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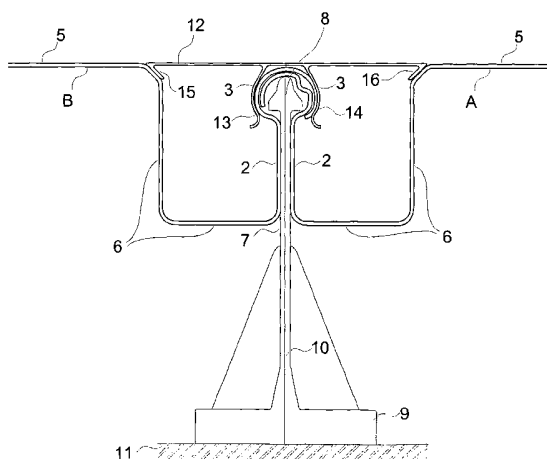
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(54) Title: COMBINATION OF TWO BUILDING MEMBERS, A RETAINING ELEMENT AND A BRIDGING ELEMENT



(57) Abstract: The invention relates to a combination of two building members (A, B) wherein the building members comprise upstanding flanges on opposite sides and an intermediate portion between the upstanding flanges where the upstanding flanges have a curved portion at their free end and a retaining element, wherein the retaining element comprises a head portion, a base for securing to a support member and a web portion joining the head portion to the base portion, wherein the head portion supports at least the curved portion of one upstanding flange on one building member (A) and one upstanding flange on the other building member (B) and wherein the combination further comprises a bridging element extending at least partially between building member (A) and other building member (B) over the head of the retaining element, wherein the curved portion of one upstanding flange on one building member (B) closely surrounds the curved portion of the upstanding flange of the other building member (A) and the bridging element comprises depending parts which closely surround the curved portions of the upstanding flanges.



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

COMBINATION OF TWO BUILDING MEMBERS, A RETAINING ELEMENT AND A BRIDGING ELEMENT

The present invention relates to a combination of two building members (A ,B) wherein the building members comprise upstanding flanges on opposite sides and an intermediate portion between the upstanding flanges where the upstanding flanges have a curved portion at their free end and a retaining element, wherein the retaining element comprises a head portion, a base for securing to a support member and a web portion joining the head portion to the base portion, wherein the head portion supports at least the curved portion of one upstanding flange on one building member (A) and one upstanding flange on the other building member (B) and wherein the combination further comprises a bridging element extending at least partially between building member (A) and other building member (B) over the head of the retaining element. The present invention also relates to such a combination when used in a roof and/or façade construction for a building.

An example of a building member (or members) for use in roof sections, wall sections and the like is disclosed in GB-2167464. The building member has an upstanding flange on both sides, both of which in use are supported by the head portions of retaining elements. An intermediate portion is present between the upstanding flanges. The intermediate portion of the building member is substantially flat. The retaining element has a head portion, base portion and a web portion that connects the head portion to the base portion. The base portion is for attaching to a support member such as a girder or a roof beam.

An example of a combination of two building members, a retaining element and bridging element is disclosed in JP-11-247368-A. The building members have upstanding flanges on each side and a raised portion between the upstanding flanges. The upstanding portions have curved portions at their free ends. The retaining element has a head portion against which the curved portion of an upstanding flange from each building member is supported. A bridging element extends at least partially between the building members and over the head of the retaining element.

It is an object of the present invention to provide an improved combination of two building members, a retaining element and bridging element.

It is a further object of the invention to provide a combination of two building members, a retaining element and bridging element having a compact and stable connection between the building members, retaining element and bridging element.

One or more of the objects of the invention is achieved by a combination of two

building members (A, B) wherein the building members comprise upstanding flanges on opposite sides and an intermediate portion between the upstanding flanges where the upstanding flanges have a curved portion at their free end and a retaining element, wherein the retaining element comprises a head portion, a base for securing to a support member and a web portion joining the head portion to the base portion, wherein the head portion supports at least the curved portion of one upstanding flange on one building member (A) and one upstanding flange on the other building member (B) and wherein the combination further comprises a bridging element extending at least partially between building member (A) and other building member (B) over the head of the retaining element, characterised in that the curved portion of one upstanding flange on one building member (A) closely surrounds the curved portion of the upstanding flange of the second building member (B) and the bridging element comprises depending parts which closely surround the curved portions of the upstanding flanges.

