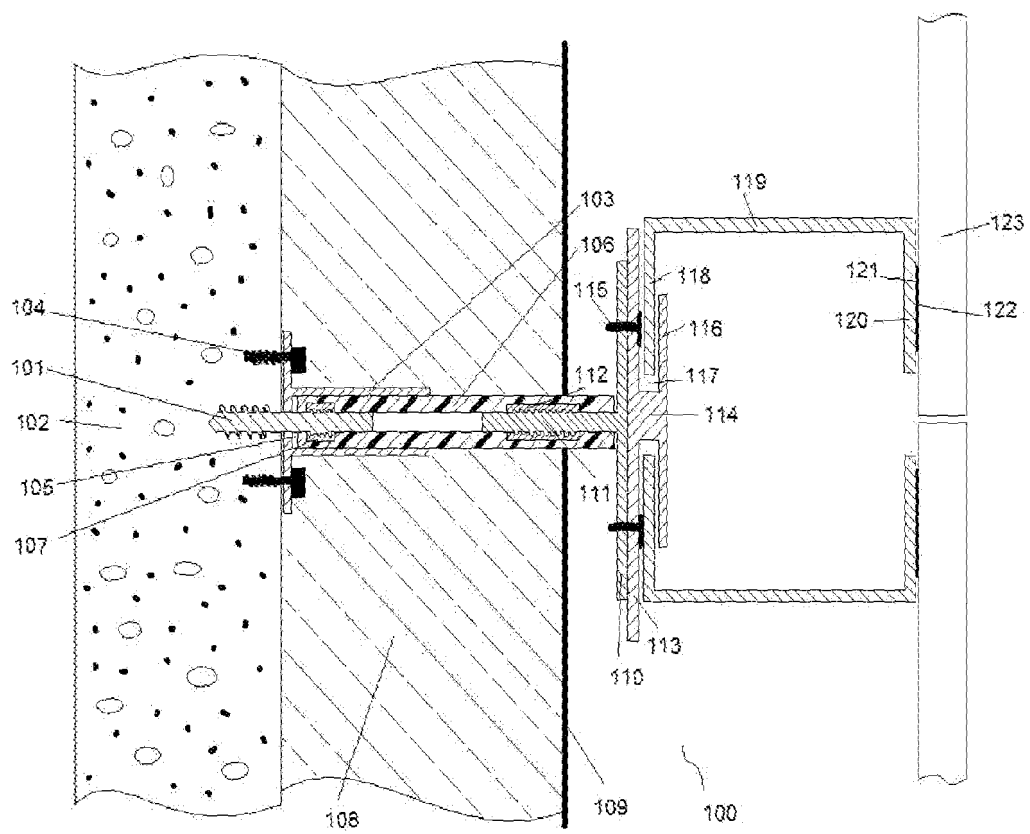






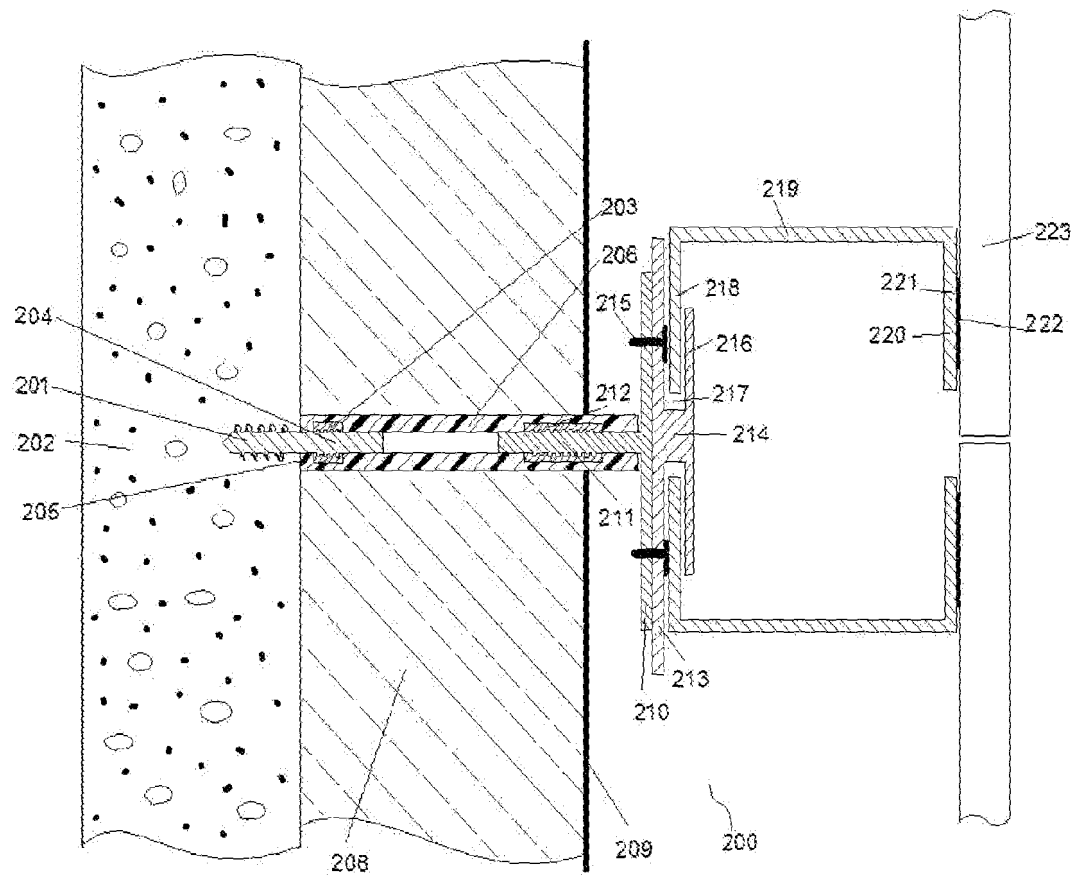


Fig. 2

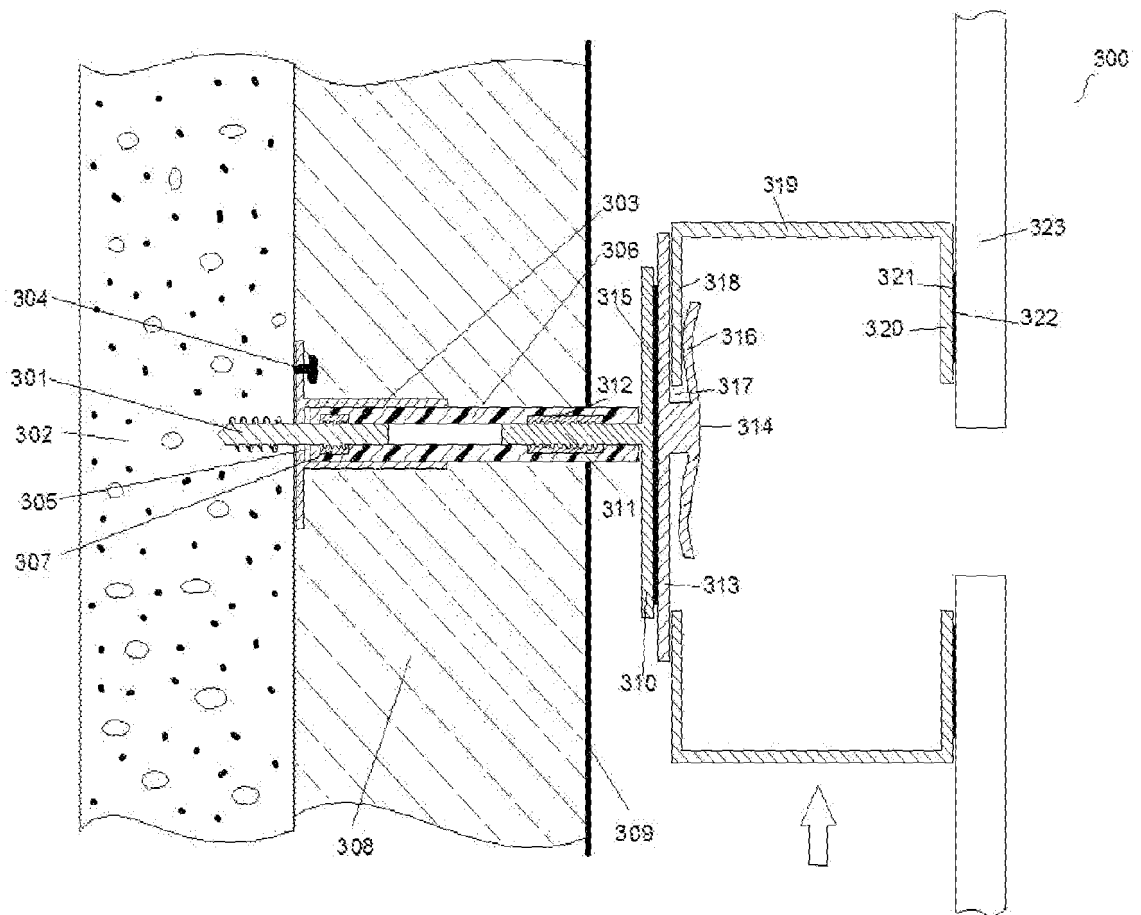


Fig 3

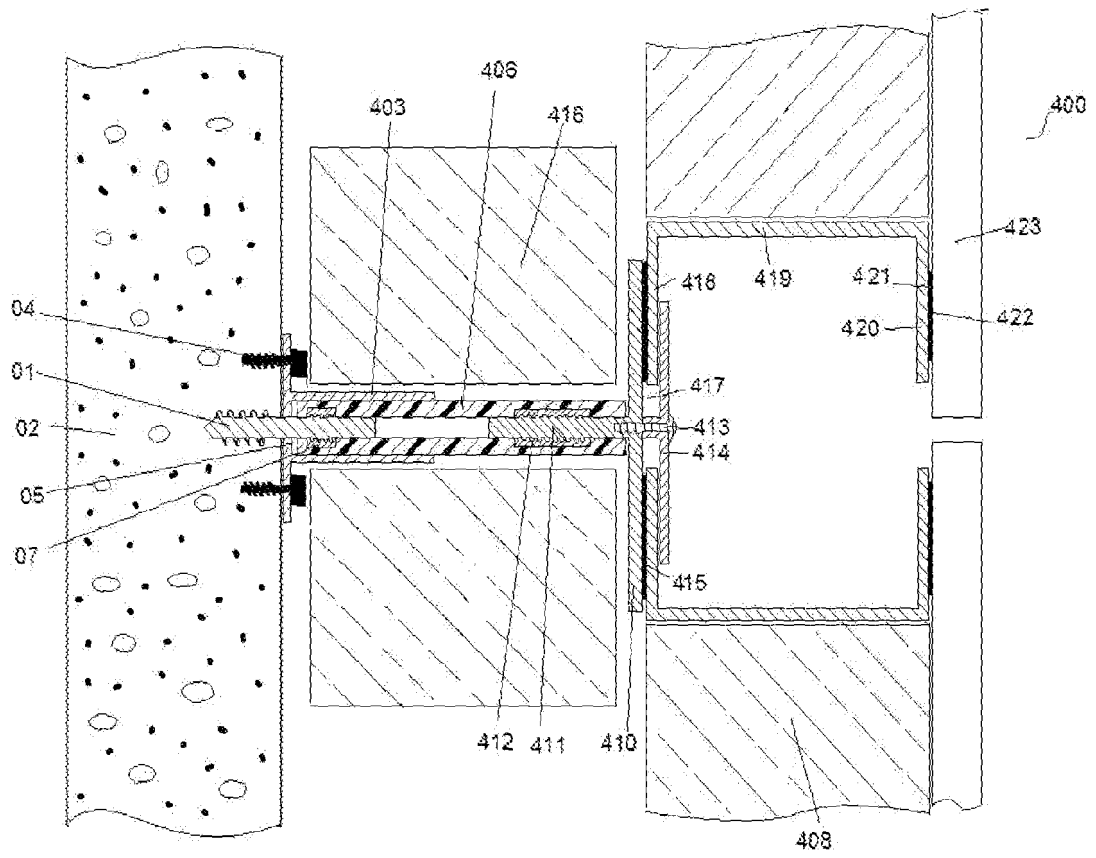


Fig. 4

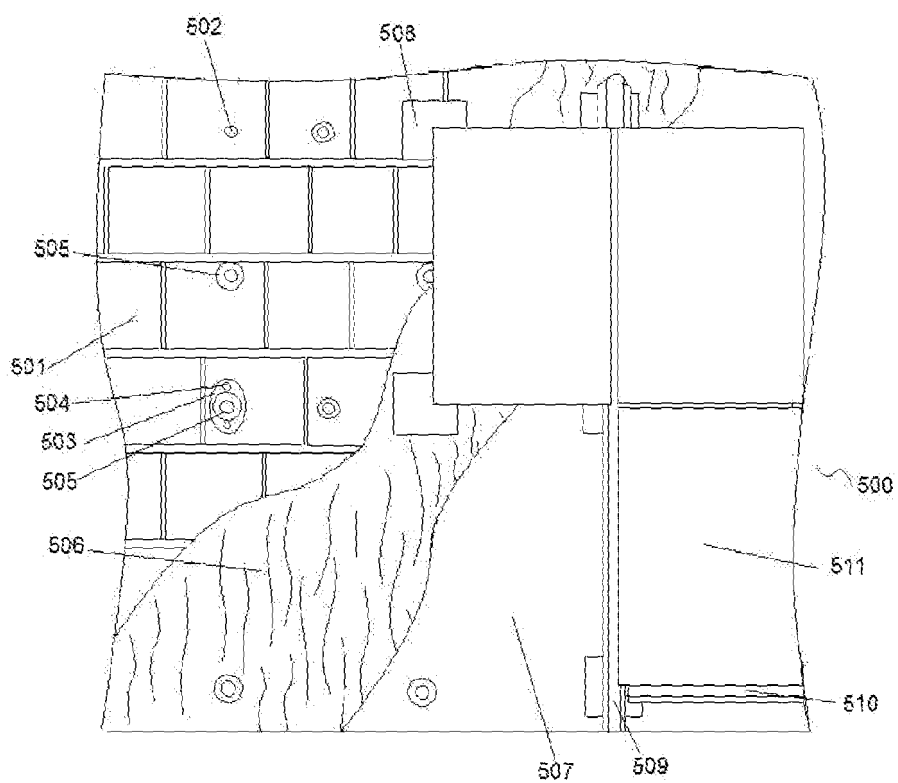


Fig. 5

FIELD OF THE INVENTION

The present invention relates to a façade system and in particular to thermally efficient façade systems.

The invention has been developed primarily for use as a thermally efficient exterior façade cladding system in building construction and will be described hereinafter with reference to this application. However, it will be appreciated that the invention is not limited to this particular field of use.

BACKGROUND OF THE INVENTION

Any discussion of the prior art throughout the specification should in no way be considered as an admission that such prior art is widely known or forms part of the common general knowledge in the field.

Façade systems for new buildings are widely known. Panels of various types of materials, including coated aluminum and polymer composite materials are fixed to a structural frame, generally a metal frame, to provide a weather tight exterior envelope on a building. These systems are effective as providing a weather tight exterior envelope, but provide little or no thermal insulation performance.

Exterior Insulated Foam Systems are known for providing a thermally efficient exterior façade system, whereby a thick insulation layer is formed on the exterior of a building structure and a thin layer of weatherproofing render is applied over a chicken-wire type support mesh attached to the insulation. These systems are more effective at providing thermal insulation performance, but, if the screed is breached, they lose their ability to provide a weather tight exterior envelope resulting in water ingress causing a reduction in thermal performance and possible damage to building structural elements.

It is desirable to provide a thermally efficient façade system that is an easy to install, adjustable, concealed fix, façade system incorporating a thermal conduction discontinuity for minimizing or

substantially eliminating direct thermal conductivity between the façade face and the building structural substrate.

