

WALL MODULE AND FAÇADE ASSEMBLY

FIELD OF THE INVENTION

[0001] The present invention relates to a module and facade assembly for forming an internal or external wall façade cladding.

BACKGROUND TO THE INVENTION

[0002] In the construction industry, external and internal facades are both expensive, time consuming and labour intensive in their installation, maintenance, and repair where necessary. A significant portion of overall project cost can be attributed to a building's facades.

[0003] Current versions of external facades are prone to damage during their installation, and post installation during maintenance and general building cleaning activities.

[0004] Current Façade facade assemblies are designed to be permanently fixed to a structure, and have not been designed for simple or easy removal, and typically are not capable of recycling or re-use to any great effect.

[0005] When an individual façade panel located within a combination of other facades on a building is damaged, the process of replacement and/or repair is extremely time consuming, costly, and often dangerous depending on its location (e.g. external facades on high rise commercial and/or apartment buildings).

OBJECT OF THE INVENTION

[0006] The present invention seeks to address or ameliorate one or more of the above problems.

[0007] Other preferred objects of the present invention will become apparent from the following description.

SUMMARY OF INVENTION

[0008] In one aspect, there is provided a module for a wall including a frame for supporting a façade panel on a supporting structure, the frame including a male section with an elongate strip on one edge and a female section with a groove to receive an elongate strip of an adjoining module.

[0009] In one embodiment, the male and female sections are connected by a joiner which is fastened to both sections.

[0010] In one embodiment, the joiner includes two arms which are angled relative to each other, each arm being received in a corresponding recess in the associated male and female sections.

[0011] In one embodiment, the frame includes a joiner at each corner of the frame.

[0012] In one embodiment, the male and female sections include a track for mounting a component with a ledge to support a façade panel.

[0013] In one embodiment, the module includes the component.

[0014] In one embodiment, the frame includes two male sections forming an upper profile and side profile of the frame.

[0015] In one embodiment, the frame includes two female sections forming a lower profile and side profile of the frame.

[0016] In one embodiment, the frame includes a strut between the upper and lower profiles, the strut providing support to a façade panel.

[0017] In one embodiment, the module includes interface units that fit into channels provided in the upper and lower profiles, the interface unit interface units being interconnected with the strut at top and bottom ends of the strut to secure the struts relative to the profiles.

[0018] In one embodiment, the module includes facade sub-board attached to the strut for holding the façade panel.

[0019] In one embodiment, one or more attachment clips are fixed to the façade sub-board for supporting the façade panel.

[0020] In one embodiment, the one or more attachment clips include a projecting tab for mechanical attachment to the façade panel.

[0021] In one embodiment, the façade sub-board includes holes around a perimeter to receive fasteners for securing the façade panel to the frame. Preferably, the sub-board includes holes which align with one or more supporting struts to receive fasteners.

[0022] In one embodiment, the module includes a rail attachment profile for connecting the frame to a supporting structure.

[0023] In one embodiment, the module includes two rail attachment profiles.

[0024] In a larger embodiment, a module may include 3 or more rail attachment profiles.

[0025] In one embodiment, the male section has a rebated end to accommodate a strip of an adjoining frame.

[0026] In one embodiment, a rear side of the male section includes an integrated clip for receipt of a fixture for locking the module to the supporting structure.

[0027] The clip, which could be plastic, metal or other appropriate material, locks a module in place by bracing against a corresponding module within a facade assembly formed of multiple adjoining modules. When the clip is removed from the groove on the rear of the male section, a module can be moved in a vertical direction, fixing the alignment of the modules.

[0028] In one embodiment, the groove in the female section is made to accept a seal insert to waterproof the connection between a corresponding male section, and female section of an adjoining module.

[0029] In one embodiment, the groove includes internal notches to match with external ridges of the insert to hold the insert in place.

[0030] In one embodiment, the module further includes the façade panel.

[0031] In another aspect, there is provided a facade assembly of interconnected modules as described above, wherein the strip of a first module is received in the groove of a female section of an adjoining second module.

