.

[0016] In a preferred embodiment of the set of ceiling panels according to the invention, the edges of each of the ceiling panels are shaped so that a protruding lip on the first edge overlaps with a protruding lip on the third edge of another panel of said set of panels, and a protruding lip on the second edge overlaps with a protrusion on the fourth edge of a further panel of said set of panels, when the panels are installed in close contact in a side by side relationship.

[0017] The invention also comprises a method of mounting a set of ceiling panels comprising a plurality of substantially identical panels to a basic ceiling, which method comprises the steps of

i) mounting a first ceiling panel by attaching it to the basic ceiling in a desired position with mounting means,

ii) mounting a second ceiling panel by bringing it into side by side contact with the first ceiling panel, whereby a protruding lip on the edge of said second ceiling panel overlaps a protruding lip on said first ceiling panel, and attach said second ceiling panel to the basic ceiling with fastening means,

iii) mounting the remaining panels of said set of panels one by one by bringing each of the panels into side by side contact with one or two already mounted neighbouring panels, wherein a protruding lip on the one or two edges is brought into contact with edges of neighbouring panels overlapping a protruding lip on the respective edges of neighbouring ceiling panels.

[0018] In a preferred embodiment of the method according to the invention the set of panels is used in a method comprising the steps of bringing the first edge of one of the panels of the set of panels in contact with the third edge of a neighbouring panel, and bringing the second edge of the one panel in contact with the fourth edge of a neighbouring panel.

[0019] It is preferred to use nails, screws, cramps, clamps, bolt, rivets, glue, adhesive tape or a fittings as

fastening means in the method according to the invention. Any other fastening means may however be used. Basically it is preferred that the fastening means can be substantially concealed by the panels.

[0020] In an even more preferred embodiment of the method the fastening means are fittings adapted to fit in a mounting groove in the first edge of the ceiling panels. The fittings will later be described in details.

[0021] It is obvious that the panels according to the invention may be manufactured in a wide range of materials e.g. steel, wood, gypsum, plastic, ceramics, composites and mineral fibres. When the sets of panels serve as fire insulation, it is naturally preferred to use material with good fire insulation qualities, especially preferred are man-made vitreous fibres (MMVF) such as mineral fibres of stone or glass.

[0022] The set of ceiling panels and the method according to the invention will now be described with reference to an example. The example is only meant to illustrate an embodiment of the invention and should not in any way be considered as a limitation for the scope of the invention, as it is clear that the skilled person will be able to adapt the invention to be used in many other ways.

Example

[0023] In the example reference will be made to the drawing in which:

Fig. 1 a shows a ceiling panel according to the invention as seen from below.

Fig. 1 b shows the profile of the edges of the panel through the cuts A-A and B-B in fig. 1 a.

Fig. 2 shows the panels in side by side relationship.

Fig. 3 shows a preferred embodiment of the invention, where the edge G1 in the panel is mounted with a fitting.

Fig. 4 shows the panel of fig. 3 seen from above.

Fig. 5 shows a preferred embodiment of a fitting to be used according to the invention.

Fig. 6 a shows how the fitting is mounted in the connection between to panels

Fig. 6 b shows the fitting in fig. 6 a seen from above.

Fig. 7 shows a ceiling with ceiling panels installed according to the method according to the invention.

[0024] A set of ceiling panels according to the inven-

tion was provided. Each ceiling panel had four edges denoted the first edge G1, the second G2, the third edge G3 and the fourth edge G4 as seen in fig. 1 a. The first edge G1 and the third edge G3 are mutually parallel and the second edge G2 and the fourth edge G4 are mutually parallel. The first edge G1 and the second edge G2 had protruding lips on their lower portion and the third edge G3 and the fourth edge G4 had protruding lips on their upper portion as shown in fig. 1 b. Furthermore, the first edge G1 had a groove in the entire longitudinal direction as seen on fig. 1 a. The ceiling panels were manufactured from mineral wool, and the surface facing away from the basic ceiling was applied with a non-woven scrim and covered with an acoustic paint.