OBJECT OF THE INVENTION

- 5 It is an object of the present invention to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

It is a further object of the invention in its preferred form to provide a thermally efficient façade system as characterized in the claims that follow.

10 SUMMARY OF THE INVENTION

According to the invention there is provided a thermally efficient façade comprising: a building structural substrate; at least two structural support elements; at least two structural spacer elements; an insulating material; at least two support plates; at least two panel retaining elements, each comprising at least one channel formation; at least two panel support elements;
15 and at least one façade panel, wherein each structural support element is fixed to the building structural substrate in a user determined position, each structural support element is connected to a respective structural spacer element, an insulating material is disposed between each façade panel and the structural building substrate, a support plate is connected to each structural support element, a panel retaining element is fixed to at least one support plate, at least two panel support
20 elements are fixed to each façade panel and each façade panel is retained in position by engaging each panel support element with a respective channel formation at least partially formed by a panel retaining element for providing an easy to install, adjustable, concealed fix, façade system incorporating a thermal conduction discontinuity for minimizing or substantially eliminating direct thermal conduction between the façade face and the building structural substrate.

25

Preferably, each said structural spacer element is a hollow tube.

Preferably, each structural spacer element further comprises at least one threaded portion.

Preferably, each threaded portion comprises a nut.

Preferably, each said structural spacer is formed from at least one material selected from the
30 group comprising polymers, fibre reinforced polymer composites, ceramics, wood, wood composites, minerals and mineral filled composites.

Preferably, the invention further comprises at least one support bracket, each support bracket fixable to the structural building substrate for providing additional support for a structural spacer element.

Preferably, each support plate comprises a support surface and a support shaft.

- 5 Preferably, each support shaft comprises a threaded portion.

Preferably, at least one panel retaining element is a “C” channel section.

Preferably, at least one panel retaining element is an “H” channel section.

Preferably, at least one panel retaining element is a “T” section.

Preferably, at least one panel retaining element further comprises a resilient spring formation.

- 10 Preferably, at least one panel retaining element is formed as a continuous section.

Preferably, at least one panel retaining element is formed as a discrete clip.

Preferably, at least one panel support element is a “C” channel section.

Preferably, at least one spacer element is positioned between at least one said structural support element and said structural building substrate.

- 15 Preferably, at least one façade panel is a fibre cement panel.

BRIEF DESCRIPTION OF THE DRAWINGS

A preferred embodiment of the invention will now be described, by way of example only,

With reference to the accompanying drawings in which:

- 20 Figure 1 is a (cross-sectional view) of a thermally efficient façade according to one aspect of the invention,

Figure 2 is a cross-sectional view of a thermally efficient façade according to a further aspect of the invention,

- 25 Figure 3 is a cross-sectional view of a thermally efficient façade according to a further aspect of the invention,

Figure 4 is a cross-sectional view of a thermally efficient façade according to a further aspect of the invention, and

Figure 5 is a partial cut-away front view of a thermally efficient façade system according to one aspect of the invention.

PREFERRED EMBODIMENT OF THE INVENTION

Referring to the drawings, a thermally efficient façade according to one aspect of the invention is shown in Figure 1, where façade 100 comprises an array of structural support elements 101 fixed to building structural substrate 102 in user determined positions, support bracket 103 is mounted
5 over the protruding part of at least some of structural support elements 101 and fixed in place by mounting bolts 104 into substrate 102. Optional spacer 105 may then be placed over each structural support 101 before structural spacer elements 106 are fed into the central aperture of each support bracket 103 and onto a respective structural support element 101 and rotated to releasably engage first threaded portion 107 with a threaded portion on structural support
10 element 101. Each structural spacer element 106 is tightened against optional spacer 105, if used, and support bracket 103.