[0032] In one embodiment, the frame of the first module is fixed to the supporting structure such that the strip of the first module projects partially into the groove of the female section of the adjoining second module.

[0033] In one embodiment, the groove of the female section of the second module defines a space between the strip and a base of the groove which allows the first module to be disconnected from the supporting structure and the strip to be pushed into the space in order to provide clearance for the first module to separate from the supporting structure and other adjoining modules for independent removal of the first module from the supporting structure.

[0034] This allows for the removal of a single module within the façade assembly for the purpose of replacement/repair where necessary, without the need to completely disassemble a module assembly.

[0035] In one embodiment, the other adjoining modules have respective male and female sections which inter-fit with adjacent panels to form a grid of modules.

[0036] In one embodiment, the connected modules and associated inter-fitting male and female sections of the grid provide a waterproof wall.

BRIEF DESCRIPTION OF THE DRAWINGS

[0037] The invention is more fully described, by way of non-limiting example only, with reference to the following drawings, in which:

Figure 1 is an exploded perspective view of a module;

Figure 2a is a top view of a bracket;

Figure 2b is a rear view of the bracket;

Figure 2c is a side view of the bracket;

Figure 2d is a partial perspective view of the bracket;

Figure 3a is a front view of a joiner;

Figure 3b is a cross-sectional view of the joiner, taken along the line A-A shown in Figure 3a;

Figure 3c is an end view of the joiner;

Figure 3d is a perspective view of the joiner;

Figure 4a is a front view of a male section;

Figure 4b is a cross-sectional view of the male section;

Figure 4c is a rear view of the male section;

Figure 4d is a partial perspective view of the male section;

Figure 4e is a perspective view of the panel lock clip;

Figure 4f is a side view of the panel lock clip;

Figure 5a is a top view of a female section;

Figure 5b is a cross-sectional view of the female section;

Figure 5c is a front view of the female section;

Figure 5d is a rear view of the female section;

Figure 6 is a profile view of a seal insert;

Figure 7 is a perspective view of a frame with a façade panel;

Figure 8 is a side view of the panel of Figure 7;

Figure 9 is a rear view of the panel;

Figure 10 is a cross-sectional view of the complete module;

Figure 11 is a front view of a façade sub-board;

Figure 12a is a side view of the façade sub-board;

Figure 12b is an enlarged section of the view of Figure 12a;

Figure 13a is a front view of an attachment clip;

Figure 13b is a side view of the attachment clip;

Figure 13c is a perspective view of the attachment clip;

Figure 14 is a cross sectional view of a component for supporting the façade panel on the frame;

Figure 15 is a perspective view of a facade assembly including multiple interconnected modules;

Figure 16 is a cross-sectional view of the facade assembly, showing two interconnected modules;

Figure 17 is an enlarged view of the cross-section of Figure 16;

Figure 18 is a profile view of a modified component;

Figure 19 is a cross-sectional view of another façade assembly; and

Figure 20 is an enlarged view of the cross-section of Figure 19.

DETAILED DESCRIPTION

[0038] Figure 1 is an exploded perspective view of a module 1 which includes a frame 2 formed of a male section 3 and a female section 4 forming upper and lower profiles 5, 6 of the module 1. An identical male section 7 and female section 8 form side profiles 9, 10.

[0039] Joiners 11 are provided to connect the male sections 3, 7 and the female sections 4, 8.

[0040] The female sections 4, 8 have respective grooves 12 which house a seal 13.

[0041] Two rail attachment profiles 14 are provided at a rear side 15 of the frame 2. A front side 16 of the frame 1 includes a façade sub-board 17 for attaching a façade panel 18. The façade sub-board 17 supports attachment clips 19 which include tabs 20 for fixing the façade panel 18 onto the frame 2.

[0042] The frame 2 also has struts 21 formed of an elongate body 22 and interface unit interface unit 23 to anchor the struts 21 to the male section 3 and female section 4.