[0025] In this example the panels had the shape of quadrangles with edges of substantially the same length. This is not a necessity, as the panels may e.g. be shaped as rectangles, where two opposing edges have a length differing from the length of the other two opposing edges.

[0026] The panels were attached to a basic ceiling using the fittings illustrated in fig. 6. The fitting 1 comprises one supporting plate A designed to support and lock the ceiling panels. The support plate A is connected to a fastening plate B through a middle piece C which is substantially perpendicular to the support plate A and the fastening plate B. The fastening plate B has an opening D substantially in the center for fastening means. The opening D has an elongated shape in order to adjust the fitting, when fastening means, e.g. a screw, is placed in the opening D to fasten the fitting to a basic ceiling. The support plate A and the fastening plate B of the fitting 1 are substantially parallel to each other and in such a position with regard to each other that the access to the fastening plate B and the opening D is free during the operation, when the fitting is used for attaching the panels to a basic ceiling as illustrated in e.g. fig. 2, fig. 3 and fig. 7. The distance between the basic ceiling and the upper surface of the ceiling panels is substantially defined by the length of the middle piece C.

[0027] The set of panels was attached to a basic ceiling starting with a first panel of the set. The first panel was adapted to fit a basic ceiling in a corner formed by two walls perpendicular to each other and supporting the ceiling. Therefore, the protruding lips on the third edge G3 and the fourth edge G4 of the panel, which were in contact with the walls, were removed by cutting, so the two edges came in close contact with the wall. The following neighbouring panels in contact with the walls had also the one edge or two edges for corner panels in contact with the wall adapted. The edges were adapted by cutting and removal of the protruding lips.

[0028] The third edge G3 and the fourth edge G4 of the first panel facing the walls were attached to the basic ceiling by use of a lath 2 in fig. 7. The first edge G1 was attached to the basic ceiling by use of fittings as described above. A part of the support plate A of the fitting was placed in the groove in the first edge G1 as illus-

trated in fig. 3 and the fastening plate B was fastened to the basic ceiling in a desired position by use of a screw.

[0029] The second ceiling panel was adapted to fit the wall with the third edge G3. And the fourth edge G4 of the second panel was brought to overlap with the second edge G2 of the first panel. The following panels were installed so the second edge G2 of one panel overlapped with the fourth edge G4 of an other panel in side by side relation as illustrated in fig. 2. The first edge G1 of one panel was brought to overlap with the third edge G3 of an other panel in side by side relation, and in such a way that the protruding lip on the third edge G3 was supported not only by the protruding lip on the first edge G1, but also by the supporting plate A on the fitting 1 (fig. 3). The fittings 1 were placed so that one fitting was placed substantially in the middle of the first edge G1 (and substantially in the middle of the third edge G3). Another fitting was placed substantially in the connection of the second edge G2 and the fourth edge G4 as seen in fig. 6 a, and thereby supporting four panels.

[0030] By installing the ceiling panels as explained above each panel was installed by use of only two fittings (or two screws) as seen in fig. 2 and fig. 7.

[0031] The final panels to finish the ceiling were adapted to face the walls by cutting like the first panels and fastened with a lath.

[0032] In fig. 7 the fittings 1 are fastened to laths attached to the basic ceiling. Hereby it is possible to increase the distance between the basic ceiling and the upper surface of the panels when desired. Furthermore, it is easier to attach the fittings to a wooden lath than to the basic ceiling, when this is made from concrete.

Claims

1. A set of ceiling panels comprising a plurality of substantially identical panels, each panel being substantially rectangular and having a first and a second major surface opposite to each other and four edges each having a length defined as the distance between the two corners of the panel separating the edge from other edges, each edge having one or more lengthwise protruding lips and/or one or more lengthwise grooves along substantially the whole length of the edge, said four edges two and two being substantially identical to each other and the one or more lengthwise lips and/or one or more lengthwise grooves along substantially the whole length of the edges of a first pair of said pairs of edges being substantially complementary to the one or more lengthwise lips and/or one or more lengthwise grooves along substantially the whole length of the edges of the second pair of said pairs of edges, said first pair of edges and said second pair of edges, respectively, being substantially perpendicular to each other.