Once support brackets 103 and structural spacer 106 are installed in their respective positions, insulating material 108 such as fibreglass batt insulation having a predetermined thickness and
15 thermal insulation performance is positioned to cover the wall section to be clad with the façade panels. Insulating material 108 is positioned to butt up against each support bracket and structural spacer, so that no gaps are left that may detract from thermal performance of the completed façade. The length of structural spacer 106 should be sufficient for it to protrude a predetermined distance from the surface of structural building substrate 102 and therefore also
20 from the surface of insulating material 108. Building wrap 109 is optionally installed over the insulating material 108, with minimally sized perforations made to accommodate the protruding ends of structural spacers 106. Alternatively, an insulating material including a building paper surface layer may be used.

25 Support plate 110, essentially having a “T” configuration in cross-section, comprising a support surface and an attached support shaft 111 including a threaded portion can then be connected to structural spacer 106 by inserting shaft 111 into the central aperture of structural spacer 106 and releasably engaging its threaded portion with second threaded portion 112 of structural spacer 106. Support plate 110 may be wound in or out to allow for some variability in the surface of
30 structural building substrate 102 and provide a substantially planar surface for mounting adjacent facade panels. Once adjusted to a desired position, an optional additional nut positioned on shaft

111 may be used to lock support plate 110 at that position and prevent movement during installation of façade panels 123, particularly if using discrete panel retaining elements rather than extruded lengths that may span several support plates 110.

5 Once support plate 110 is in position, retaining element 114 may be fixed to it mechanically by bolts, screws or rivets 115 as shown in Figure 1 and/or chemically by means of an adhesive. Panel support elements 119 are attached to rear face 122 of façade panel 123 in a predetermined position, in this example panel support element 119 is in the form of a “C” channel section and the face of one side arm 120 is chemically bonded by adhesive 121 to rear face 122 of façade
10 panel 123. Side arm 118 of panel support element 119 is inserted into channel 117 formed between flanges 113 and 116 of retaining element 114.

Retaining element 114 may be installed as discrete sections or in continuous channel sections. For example, continuous length sections of retaining element 114 may be installed vertically, and
15 discrete sections may be used as horizontal retaining elements.

As shown in Figure 2, in a further aspect of the invention, at least one structural support element is connected to the structural building substrate without a support bracket. A thermally efficient façade may be constructed where at least some structural spacer elements 206 may be connected
20 directly to a respective structural support element 201, without the need for the use of a structural support bracket 203. This may particularly be the case for structural spacer elements installed at intermediate panel edge positions, rather than corner support positions.

As shown in Figure 3, at least some support brackets 303 may be used that are not directly
25 chemically or mechanically fixed to structural building substrate 302, they are instead held in place by positioning support bracket 303 over structural support 301, positioning structural spacer element 305 over structural support 301, engaging structural spacer element and rotating to releasably engage a threaded portion on structural support 301 with a first threaded portion in structural spacer 303. Tensioning screws 304 may be used to adjust the angle of support bracket
30 303 and thereby also adjust the angle of structural spacer element 306 relative to structural building substrate 302.

Panel retaining element 314 is fixed to support plate 310 by adhesive 315. A portion of flange 316 is biased towards flange 313 forming a restricted portion of channel 317. When side arm 318 of panel support element 319 is urged into the restricted portion of channel 317, flange 316 is resiliently biased away from flange 313 resulting in flange 316 acting as a resiliently biased spring on side arm 318 to retain it in its installed position. Figure 3 shows one panel in an installed position and one panel in position ready to be installed by moving in the direction of the arrow, thereby urging side arm 318 into the restricted portion of channel 317.

Figure 4 shows a cross-sectional view of a thermally efficient façade according to a further aspect of the invention where panel retaining element 414 is a “T” section and channel 417 is formed between support plate 410 and panel retaining element 414. Panel retaining element 414 is fastened through support plate 410 to structural spacer 406 by mechanical fastener 413. Insulating material, 408 is disposed between panel support elements 419. In this aspect of the invention, façade panel units comprising a panel 423, at least two panel support elements 419 and insulating material 408 can be preassembled and delivered to a building site, further reducing the amount of time required on site to complete installation of a thermally efficient façade. Additional insulating material 416 can be installed prior to installing façade panels 423 to fill gaps between insulating material 408 in preassembled façade panel units.

