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(11) **EP 1 580 346 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
28.09.2005 Bulletin 2005/39

(51) Int Cl.7: **E04D 3/362, C09D 127/18**

(21) Application number: **04077734.4**

(22) Date of filing: **08.10.2004**

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IT LI LU MC NL PL PT RO SE SI SK TR**
Designated Extension States:
AL HR LT LV MK

(71) Applicant: **Corus Bausysteme GmbH**
56070 Koblenz (DE)

(72) Inventors:
• **The inventor has agreed to waive his entitlement
to designation.**

(74) Representative:
van der Donk, Henricus Matheus et al
Corus Technology BV
P.O.Box 10000
1970 CA IJmuiden (NL)

(54) **Elongate retaining element**

(57) The invention relates to an elongate retaining element made from an aluminium alloy for joining building sheets, which retaining element having, in plane perpendicular to its direction of elongation, a head part for engaging building sheets whereby in use the free end of a building sheet is flanged along the head part, a base part for mounting the elongate retaining element on a

support structure, and a connecting flange extending upwardly in use from said base and joining the head part to said base, wherein substantially the whole elongate retaining element is provided with an anodised coating or layer impregnated with a fluorinated hydrocarbon compound.

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Description

[0001] The present invention relates to an elongate retaining element for building sheets e.g. for a roof or façade, which elongate retaining element having, in plane perpendicular to its direction of elongation, a head part for engaging building sheets whereby in use the free end of a building sheet is flanged along the head part, a base part for mounting the elongate retaining element on a support structure, and a connecting flange extending upwardly in use from said base and joining the head part to said base. The present invention further relates to an assembly of at least one such elongate retaining element and at least one building sheet mounted thereby on a support structure.

[0002] An example of such an elongate retaining element is known from Dutch patent no. NL-190292. The known elongate retaining element comprises an elongate extruded aluminium "upside-down-T"-shaped profile. As seen in cross section perpendicular to its direction of elongation, the cross bar of the "upside-down-T"-shaped profile forms the base section, which is provided with holes for connecting elements such as screws passed through the holes to connect the elongate retaining element to a supporting structure of a building, such as for example supporting beams, T-bars or similar structural elements manufactured from for example timber, steel, aluminium or concrete. An engagement section extends perpendicularly from the base section and comprises at its end a wider head section that in this specific example is substantially triangularly shaped in cross section. The free ends of the building sheets are flanged over the head section such as to allow for a longitudinal sliding movement of the building elements relative to the elongate retaining element. The known elongate retaining elements can be an "upside-down" T-shape, asymmetrically shaped, or it can even be an L-shape.

[0003] Another elongate retaining element is known from EP-0983409 whereby the head parts is joined in such a way that it is free to move relative to the support structure.

[0004] The known retaining elements are formed wholly from aluminium alloy which is a good heat conductor, and typically made from an extruded AA6xxx-series alloy. When using the known retaining elements a colder outer temperature and a warmer inner temperature leads to the possible formation of condensation on the interior of the supporting structure as well as heat loss from the interior of the supporting structure. This occurs because the head section of the retaining element is in direct contact with the metal building sheets that are exterior to the support structure. The retaining element as a result cools and also cools the air surrounding it, which reduces the amount of water the air can hold and condensation can form. The condensation formation can lead to multiple problems within the support structure e.g. rotting of organic structures, corro-

sion of metallic structures. The known retaining element acts as a thermal-bridge. It also conducts heat to the interior if the exterior temperature is warmer than that of the interior. This phenomenon can lead to higher energy costs for cooling the building by e.g. air-conditioning.

[0005] To reduce the risk of the occurrence of thermal-bridges between the building sheet and the supporting structure, EP-1236840-A1 and WO-04/022877 disclose each an elongate retaining element made from a solid thermoplastic material which is provided with a metallic reinforcement to provide sufficient mechanical stability. The use of the thermoplastic material results also in a favourable reduction in friction between the building sheets and the head part of the retaining element. A disadvantage of these reinforced plastic retaining elements is that these are more complicated to produce than the elongate retaining elements wholly made from aluminium alloy.

[0006] It is an object of the invention to provide an elongate retaining element that reduces the risk of the retaining element acting as a thermal-bridge between the building sheets and the support structure.

[0007] This object is achieved by the elongate retaining element made from an aluminium alloy for joining building sheets, which retaining element having, in plane perpendicular to its direction of elongation, a head part for engaging building sheets whereby in use the free end of a building sheet is flanged along the head part, a base part for mounting the elongate retaining element on a support structure, and a connecting flange extending upwardly in use from said base and joining the head part to said base, characterised in that substantially the whole elongate retaining element is provided with an anodised coating or layer impregnated in part or in whole with a fluorinated hydrocarbon compound. Preferably the anodised coating or layer is a hard-anodised coating or layer.