2. A set of ceiling panels according to claim 1, **CHARACTERIZED in that** each ceiling panel is shaped substantially as a rectangle having four edges, each of said edges having an upper portion and a lower portion, where the upper portion is the part of the edge being closer to the surface that faces the basic ceiling than the lower portion, a first and a third edge of said four edges are mutually parallel and a second and a fourth edge of said four edges are mutually parallel, said first and second edge, respectively, have a protruding lip in the longitudinal direction on the lower portion of the edge, said lip being shaped to overlap with a protruding lip in the longitudinal direction on the upper portions of the third and fourth edge, respectively, of another panel of said set of panels.
3. A set of ceiling panels according to claim, **CHARACTERIZED in that** said first edge of the ceiling panels further comprises a mounting groove substantially in the middle of the edge in the longitudinal directions.
4. A set of ceiling panels according to any one of the preceding claims, **CHARACTERIZED in that** the edges of each of said ceiling panels are shaped so that a protruding lip on the first edge overlaps with a protruding lip on the third edge of another panel of said set of panels, and a protruding lip on the second edge overlaps with a protrusion on the fourth edge of a further panel of said set of panels, when the panels are installed in close contact in a side by side relationship.
5. A method of installing a set of ceiling panels according to any one of claims 1 to 4 comprising a plurality of substantially identical panels to a basic ceiling, said method comprising the following steps:
 - i) installing a first ceiling panel by attaching it to the basic ceiling in a desired position with mounting means,
 - ii) installing a second ceiling panel by bringing it into side by side contact with the first ceiling panel, whereby a protruding lip on the edge of said second ceiling panel overlaps a protruding lip on said first ceiling panel, and attaching said second ceiling panel to the basic ceiling with fastening means,
 - iii) installing the remaining panels of said set of panels one by one by bringing each of the panels into side by side contact with one or two already mounted neighbouring panels, wherein a protruding lip on the one or two edges is brought into contact with edges of neighbouring panels overlapping a protruding lip on the respective edges of neighbouring ceiling panels.
6. A method according to claim 5, wherein the set of panels is as defined in claims 2-4, said method comprising the steps of bringing the first edge of one of the panels of the set of panels in contact with the third edge of a neighbouring panel, and bringing the second edge of the one panel in contact with the fourth edge of a neighbouring panel.
7. A method of installing a set of ceiling panels according to claims 5 or 6, **CHARACTERIZED in that** said fastening means are nails, screws, cramps, clamps, bolt, rivets, glue, adhesive tape or a fitting.
8. A method of installing a set of ceiling panels according to claims 5, 6 or 7, **CHARACTERIZED in that** said fastening means are fittings adapted to fit in a mounting groove in the first edge of the ceiling panels.
9. A set of ceiling panels according to any one of claims 1-4, **CHARACTERIZED in that** the panels are sound absorbing panels.
10. A set of ceiling panels according to any one of the preceding claims, **CHARACTERIZED in that** said panels are made from man-made vitreous fibres, preferably mineral fibres.

