A rectilinear extruded plastic wall forming panel characterized being able to directly connect to next adjoining panels either by sliding adjoining panels together or by pushing them together. Also, if one of the panel walls is to become an exterior wall, it is preferably reinforced, for example with pultruded fiberglass or foamed PVC.
BUILDING WALL STRUCTURES AND THEIR COMPONENTS

FIELD OF THE INVENTION

This invention relates to novel wall structures for housing and other buildings and novel components therefore.

BACKGROUND OF THE INVENTION

More particularly, the invention relates to the creation of a wall structure of confined, poured concrete (which in some cases is or may be fully insulated at the time of the erection), such as illustrated in U.S. Pat. No. 6,212,845 B1.

In such prior art, illustrated by the said U.S. patent, a wall structure was created by wall forming panels indicated at 5 in the said U.S. patent joined by box connectors indicated at 6 in the said U.S. patent.

Because such panels and box connectors were formed from different extrusions it was difficult to match colour of the panels and the box connectors with the result of the wall formed by their connection showed an exterior and interior wall of contrasting colours which was offensive to the eye.

It is one object of the present invention to eliminate this visually undesirable feature.

Another important object of the invention is to eliminate the need for any form of separate connector pieces, such as the prior art box connectors of the said U.S. patent, to connect adjoining wall forming panels. Use of wall-forming panels according to the invention thus reduces, as compared to the prior art, the number of wall-forming components necessary to erect a wall structure, with attendant savings in manufacturing, inventory, installation and other costs. This reduction of components depends on the length of the wall.

It will be understood that the size of the panels used is limited by the ability of the workmen to handle them.

Another important object of the invention is to provide wall panel connections such that the panels can be joined by either vertical sliding assembly or by lateral push snap-fit assembly.

Another object of the invention is to provide panel connections which reduce or block air, vapour, moisture and other agents from seeping into the connection between adjoining panels thereby improving the thermal performance and weather resistance of the connections and wall structures.

These and other features of the invention will become apparent from the following description given with reference to the accompanying drawings in which:

FIG. 1 is a plan view of the panels of the present invention showing the connections between adjoining panels;

FIG. 2a is a cross-section enlargement of one form of connection between adjoining panels wherein a projecting bearing ridge or projection at the entrance to the groove provided to receive the in-turned flange at the end of the next connecting panel;

FIG. 3 is a cross-section enlargement of an alternative form of connection between adjoining panels in accordance with the invention;

FIG. 4 is a broken away perspective view illustrating the assembly of a wall forming panel with other panels by vertical sliding movement;

FIG. 5 is a part diagrammatic cross-sectional view illustrating the assembly of panels through a pushing snap-fit connection.

FIG. 6 is a perspective view of a panel according to the invention for use in making solid concrete walls;

FIG. 7 is a perspective view of a panel similar to the panels shown in FIG. 4 but has an exterior wall reinforced with a layer of pultruded fiberglass;

FIG. 8 is a perspective view of a panel similar to the panels shown in FIG. 4 but has an exterior wall reinforced with pockets of pultruded fiberglass;

FIG. 9 is a perspective view of a panel similar to the panels shown in FIG. 4 but has an exterior wall reinforced with a layer of foamed PVC; and,

FIG. 10 is a cross-section enlargement of an alternative form of connection between adjoining panels in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to FIGS. 1 and 2, the panels 1 illustrated are connected according to the invention with each panel having adjacent one end a groove 2. At the edge of groove 2 is a projecting ridge 3. At the end of each panel 1 opposite to the groove 2, the panel 1 is provided with a short in-turned flange or finger 4 at the end of a projecting arm 5. The projecting arm 5 has a measure of flexibility such that the flange or finger 4 can be flexed outwardly to pass over ridge 3 and snap back into groove 2 (as shown in FIG. 5). Groove 2 is preferably of a depth that there is a gap 2a between the bottom of finger 4 and the bottom of groove 2.