[0043] The facade sub-board 17 preferably forms part of the module 1 but may be omitted if the façade panel 18 is fixed directly to the frame 2.

[0044] Also, the struts 21 provide structural support for the façade panel 18 but may be optional, depending on the weight of the façade facing material of panel 18 and the size dimensions of the frame 2.

[0045] The module 1 preferably also includes a component 24 with a ledge 25 to support the façade facing material of the panel 18 as well as providing an additional surface for mechanical attachment when a material is folded over the angle. The component 24 slides into tracks 26 provided in the front face of the female component 4 and the male component 7.

[0046] Figure 2 shows one of the rail attachment profiles 14 as having a top flange 27 with a hook 28 and a lower flange 29 extending from elongate body 30. The body 30 has a series of holes 31 for fixing the bracket 14 across the side profiles 9, 10 of Figure 1.

[0047] Figure 3 shows a joiner 11 as including two arms 32 arranged at 90 degrees. The arms 32 have holes 33 for fixing the joiner 11 to the respective male and female sections 3, 4, 7 and 8 of Figure 1, however the joiner 11 may be attached by any other suitable means such as welding, gluing or a combination of all. The arms 32 may also be arranged at angles other than 90 degrees depending on installation requirements and configuration of the frame 2. For example, the frame 2 may be triangular and for that purpose the arms 32 might be angled at 60 degrees.

[0048] Figure 4 shows the male section 3 as having an elongate body 40 with fixture holes 41 along a lower part 42 and pre-drilled holes 43 through a mid-section 44. One end 45 of the section 3 is angled and the other end 46 includes a partial angle 47 and a rebate 48 with an extension 49. A strip 50 projects from the mid-section 44, along the length of the body 40.

[0049] As shown more clearly in Figure 4b, the male section 3 is formed as an extrusion with the strip 50 projecting upwardly from the mid-section 44. The mid-section 44 also has an integrated clip 51 on a rear side 52 of the section 3. A front side 54 of the male member 3 includes tracks 55, which are of the same profile as tracks 26 formed in the female section 4 of Figure 1.

[0050] The section 3 includes an open channel 56 formed in the bottom part 4, which receives the interface unit 23 of Figure 1, and a recess 57 for insertion of the joiner 11 of Figure 1.

[0051] Referring now to Figure 5, the female section 4 is shown as also having an elongate body 60 with holes 61 in a lower part 62 and fixing holes 63 in a mid-section 64. The section 4 has an angled end 65 and an extended portion 66.

[0052] As illustrated in Figure 5b. in particular, a top part 67 of the section 4 includes adjacent fingers 68 that define the groove 12 therebetween. The groove 12 has notches 69. The section 4 also has tracks 26 on a front side 70. The lower part 62 includes an open channel 71, which receives the interface unit 20 of Figure 1, and a recess 72 for insertion of the joiner 11 of Figure 1.

[0053] Referring now to Figure 6, the seal 13 is shown in cross-section. The seal 13 includes two legs 80 extending from a base 81. The legs 80 terminate with side strips 82 and define an entry 83 between return lips 84. The entry 83 leads into an internal space 85. Locating ribs 86 are provided on the exterior 87 of the legs 80.

[0054] The seal 13 is shaped for insertion in the groove 12 of Figure 5b such that the ribs 86 lock into the notches 69 of Figure 5b in order to secure the seal 13 in the female section 4.

[0055] Figure 7 shows an assembled module 1 which includes the frame 2 with a façade facing material 18 attached.

[0056] Figure 8 is a side view of the module 1, showing the rail attachment profiles 14 attached to a rear face 90 of the frame 2 by fasteners 91 and the strip 50 projecting upwardly from the frame 2.