FIG. 1A

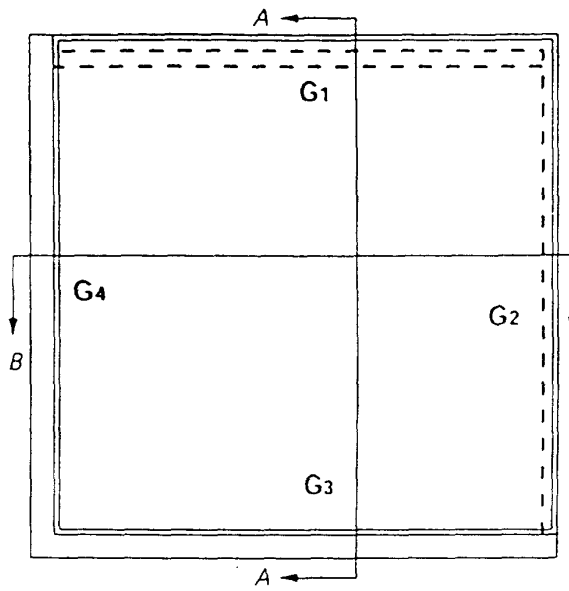


FIG. 1B

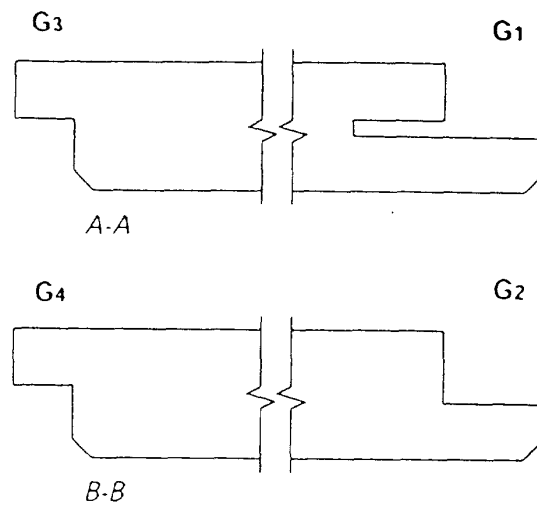


FIG. 2

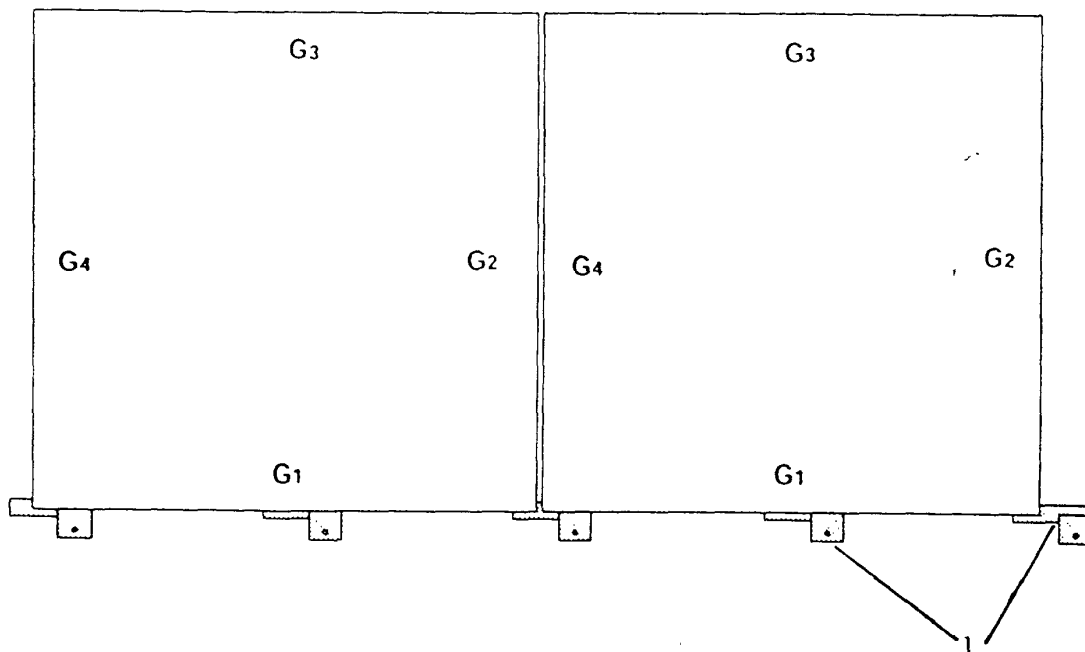