Figure 5 shows a partial cutaway front view of a thermally efficient façade 500 constructed according to one aspect of the invention, wherein structural support elements 502 are fixed to structural building substrate 501, in this case, an existing masonry wall construction. Structural support elements 502 may be bolts, chemical anchors, masonry anchors and the like, that have a portion for engaging the structural building substrate and a portion for engaging at least a structural spacer element. Alternate structural support element 502 in both the horizontal and vertical plane of structural building substrate 501 have a support bracket 503 positioned and fixed to the structural building substrate using bolts 504. Spacer elements (not shown), such as washers, are positioned over each structural support element 502 and a respective structural spacer element 505 engaged and rotated to bring threaded portion of structural support 502 into releasable engagement with a first threaded portion of structural spacer element 505.

Structural spacer elements 505 are formed from non-metallic materials such as glass fibre filled polymers, polypropylene, wood composites, wood, mineral materials, mineral filled polymers, and the like. Any materials with a low thermal conductivity and sufficient structural strength to meet the requirements of static and dynamic loading encountered in installation and in service are suitable.

Structural spacer elements 505 also provide a break in thermal conduction between metal support and retaining elements and the structural support elements 502 fixed to the structural building substrate 501, thereby reducing thermal conduction between the face of the façade 511 and the structural building substrate 501 in the constructed façade.

Insulating material 506 such as glass fibre batts, polystyrene insulating panels or the like, user selectable to meet local building code requirements, are positioned between installed structural spacer elements snugly, so that no large open gaps exist which would detract from the thermal insulation efficiency of the façade. Over the top of the insulating material 506, a building wrap or building paper 507 is installed. Building wrap or building paper is designed to prevent the passage of liquid water but allow for passage of water vapour, thereby allowing a wall cavity to breathe and enable evaporation of any ingressed rain water or condensation.

Each support plate 508 is positioned by engaging a threaded portion on its shaft with a respective second threaded portion of a structural spacer element. The relative distance of the support plate away from the structural building substrate is adjustable by controlling the depth of the engagement of the support plate with the second threaded portion of each respective structural spacer. In this way, any variability in the flatness of the structural building substrate 501 can be taken into account, and the relative height of the support plates 508 can be controlled.

Once the height of each support plate 508 has been set, the panel retaining elements 509, 510 can be fixed in position. Panel retaining elements are in the form of continuous extruded aluminum channel "H", "C" or "T" sections that may be fixed chemically or mechanically to support plates 508. In this example, they are glued to the support plates 508 by a suitable construction grade adhesive (not shown). At least one channel in each panel retaining element may comprise at

least one resiliently biased arm, for providing additional frictional support to an installed façade panel.

Once panel retaining elements 509, 510 are in place, panel support elements are either chemically or mechanically fixed to the rear face of each façade panel 511. In Figure 5, panel support elements are not shown. Panel support elements, in the form of extruded aluminum “C” channel sections may be adhered to the rear face of each façade panel, with the opening of the “C” facing towards the edge. A minimum of two panel support elements are required to fix a panel into a desired position within the façade construction. Generally four panel support elements are used, each adhered to the rear face of a panel, and each adjacent an edge. Optional additional supports may be used in intermediate positions to improve properties such as wind loading and for stiffening of very large panels. Once these are fixed in position, each non-fixed side arm of each “C” channel panel support element may be engaged with a respective panel retaining element 509, 510 to secure the panel into a desired, and user selectable position.

The central flange of the “C” channel section may be perforated to allow ventilation of at least the portion between the insulating material 506 and rear face of each installed façade panel 511.

The use of continuous section panel retaining elements allows for construction of a weather tight façade system, where any water that ingresses through the panel joint positions, is contained within the channels formed by the flanges of the panel support elements and the panel retaining elements.

Panel support elements may be connectable to a respective panel retaining element by urging a panel support element into contact with a resiliently biased arm of a panel retaining element, forcing the resiliently biased arm to open sufficiently to admit the panel support element into the channel in the “H”, “C” or “T” section and retaining it in that position via a resiliently biased spring action.