Such flexibility is affected by both the choice of materials as well as the dimensions of the components. For example, for typical substrate materials such as PVC or processed thermoplastic, it has been found that, if the length of arm 5 is in the range of about ½ inch to about 1 inch, and preferably about ⅜ inch, and the thickness of arm 5 is in the range of about 0.08 inch to about 0.1 inch, then adequate flexibility is achieved while retaining sufficient strength and integrity.

When finger 4 is engaged with groove 2, arm 5 presses down on ridge 3 thereby establishing a sealing arrangement therebetween which reduces or blocks the passage of air, vapour, moisture or other agents through the connection. Having a gap 2a between the bottom of finger 4 and the bottom of groove 2 helps to ensure that the sealing arrangement is as tight as possible.

As shown in all Figures except FIG. 3, the ends of fingers 4 and ridges 3 may be rounded. Alternatively, as shown in FIG. 3, they may be angled.

The cooperating shapes of the end 4a of finger 4 and the corner portion 25 of adjacent panel 1 are such that as the two panels 1 are brought into snap-fit connection arms 5 are forced outwardly (as shown in FIG. 5) by wedging action. In the embodiments shown in all Figures (except FIG. 3), this is achieved by providing finger end 4a with a rounded shape and enhanced by providing corner 26 of corner portion 25 with a rounded shape as well. In the embodiment shown in FIG. 3, finger end 4a is provided with an angled, wedge-like shape; ridge 3 may also be provided with a cooperating angled wedge-like shape.

In yet a further embodiment, as shown in FIG. 10, corner portion 25 of panel 1 is provided with an angled face 27 to assist in the wedging action as the two panels 1 are brought into snap-fit connection.

Preferably, the length of fingers 4 is such that when fingers 4 of one panel 1 are brought into initial contact with
the corner portion 25 of a neighbouring panel 1 wedging action may begin immediately as the two panels are snap-fit together.

[0028] Groove 2 and finger 4 define cooperating locking means 30 to resist disconnection of two connected panels 1. In the illustrated embodiments, locking means 30 comprises groove wall or surface 2b (or 2b' in FIG. 3) and finger surface 4b (or 4b' in FIG. 3) oriented perpendicularly to the direction of disconnection (arrow B in FIGS. 2 and 3). Other locking means may be used. In such an arrangement, ridge 3 (or 3') may comprise an upward extension of the groove wall 2b (or 2b').

[0029] In operation, as shown in FIG. 5, adjacent panels 1 may be manually snap-fitted together by moving them together in the direction indicated by arrow A. As fingers 4 engage ridges 3, arms 5 flex outwardly to allow fingers 4 to ride up over ridges 3 and then snap down into grooves 2. It has been found that if the length of fingers 4 is too short, then connected panels 1 may disengage too easily. On the other hand, if the length of the fingers 4 is too great, then it is difficult to achieve a manual snap-fit. For example, in such circumstance, to achieve a snap-fit, tools (such as a pry bar and/or a hammer) may have to be used and in the use thereof one or both panels 1 may be damaged. Or, the mere attempt to force a snap-fit with fingers 4 that are too long may damage fingers 4 and/or arms 5.

[0030] It has been found that for typical substrate materials such as PVC or reprocessed thermoplastic, an arm length for arm 5 in the range of about 1/2 inch to about 1 inch, and preferably about 3/4 inch, and an arm thickness for arm 5 in the range of about 0.08 inch to about 0.1 inch and fingers 4 with a length in the range of about 0.110 inches to about 0.230 inches are workable.

[0031] More preferably, the length of fingers 4 would be in the range from about 0.130 to about 0.160 inches.

[0032] As an alternative to snap-fitting as described above, as shown in FIG. 4, adjacent panels 1 may be connected by vertically sliding them together.

[0033] While the panels 1 shown in FIG. 1 are provided with main concrete receiving compartments 6 and compartments 7 which may contain or be filled with insulating material at the building contractor's choice, it will be understood that the connection of the panels would equally apply to panel 1' shown in FIG. 6 which is provided only with concrete receiving compartments 6. It will be appreciated that, with respect to a wall made of panels 1', if insulation is required, separate insulation may be independently applied, for example to either or both sides of such wall.