The combination of the invention has a central point, i.e. the head of the retaining element which connects all four elements of the combination and provides a compact and stable connection between the elements. This enables the bridging element to be both fastened accurately and firmly and also enables easy removal for e.g. maintenance, cable or pipe laying and replacement if necessary.

The raised portion of the building members preferably extends to a height substantially equal to or greater than the height of the upstanding flange or flanges and at least partially conceals from view the upstanding flange(s) that are supported on the retaining element, any cables, pipes, lighting means etc. and the retaining element itself. The appearance of the outer surface of e.g. a roof made using the building members thereby becomes one of a substantially non-ridged surface. The raised portion of the building member also preferably extends across at least half of the intermediate portion.

The raised portion of the building members preferably extends to a height substantially equal to the height of the upstanding flanges. The appearance of the outer surface of e.g. a roof made using the building members thereby becomes one of a substantially non-ridged surface and the amount of material required to make the building member is reduced.

The upstanding flanges and connecting portions preferably form channels substantially U-shaped in cross-section for ease of construction. The channel formed by the upstanding flanges and connecting portions may also be, for example, substantially V-shaped in cross-section thereby providing more precise positioning and

guidance of pipes and cables etc. The channel may also be substantially teardrop shaped in cross-section or substantially egg-shaped or substantially circular in cross-section to provide more precise positioning and guidance of pipes and cables etc.

The surfaces of the building members may be provided with a particular surface
5 finish or pattern by, for example, embossing, to provide a durable attractive appearance which is able to withstand weathering etc without a significant deterioration in appearance during its economic lifetime.

The building members are preferably made from metal sheet for its durability and surface appearance and more preferably alloyed aluminium sheet for ease of forming.
10 The metal or alloyed aluminium sheet is preferably roll-formed. The building members may also be made from plastic which is durable and resistant to temperature variations.

The raised portion of the building members may preferably be provided with stiffening means for reducing any residual stresses present in the building member.
15 The portion may be stiffened using for example a composite material such as a metal/plastic laminate or a metal/plastic/metal laminate. The portion may also be stiffened using material in for example honeycomb or waved form. The stiffening material is preferably applied below the raised portion so it is not visible.

The bridging element may be at a height equal to or greater than the height of
20 the raised portions of the two building members. The bridging element may be raised above the height of the raised portions of the two building members to increase the visibility of the light from light emitting means in the channels.

The bridging element may extend from the raised portion of one building member over the head of the retaining element to the raised portion of the other
25 building member to reduce the amount of water that enters the channel.

The bridging element preferably extends straight across between the raised portions of the building elements at substantially the same height as the raised portions of the building elements, thereby giving the outer surface of the combination a substantially smooth or non-ridged appearance.

30 The bridging element may also e.g. curve over the retaining element from the raised portion of building member A over the head of the retaining element to the raised portion of building member B to provide an attractive outer surface appearance.

The bridging element may be made from a different material to that of the building members or may be provided with a different outer surface finish or colour to
35 that of the building members or other bridging elements to provide an attractive surface appearance.

The bridging element is preferably made from metal to provide strength and resilience and more preferably from alloyed aluminium. The bridging element may be extrusion formed which provides a cost-effective method of production.

At least the upper surface part of the bridging element may be covered with a layer of material. The upper surface of the bridging element is the surface facing away from the retaining element. This gives the option of providing attractive surface finishes different from those achievable by extrusion forming. The layer of material is preferably made from the same material as the building sheets are made from, so a uniform appearance results.

The material is preferably wrapped around the bridging element thereby avoiding the need for fixing means such as screws, pins etc.