It will be appreciated that the illustrated thermally efficient façade provides an easy to install, adjustable, concealed fix, façade system incorporating a thermal conduction discontinuity for

minimizing or substantially eliminating direct thermal conductivity between the façade face and the building structural substrate.

Although, the invention has been described with reference to specific examples, it will be
5 appreciated by those skilled in the art that the invention may be embodied in many other forms, which are envisioned within the scope of the claims.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A thermally efficient façade comprising:

a building structural substrate;

at least two structural support elements;

at least two structural spacer elements;

an insulating material;

at least two support plates;

at least two panel retaining elements, each comprising at least one channel formation;

at least two panel support elements; and

at least one façade panel,

wherein each structural support element is fixed to the building structural substrate in a user determined position, each structural support element is connected to a respective structural spacer element, an insulating material is disposed between each façade panel and the structural building substrate, a support plate is connected to each structural spacer element, a panel retaining element is fixed to at least one support plate, at least two panel support elements are fixed to each façade panel and each façade panel is retained in position by engaging each panel support element with a respective channel formation at least partially formed by a panel retaining element for providing an easy to install, adjustable, concealed fix, façade system incorporating a thermal conduction discontinuity for minimizing or substantially eliminating direct thermal conduction between the façade face and the building structural substrate.

2. A thermally efficient facade according to claim 1 wherein each said structural spacer element is a hollow tube.

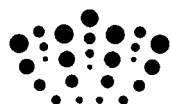
3. A thermally efficient façade according to claim 2, each structural spacer element further comprising at least one threaded portion.

4. A thermally efficient façade according to claim 3, wherein each threaded portion comprises a nut.

5. A thermally efficient façade according to any one of the preceding claims, wherein each said structural spacer is formed from at least one material selected from the group

comprising polymers, fibre reinforced polymer composites, ceramics, wood, wood composites, minerals and mineral filled composites.

- 5 6. A thermally efficient façade according to any one of the preceding claims, further comprising at least one support bracket, each fixable to the structural building substrate for providing additional support for a structural spacer element.
7. A thermally efficient façade according to any one of the preceding claims, wherein each support plate comprises a support surface and a support shaft.
8. A thermally efficient façade according to claim 7, wherein each support shaft comprises a threaded portion.
- 10 9. A thermally efficient façade according to any one of the preceding claims, wherein at least one panel retaining element is a “C” channel.
10. A thermally efficient façade according to any one of claims 1 to 8, wherein at least one panel retaining element is an “H” channel.
11. A thermally efficient façade according to any one of the preceding claims, wherein at least one panel retaining element further comprises a resilient spring formation.
- 15 12. A thermally efficient façade according to any one of the preceding claims, wherein at least one panel retaining element is formed as a continuous section.
13. A thermally efficient façade according to any one of claims 1 to 11, wherein at least one panel retaining element is formed as a discrete clip.
- 20 14. A thermally efficient facade according to any one of the preceding claims, wherein at least one panel support element is a “C” channel section.
15. A thermally efficient façade according to any one of the preceding claims, wherein at least one spacer element is positioned between at least one said structural spacer element and said structural building substrate.
- 25 16. A thermally efficient façade according to any one of the preceding claims, wherein at least one façade panel is a fibre cement panel.
17. A thermally efficient façade substantially as herein described with reference to the accompanying drawings.



Application No: GB1122059.7

Examiner: Eleanor Wade

Claims searched: 1 to 17

Date of search: 20 April 2012

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A	-	GB2460961 A KINGSPAN see whole document
A	-	GB2449360 A KINGSPAN see whole document
A	-	CH666310 A SCHAER see figures and abstract
A	-	GB2454006 A AMARI PLASTICS see whole document
A	-	FR2779467 A OWENS CORNING ISOLATION FRANCE see figures and abstract

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Field of Search:

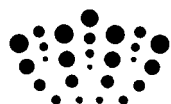
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The following online and other databases have been used in the preparation of this search report

EPODOC, WPI



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Subclass	Subgroup	Valid From
E04B	0002/88	01/01/2006
E04F	0013/08	01/01/2006