[0057] Figure 9 is a rear view of the module 1. The rail attachment profiles 14 are shown fixed to the side profiles 9, 10, formed by the male section 7 and female section 8. The fasteners 91 of Figure 11 are illustrated in the form of bolts/screws or rivets 92. Additional fasteners 93 are used to secure the rail attachment profiles 14 to the struts 21. Further fasteners 94 fix the sections 3, 4, 7, 8 to the joiners which are not visible as they are internal of the sections 3, 4, 7, 8 located inside the respective recesses 57, 72 (shown in Figures 4b and 5b).

[0058] Figure 10 is a cross-sectional view of the module 1, showing the male section 3 and the female section 4 and the strut 21. The interface unit 23 at the top of the strut 21 is inserted in the channel 56 of the male section 3 and is fixed in place by a fastener 95. The interface unit 23 at the bottom of the strut 21 is likewise fitted into the channel 71 in the female section 4 and fixed in place fastener 95.

[0059] The accessory component 24 is slotted into the tracks 26 and supports the façade panel 18 on the ledge 25. The façade panel 18 is mounted to the facade sub-board 17. The facade sub-board 17 rests on top of an upper shoulder 96 of the component 24 and the attachment clips 19 are attached to the facade sub-board 17 with fasteners 97, such that the tabs 20 project upwardly to further support the panel 18.

[0060] Figure 11 is a front view of the facade sub-board 17. The façade sub-board 17 is in the shape of a square panel 97 with sites 98, however the sub-board may also be a different shape depending on the proposed shape and material finish of a facade panel. Each site 98, which is generally rectangular in shape and is capable of allowing both screwed fixing and glue fixing, has through-holes 99 for receiving the fasteners 97 described with reference to Figure 10. The sites 98 are shown in Figure 12a as having an indent 100 relative to a face 101 of the panel 97, so that the clips 19 of Figure 10, when mounted, are flush with the face 101 the panel 97. The indent 100 is illustrated more clearly in Figure 12b.

[0061] Figure 13 shows one of the clips 19 as including a square-shaped base 102, although the clip may have a different shape such as rectangular depending on application. The base 102 has through-holes 103 that to align with the holes 99 of the facade sub-board 17 shown in Figure 11. The clip 19 is preferably formed of metal and the tab 20 projects from the base 102 to angle outwardly relative to the base 102. The clip 19 is preferably formed of stainless steel although other materials may be used, as required.

[0062] Figure 14 illustrates the component 24. The component 24 includes T-shaped elements 104 extending from one side 105 of a ribbed web 106, at an upper end 107 of the web 106. Struts 108 project from a lower end 109 of the web 106 and the ledge 25 projects from an opposite side 110 of the web 106. The ledge 25 supports the façade panel 18, as described with reference to Figure 10.

[0063] Figure 15 illustrates a facade assembly 200 which includes multiple modules 1. It should be noted the modules 1 need not be square shaped and/or multiple modules of differing shapes and sizes can be used which still lock together in the same manner. The modules 1 are attached to supporting structure 201 in the form of crossbars 202. The modules 1 slot together to form a wall 203 of façade panels 18. The façade assembly 200 works on a 90mm grid basis therefore, the modules 1, or façade frames, are placed at increments of 90mm, whether vertically or horizontally. A larger grid structure may be used, as appropriate.

[0064] Figure 16 shows modules 1 mounted to respective cross bars 202 by the rail attachment profiles 14 which fit over the cross bars 202. The hook 28 of each rail attachment profile 14 extends down a rear side 204 of the respective crossbar 202 to secure the modules 1 in place.

[0065] Figure 17 illustrates a connection between the modules 1, where the strip 50 of the lower module is accepted into the groove 12 of the upper module 1 when it is pressed over the strip 50, through the entry 83 for sealing engagement with the lips 84. In the fixed position, the strip 50 only extends partially into the internal space 85. A spacer 205 maintains a predetermined distance between the modules 1 and thereby the façade panels 18.