Several bridging elements may be positioned at intervals along the length of a building member and a single piece of the layer material may cover more than one bridging element and extend between bridging elements. This reduces the number of bridging elements required whilst still providing an attractive outer appearance and sufficient fixation for the layer material.

The present invention also relates to a roof or façade construction for a building comprising a combination.

The present invention is described further by way of example with reference to the accompanying schematic drawings in which:

Figure 1 shows a cross section through a building member which may be used in the combination of the invention.

Figure 2 shows a cross section through a cladding system for roofs or walls comprising a combination of two building members, a retaining element and a bridging element according to the invention.

Figure 1 shows building member A comprising two upstanding flanges 2 on opposite sides of the building member. The upstanding flanges have curved portions 3 at their free end. The curved portions are of different sizes and one upstanding flange extends slightly higher than the other. The intermediate portion 4 of the building member extends between the upstanding flanges. The intermediate portion comprises a raised portion 5 and connecting portions 6 which connect the upstanding flanges to the raised portion. In the particular embodiment shown in figure 1 the height h_2 of raised portion 5 is substantially equal to height h_1 of the highest upstanding flange. The height h_2 of the raised portion 5 may be substantially equal to or greater than half the height of the upstanding flange 2 h_1 , i.e. $h_2 = (h_1/2)$. If the flanges are of different heights the height of the upstanding flanges is taken to be the height h_1 of the taller

upstanding flange. An upstanding flange 2 and a connecting portion 6 form a channel substantially U-shaped in cross-section in the particular embodiment shown in Figure 1. These channels can act as receptacles for items such as cables and pipes for e.g. electricity provision or solar installations such as for electricity generation or water heating. The channels can also act as receptacles for lighting means for providing external illumination. In the particular embodiment shown in Figure 1 the raised portion 5 of the building member extends across more than half of the intermediate portion 4.

Figure 2 shows a combination of two building members A and B, a retaining element 7 and a bridging element 12 which make up a cladding system for roofs or walls. Only one of the upstanding flanges 2 from each building member is shown. The upstanding flanges have curved portions at their free end 3. The intermediate portion comprises a raised portion 5 and connecting portions 6 which connect the upstanding flanges to the raised portion. Only one connecting portion 6 is shown for each building member A and B. Retaining element 7 comprises a head portion 8, a base 9 for securing to a support member 11 and a web portion 10 joining the head portion 8 to the base portion 9. The curved portions 3 of the upstanding flanges 2 of the building members curve closely around the head portion 8 of the retaining element 7. The curved portion 3 of the building member B closely surrounds or overlaps the curved portion 3 of the upstanding flange 2 of the building member A. The curved portion 3 of the upstanding flange 2 of the building member A may also support the curved portion 3 of the upstanding flange 2 of the building member B. A bridging element 12 extends between the raised portions 5 of building members A and B. In the particular embodiment illustrated in Figure 2 the bridging element 12 does not extend higher than the raised portions 5 of the building members A and B. The bridging element 12 has depending parts 13,14 which closely surround or clip onto the overlapping curved portions 3 of the upstanding flanges 2 and attach the bridging element. In the particular embodiment illustrated in Figure 2 the bridging element 12 also has means 15,16 for improving the fixing of the bridging element and preventing it turning. The means 15,16 are positioned at the sides of the bridging element and depend at an angle from the bridging element and abut a correspondingly angled upper part of the connecting portions, where the upper part of the connecting portion adjoins the raised portion of the building element.

The building members may be made from metal or plastic. The metal used is preferably an aluminium alloy e.g. AA3004. The building members A,B may be formed by roll forming or folding or a combination of both. The upstanding flanges 2 may be of different heights. If the flanges are of different heights the height of the upstanding

flanges is taken to be the height of the taller upstanding flange.

The channels formed by the upstanding flanges and the connecting portions may be substantially U-shaped, V-shaped, teardrop shaped, egg-shaped or circular in cross-section.

5 The surfaces of the building members A, B may be decorated or provided with an attractive finish by e.g. embossing.

The raised portion of the building members A, B may be stiffened. The portion may be stiffened using for example a composite material such as a metal/plastic laminate or a metal/plastic/metal laminate. The portion may also be stiffened using
10 material in for example honeycomb or waved form. The stiffening material is preferably applied below the raised portion so it is not visible.