[0008] In accordance with the invention it has been found that retaining elements having such a coating have a thermal conductivity depending on the thickness of the coating of 1/10 to 1/30 of the aluminium alloy base material. The aluminium alloy base material has typically a thermal conductivity of nearly 200 W/m.K at room temperature. The significantly reduced thermal conductivity of the retaining element provides in a considerable reduction of problems associated with thermal-bridges, while maintaining the advantages of aluminium alloy for the base material, such as mechanical strength and stability in particular, and aluminium being an accepted construction material.

[0009] When the surface of the aluminium alloy retaining element is being anodised the aluminium surface is converted to aluminium oxide while the retaining element is the anode in an electrolytic cell. The anodic coating protects the underlying metal by serving as a barrier to corrodents. The amorphous aluminium oxide produced by anodising is sealed usually by treating in acidified hot water or a hot dichromate solution. Hard-ano-

dising produces a considerably heavier coating than conventional anodising in a given length of time. The pores of the anodic coating are impregnated before sealing with a fluorinated hydrocarbon compound. The depth of absorption depends on the thickness and porosity of the anodic coating. The fluorinated hydrocarbon compound is preferably one selected from the group comprising of polytetrafluoroethylene (PTFE), tetrafluoroethylene-hexafluoropropylene copolymer (FEP), tetrafluoroethylene-ethylene copolymer (ETFE), polyvinylidene fluoride (PVDF), polyvinyl fluoride (PVF), or polychlorotetrafluoro-ethylene (PCTFE). From this group PTFE is most preferred.

[0010] The fluorinated hydrocarbon is applied using regular techniques for example using a solution or a suspension. Preferably the fluorinated hydrocarbon is applied in the form of particles typically having a particle size of less than 50 nm, and preferably less than 20 nm.

[0011] Preferably the thickness of the anodised coating is in a range of 20 to 80 μm , and more preferably in the range of 35 to 60 μm .

[0012] It will be immediately apparent to the skilled person that the retaining element can be made also from magnesium or magnesium alloys, while achieving the similar advantages.

[0013] In a further aspect of the invention it relates to an assembly comprising at least two building sheets and at least one elongate retaining element according to the invention engaging said building sheet to retain it on a support structure, and whereby the free ends of two adjacent building sheets are flanged one on top of the other along the longitudinal head part of the elongate retaining element.

Claims

1. An elongate retaining element made from an aluminium alloy for joining building sheets, which retaining element having, in plane perpendicular to its direction of elongation, a head part for engaging building sheets whereby in use the free end of a building sheet is flanged along the head part, a base part for mounting the elongate retaining element on a support structure, and a connecting flange extending upwardly in use from said base and joining the head part to said base, **characterised in that** substantially the whole elongate retaining element is provided with an anodised coating or layer impregnated with a fluorinated hydrocarbon compound.
2. A retaining element according to claim 1, wherein the anodised coating or layer is a hard-anodised coating or layer.
3. A retaining element according to claim 1 or 2, wherein the fluorinated hydrocarbon compound is

selected from the group comprising polytetrafluoroethylene (PTFE), tetrafluoroethylene-hexafluoropropylene copolymer (FEP) and tetrafluoroethylene-ethylene copolymer (ETFE), polyvinylidene fluoride (PVDF), polyvinyl fluoride (PVF), or polychlorotetrafluoro-ethylene (PCTFE).

4. A retaining element according to any one of claims 1 to 3, wherein the thickness of the anodised coating is in a range of 20 to 80 micron.
5. An assembly comprising at least two building sheets and at least one elongate retaining element according to any one of claims 1 to 4 engaging said building sheet to retain it on a support structure, and whereby the free ends of two adjacent building sheets are flanged one on top of the other along the longitudinal head part of the elongate retaining element.



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 04 07 7734

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)
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Y	EP 0 311 737 A (WARD BUILDING SYSTEMS LTD) 19 April 1989 (1989-04-19) * column 1, line 2 - column 9, line 16; figure 3 *	1-5	
Y	US 6 500 537 B1 (KUMEGAWA MASAHIRO ET AL) 31 December 2002 (2002-12-31) * column 1, lines 6-19 * * column 4, line 61 - column 29, line 35 *	1-5	
A	GB 2 342 933 A (HOOGO VENS ALUMINIUM BAUSYSTEME) 26 April 2000 (2000-04-26) * the whole document *	1-5	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 16 December 2004	Examiner Vratsanou, V
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P4/C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

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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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16-12-2004

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