[0066] In the facade assembly 200, the lower module 1 is initially locked onto the supporting structure 201, using the rail attachment profile 14 previously described above. The upper module 1 in the panel assembly 200 is locked onto the supporting structure 201 using the rail attachment profile 14. Using the height clearance available by the rail attachment profile 14 relative to the supporting structure 201 crossbars 202, the upper module 1 is then lowered into place so that the strip 50 of the lower module 1 in the panel assembly fits into the groove 12 of the lower profile of module 1 such that the groove 85 is lowered over the strip 50 of the upper module 1.

[0067] The module 1 is then moved sideways to engage with an adjacent module,

[0068] The method of attachment of module 1 within an assembly 200 as described above is one possible method of attachment, another possible method is that module 1 may be inserted diagonally relative to the position of lower and adjacent modules. The rail attachment profile 14 is placed against the crossbars 202 of the supporting structure 201, however is not locked in place yet using the hooks 28. The groove 85 of module 1 is pressed over the strip 50 of the adjacent and lower module of the façade assembly 200, allowing the strip 50 of adjacent and lower modules in an assembly to partially insert into the groove 85 of the upper and lower corners of module 1. The rail attachment profile 14 would then be engaged with the supporting structure 201 and crossbars 202 by placing diagonal pressure to the top right section of module 1, thus engaging the hooks 28 of the rail attachment profile 14. This would engage all attachment methods simultaneously.

[0069] As such, each module 1 is able to be easily and independently removed from the wall 203 without needing to remove any other adjoining modules, when removed in reverse operation to the assembly process.

Figure 18 shows another component 210. The component 210 is designed to allow for an alternate method of fixing a façade material to a module; it can be used for both an aesthetic function, and a structural function, or both simultaneously. The component 210 includes short connection

elements 211 and supporting struts 212 to reduce transmission of cantilevered force on the frame 2.

[0070] Another assembly 220 is shown in Figures 19 and 20, where like parts to those described above are denoted with like reference numerals. The assembly 220 includes modules 1 attached to cross bars 202 via rail attachment profiles 14. A female section 4 of an upper module 1 has a groove 12 to receive a strip 50 of an adjoining male section 3. The accessory component 210 of Figure 18 is attached to the female section 4 to support the façade panel 18. The method of constructing the façade assembly 220 is otherwise the same as that described above.

[0071] The accessory track allows for a different extrusion to slide into the track depending on the different materials and features that have been specified by a designer/architect. This accessory track will use the same attachment method by way of a groove as shown, however the method of mounting the façade material to the accessory track may differ depending on the material (i.e. mechanical fixing v chemical fixing or a combination of both)

[0072] The above described track 26, together with the component 24, 210 and façade material may also be used for a variety of alternate façade facing options; such as the use of lighting panels and/or solar facing panels which are mounted to the Façade sub-frame. The component 24, 210 may be substituted for a variety of different designs which have the same corresponding attachment functions which will connect with the described track 26, depending on the façade material used with module 1 i.e. weight, width of material and whether the material requires additional fixing to reduce risk of damage or shatter.

[0073] The above described facade assembly 200 has been developed to address issues currently prevalent within the construction industry where façade walls in which individual panels are not easily installed or removed for repair. A conventional façade wall is usually a bespoke construction which is expensive, time and labour intensive, prone to damage and not readily repaired and also unsafe for users as a result of both lengthy installations and repair/maintenance.

[0074] The modules of the present facade assembly, on the other hand, are designed to be installed very quickly and very easily, regardless of the panel size, weight or façade face material being used. The facade assembly 200 uses modular components which can fit together easily to form a rain-proof wall.

[0075] The assembly process allows panels to be connected in a variety of patterns, while also allowing for the same panels to be removed and re-used again in a variety of different applications on different buildings.

[0076] In the event façade panels are damaged, the individual panels can simply be removed and replaced very quickly via a reversible method of fixing and assembly; meaning a module with a façade panel can simply be ‘unlocked’ from its position, replaced or repaired, and relocked back into position. This fast and simple process of interchanging panels eliminates the high cost and time-consuming nature of façade panel repair, and significantly reduces risk exposure for users who may be working at height to repair the panels.