The bridging element 12 may not extend fully across the gap between the raised portions of building members A and B.

The bridging element may be raised above the height of the raised portions of
15 building members A and B or may be at a height equal to or greater than the height of the raised portions of building members A and B. At least part of the bridging element may be below the raised portions of building members A and B.

The bridging element may e.g. curve over the retaining element from the raised portion of building member A over the head of the retaining element to the raised
20 portion of building member B or may extend straight across.

The bridging element may be made from a different material to that of the building members or may be provided with a different outer surface finish or colour to that of the building members or other bridging elements. Bridging elements of different finishes or colours can be for example alternated in a roof or façade structure to
25 provide an unusual and eye-catching appearance.

The bridging element may be extrusion formed and is preferably made from an aluminium alloy. At least the upper surface part of the bridging element may be covered with a layer of material. The upper surface of the bridging element is the surface facing away from the retaining element. The layer of material may be the
30 same material as the building members are made from in order to provide a uniform appearance. The layer of material may be wrapped around the upper surface of the bridging element.

The bridging elements may be elongate up to the same length as the building members or may be considerably shorter than the building members. Several bridging
35 elements may be positioned at intervals along the length of a building member and a single piece of the layer material may cover more than one bridging element and

extend between bridging elements.

The building members and/or bridging elements may be tapered or curved or a combination of both.

Multiple combinations according to the invention can be used to form a large
5 smooth area of roof or wall.

In the figures the building members and retaining element are shown in the positions they would be in when positioned on a roof in a substantially horizontal position. The height h_1 of the upstanding flange is the distance from the base of the upstanding flange to the furthest extension of the upstanding flange. The base of the
10 upstanding flange is the point at which the upstanding flange joins the connecting portion 6. The flanges may be of different heights in which case the height of the upstanding flanges is taken to be the greater of the two heights. The height h_2 of the raised portion is the elevation of the raised portion 5 from the deepest part of the channel 12 formed by the connecting portions 6.

15 Having now fully described the invention, it will be apparent to one of ordinary skill in the art that many changes and modifications can be made without departing from the scope of the invention as herein described.

CLAIMS

1. Combination of two building members (A,B), wherein the building members
comprise upstanding flanges (2) on opposite sides and an intermediate portion
5 (4) between the upstanding flanges where the upstanding flanges have a curved
portion (3) at their free end, and a retaining element (7), wherein the retaining
element comprises a head portion (8), a base (9) for securing to a support
member and a web portion (10) joining the head portion to the base portion,
10 wherein the head portion supports at least the curved portion (3) of one
upstanding flange (2) on one building member (A) and one upstanding flange (2)
on the other building member (B) and wherein the combination further
comprises a bridging element (12) extending at least partially between building
member (A) and other building member (B) over the head (8) of the retaining
15 element (7), characterised in that the curved portion (3) of one upstanding flange
(2) on one building member (B) closely surrounds the curved portion (3) of the
upstanding flange (2) of the other building member (A) and the bridging element
(12) comprises depending parts (13,14) which closely surround the curved
portions (3) of the upstanding flanges (2).
- 20 2. Combination according to claim 1, wherein the raised portion (5) of the building
members (A, B) extends to a height substantially equal to or greater than the
height of the upstanding flanges (2).
3. Combination according to claim 2, wherein the raised portion (5) of the building
25 members (A, B) extends to a height substantially equal to the height of the
upstanding flanges (2).
4. Combination according to any one of claims 1 to 3 wherein the upstanding
flange (2) and connecting portions (6) of the building members (A, B) form a
30 channel substantially U-shaped, V-shaped, teardrop shaped, egg-shaped or
circular in cross-section.
5. Combination according to any one of the preceding claims, wherein the surfaces
35 of the building members (A, B) may be provided with a particular surface finish
or pattern.