[0034] Each of the concrete receiving compartments 6 may be provided with a pair of inwardly projecting and outwardly turned guide members 8 over which may be sleeved a sleeve member 9 (FIG. 1) to provide a channel 10 isolated from concrete poured within the compartments 6 to receive wiring or other services all as shown in U.S. Pat. No. 6,212,845 B1.

[0035] It will be understood that the panel walls 11 or the portions of such walls which confront the concrete receiving compartments 6 will be provided with openings 12 to provide for the ready flow of concrete between adjoining concrete receiving compartments 6 all as shown in the said U.S. patent.

[0036] It will also be understood that the exterior walls 19 of panel 1 (and of panel 1', FIG. 6), may be provided with any requisite coating usually a coextruded coating to protect against ultra-violet rays and the like.

[0037] FIG. 7 shows a panel 13 which is similar to panels 1 except that it has an exterior wall 14 reinforced with a layer 15 of pultruded fiberglass.

[0038] Similarly, FIG. 8 shows the use of pultruded fiber-glass pockets 16 to reinforce an exterior wall 17 of a panel 18 otherwise similar to panel 1.

[0039] Similarly, FIG. 9 shows the use of foamed PVC 20 to reinforce an exterior wall 21 of a panel 22 otherwise similar to panel 1.

[0040] While various preferred embodiments of the present invention have been described herein in detail, it will be appreciated that variations may be made thereto without departing from the spirit of the invention or scope of the appended claims.

1. A wall forming panel comprising an integral elongated encased extrusion of thermal plastic material, said panel having means for connecting to an adjoining panel on two sides thereof, said means comprising an inwardly projecting groove running the length of said panel at each side of said panel adjacent a first end of said panel, and having at each side of said panel a projecting arm having a measure of resiliency provided with an in-turned end or finger running the length of said panel, the arrangement being such that the fingers of said projecting arms are adapted to be received in the grooves of a next adjoining panel either by a sliding or pushing motion, and sealing means to prevent ingress of moisture and other agents into said wells.

2. A wall forming panel as claimed in claim 1 in which said sealing means comprises a projecting ridge adjacent each groove on which the projecting arms of an adjoining connected panel bear.

3. A wall forming panel as claimed in claim 2 in which said projecting ridge is an upward extension of the wall of the groove adjacent said first panel end.

4. A wall forming panel as claimed in claim 3 in which said ridge defines a wedge surface to cant the finger passing over said ridge outwardly from its in-turned position.

5. A wall forming panel as claimed in claim 1 having a wall which is to become an exterior wall when said panel is assembled with other panels reinforced.

6. A wall forming panel as claimed in claim 5 in which said exterior wall is reinforced with pultruded fiberglass.

7. A wall forming panel as claimed in claim 6 in which the pultruded fiberglass is a layer of pultruded fiberglass bonded to said exterior wall.

8. A wall forming panel as claimed in claim 6 in which the pultruded fiberglass comprises pockets of pultruded fiberglass bonded to said exterior wall.

9. A wall forming panel as claimed in claim 5 in which said exterior wall is reinforced with foamed PVC.

10. A wall forming panel as claimed in claim 2 wherein the panel is formed of one of the materials chosen from PVC or reprocessed thermoplastic, the length of the arms is in the range of about 1/2 inch to 1 inch, the thickness of the arms is in the range of about 0.08 inch to about 0.1 inch and the length of the fingers is in the range of about 0.110 inch to about 0.230 inch.

11. A wall forming panel as claimed in claim 10 wherein the length of the arms is about 3/4 inch and the length of the fingers is in the range of about 0.130 inch to about 0.160 inch.

12. A wall forming panel as claimed in claim 2 which further comprises a locking arrangement between cooperating surfaces of the grooves and fingers.

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