FIG. 3

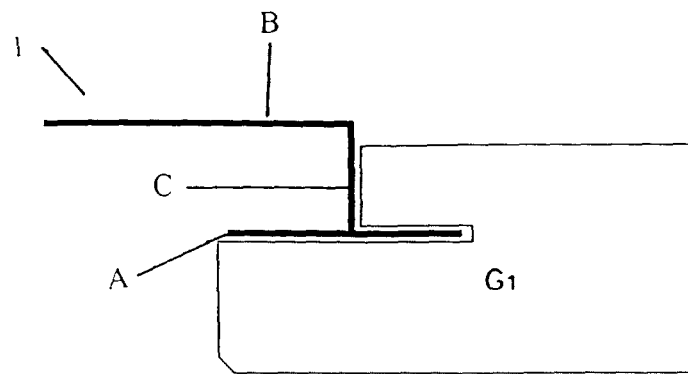


FIG. 4

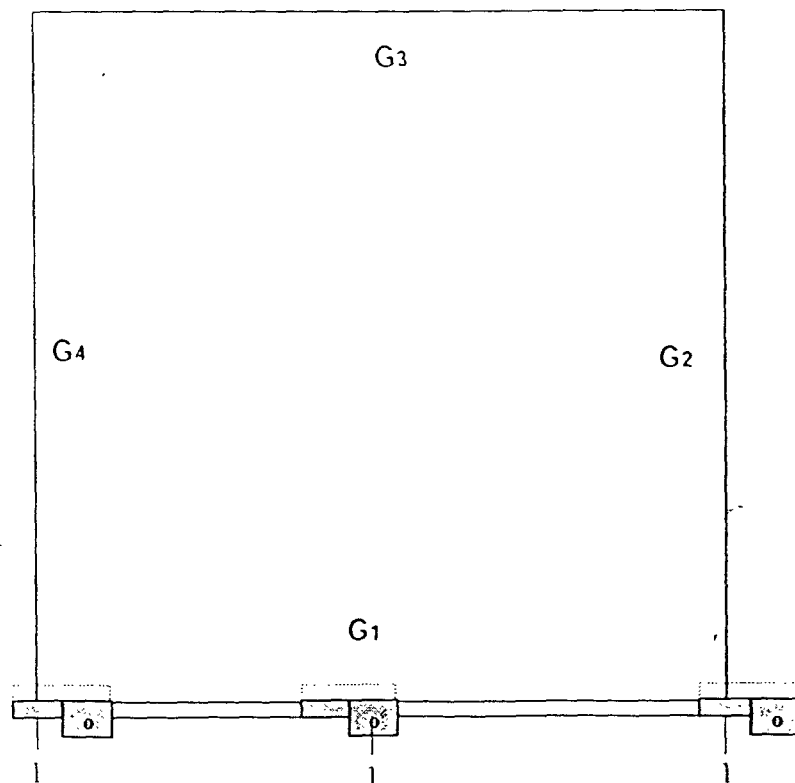


FIG. 5