6. Combination according to any of the preceding claims, wherein the raised portion (5) of the building members (A, B) is provided with stiffening means.
7. Combination according to any of the preceding claims, wherein the building members (A,B) are made from a metal sheet, preferably an aluminium alloy sheet.
8. Combination according to claim 7, wherein the building members (A,B) are manufactured by roll-forming the metal sheet.
9. Combination according to any of the preceding claims, wherein the bridging element (12) extends from the raised portion (5) of one building member (A) over the head (8) of the retaining element (7) to the raised portion (5) of the other building member (B).
10. Combination according to any of the preceding claims, wherein the bridging element (12) does not extend higher than the raised portions (5) of the building members (A,B).
11. Combination according to claim 10, wherein the bridging element (12) extends straight across between the raised portions (5) of the building elements (A,B) at substantially the same height as the raised portions (5) of the building elements (A,B).
12. Combination according to any of the preceding claims, wherein the bridging element (12) is at least partially covered with a layer of material.
13. Combination according to any of the preceding claims, wherein the bridging element is made from metal and is preferably made by extrusion forming.
14. Roof construction for or on a building comprising the combination according to any of the preceding claims.
15. Façade construction for or on a building comprising the combination according to any of the preceding claims.

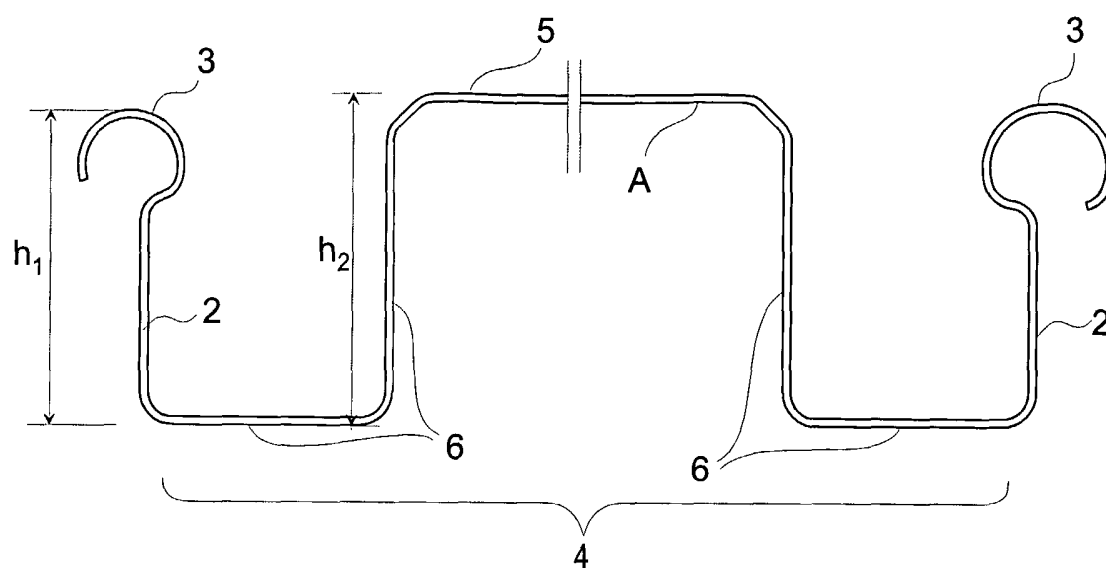


FIG. 1

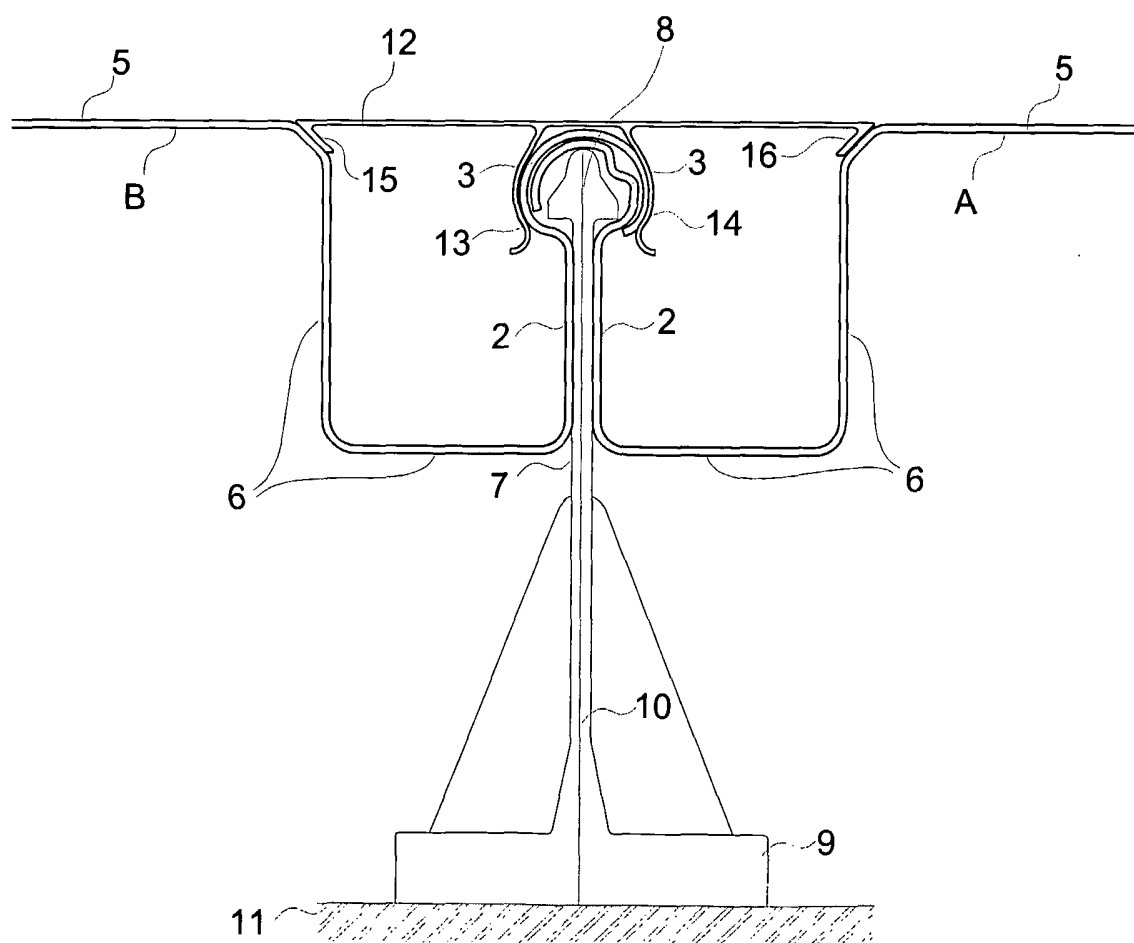


FIG. 2

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/008963

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E04D3/362 E04D3/366 E04F13/12 E04F13/08

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)

IPC 7 E04D 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 practical, search terms used)

EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	PATENT ABSTRACTS OF JAPAN vol. 1999, no. 14, 22 December 1999 (1999-12-22) -& JP 11 247368 A (GANTAN BEAUTY IND CO LTD), 14 September 1999 (1999-09-14) abstract; figures 1,8	1
A	PATENT ABSTRACTS OF JAPAN vol. 016, no. 021 (M-1201), 20 January 1992 (1992-01-20) -& JP 03 235862 A (DAIDO STEEL SHEET CORP), 21 October 1991 (1991-10-21) abstract; figures 2B,6	1
A	GB 2 167 464 A (KAISER ALUMINIUM EUROP) 29 May 1986 (1986-05-29) figures 2,3	1



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

* Special categories of cited documents:

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

E earlier document but published on or after the international filing date

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O document referring to an oral disclosure, use, exhibition or other means

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

11 November 2004

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INTERNATIONAL SEARCH REPORT

formation on patent family members

International Application No

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Patent document cited in search report		Publication date	Patent family member(s)		Publication date
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