[0077] Further, the ability of the modules to be easily removed and re-used in different buildings as part of different combinations of façade panels means that the facade assembly does not produce any on-site waste during the initial assembly, or any subsequent replacement and reassembly; modules are simply unlocked and transported where needed to be used again.

[0078] The male and female section of the facade assembly can also be assembled using an industrial press function in which the corresponding elongated lengths of a male and female section of a façade panel assembly would be sandwiched together using corresponding swage points at the corner of the façade assembly. The material used may be aluminium or steel, or may be any appropriate material which can be used in this scenario. The pressed metal assembly process can be done for a variety of different panel shapes and sizes.

CLAIMS:

1. Module for a wall including a frame for supporting a façade panel on a supporting structure, the frame including a male section with an elongate strip on one edge and a female section with a groove to receive a strip of an adjoining module.
2. The module of claim 1, wherein the male and female sections are connected by a joiner which is fastened to both sections.
3. The module of claims 1 or 2, wherein the joiner includes two arms which are angled relative to each other, each arm being received in a corresponding recess in the associated male and female sections.
4. The module of claim 3, wherein the frame includes a joiner at each corner of the frame.
5. The module of any one of claims 1 to 4, wherein the male section, and the female section each include a track for mounting a component with a ledge to support the façade panel.
6. The module of claim 5, including the component and façade panel.
7. The module of any one of claims 1 to 6, wherein the frame includes two male sections forming an upper profile and side profile of the frame.
8. The module of claim 7, wherein the frame includes two female sections forming a lower profile and side profile of the frame.
9. The module of claim 8, wherein the frame includes struts between the upper and lower profiles, the struts providing support to the façade panel.
10. The module of claim 9, including interface units that fit into channels provided in the upper and lower profiles, the interface units being interconnected with the struts at top and bottom ends of the struts to fix the struts relative to the profiles.
11. The module of claims 9 or 10, including a facade sub-board fixed to the struts for holding façade facing material.

12. The module of claim 11, wherein one or more clips are fixed to the façade sub-board for supporting the façade panel.
13. The module of claim 12, wherein one or more clips include a projecting tab for use as a mechanical supporting method of the façade panel.
14. The module of any one of claims 11 to 13, wherein the facade sub-board includes holes around a perimeter to receive fasteners for securing the façade panel to the frame.
15. The module of any one of claims 1 to 14, including a rail attachment profile for connecting the frame to a supporting structure.
16. The module of claim 15, including at least two rail attachment profiles.
17. The module of any one of claims 1 to 16, wherein the male section has a rebated end to accommodate a strip of an adjoining frame.
18. The module of any one of claims 1 to 17, wherein a rear side of the male section includes an integrated clip track for receipt of a fixture for locking the frame to the supporting structure.
19. The module of any one of claims 1 to 18, wherein the groove in the female section includes a seal insert.
20. The module of claim 18 or 19, wherein the groove includes internal notches to match with external ridges of the insert to hold the insert in place.
21. The module of any one of claims 1 to 20, further including the façade facing material panel.
22. A facade assembly of interconnected modules as claimed in any one of claims 1 to 21, wherein the strip of a first module of a male section is received in the groove of a corresponding female section of an adjoining second module.

23. The facade assembly of claim 21, wherein the frame of the first module is fixed to the supporting structure such that the strip of the first module projects partially into the groove of the female section of the adjoining second module.

24. The facade assembly of claim 22, wherein the groove of the female section of the second module defines a space between the strip and a base of the groove which allows the first module to be disconnected from the supporting structure and the strip to be pushed into the space in order to provide clearance for the first module to separate from the supporting structure and other adjoining modules for independent removal of the first module from the supporting structure.

25. The facade assembly of claim 24 wherein the other adjoining modules have respective male and female sections which inter-fit with adjacent panels to form a grid of modules.

26. The facade assembly of claim 24 wherein the connected modules and associated inter-fitting male and female sections of the grid provide a waterproof wall.