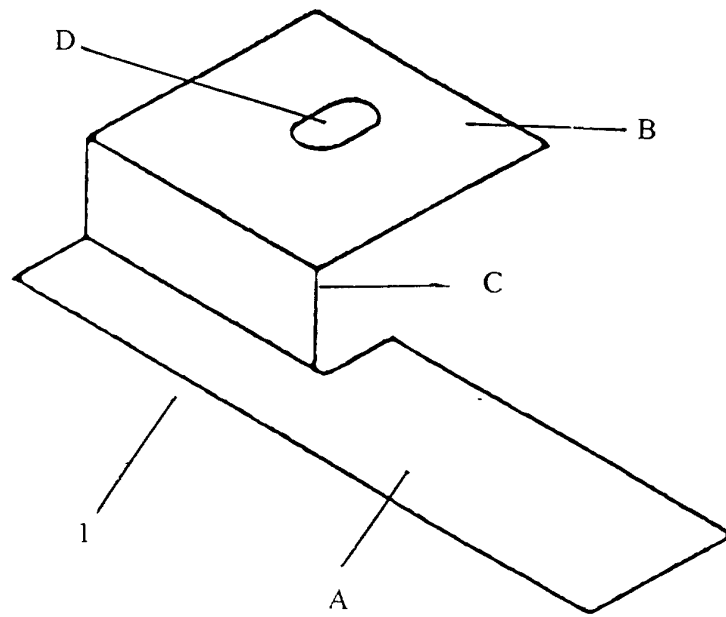


FIG. 6A

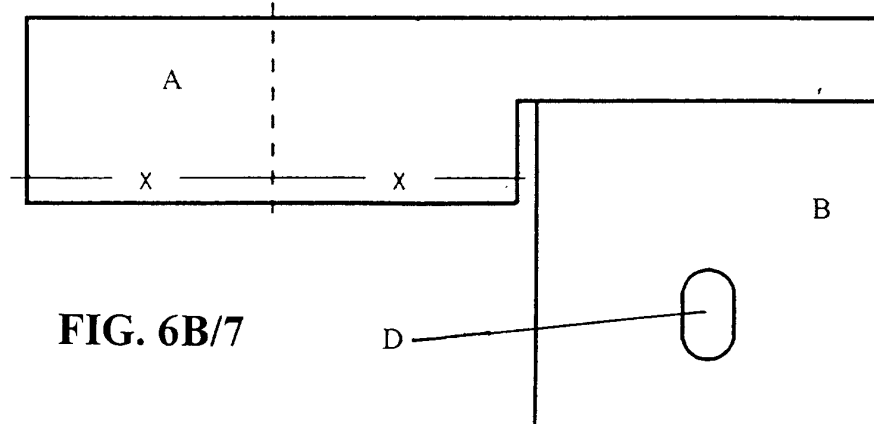
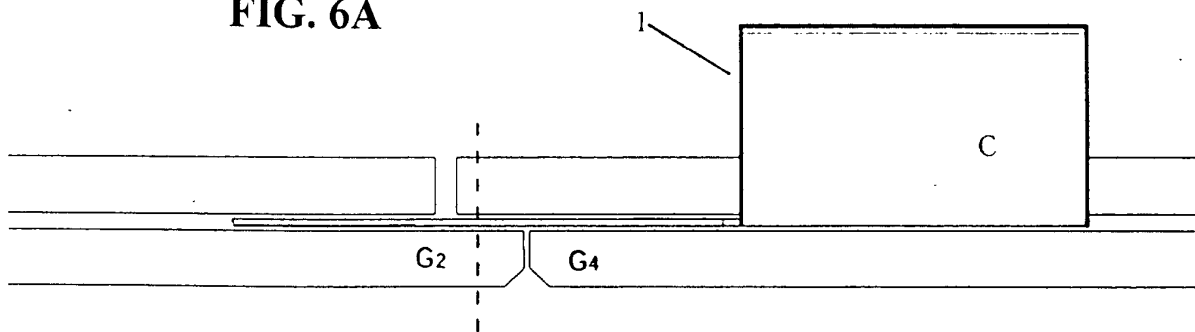


FIG. 6B/7

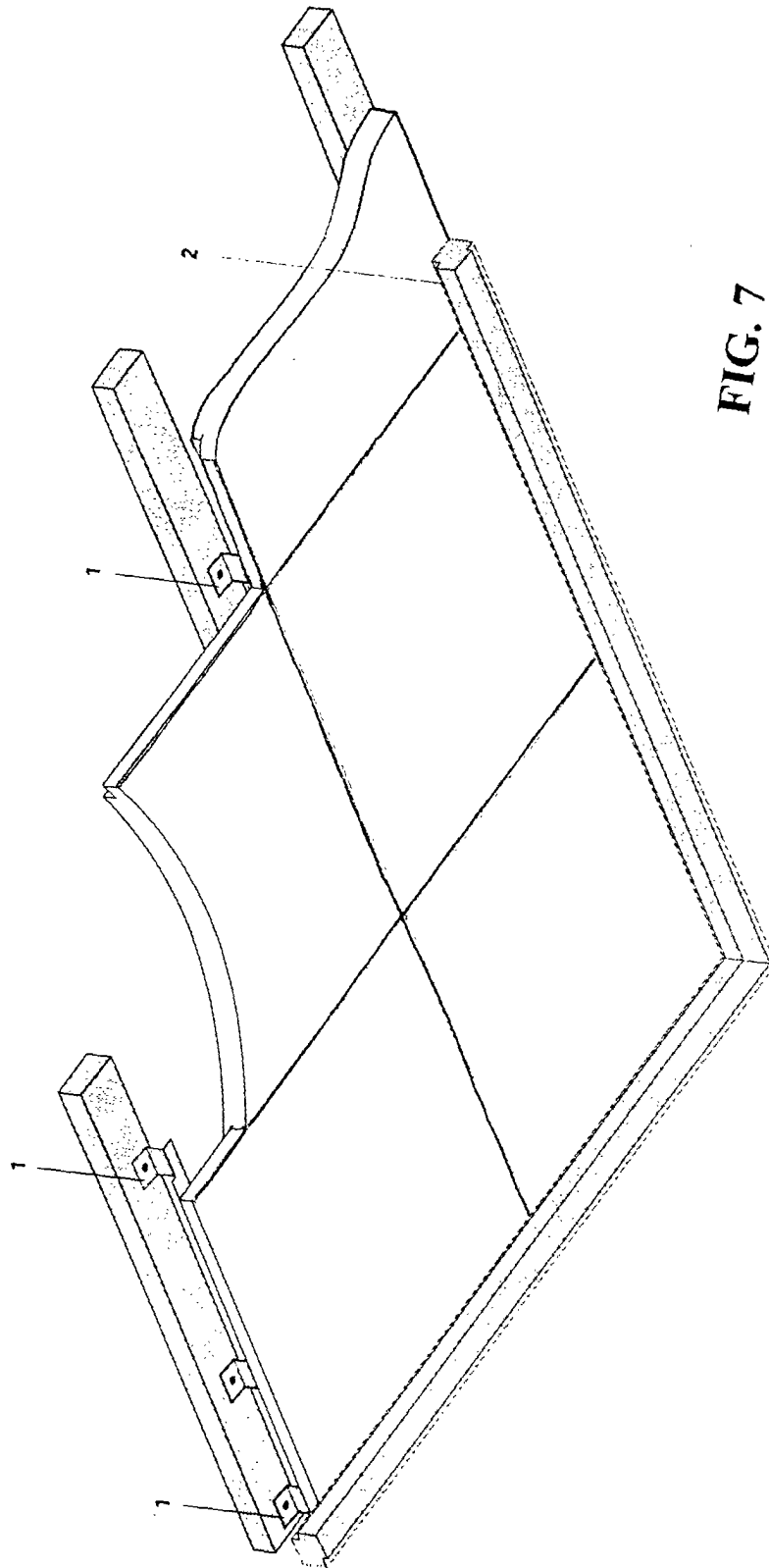


FIG. 7



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 00 61 0028

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
X	FR 1 035 821 A (GUGLIERMINA) 31 August 1953 (1953-08-31)	1-8	E04B9/04
Y	* page 2, column 1, line 9 - column 2, line 40; figures 1,2,4,5 *	9,10	
Y	WO 98 05830 A (KABUSHIKI KAISHA YAMAKICHI) 12 February 1998 (1998-02-12) * abstract; figures 1,2 *	9,10	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E04B
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 21 July 2000	Examiner Mysliwetz, W
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 00 61 0028

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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21-07-2000

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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WO 9805830 A	12-02-1998	JP 10196002 A	28-07-1998
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