



"A framing system and method for forming curved block walls, and an interconnecting web member therefor"

Field of the Invention

This invention relates to the field of forming curved block walls, and in particular to such walls utilising glass blocks, although the invention is not limited to or exclusive to such types of blocks. Moreover, the invention relates particularly to a framing system and a method for forming curved block walls and a modular interconnecting member that is used in the system and method.

Throughout the specification, unless the context requires otherwise, the word "comprise" or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated integer or group of integers but not the exclusion of any other integer or group of integers.

Background Art

The proceeding discussion of the background art is intended to facilitate an understanding of the present invention only. It should be appreciated that the discussion is not an acknowledgement or admission that any of the material referred to was part of the common general knowledge in Australia or elsewhere as at the priority date of the application.

Various systems and methods are employed in the forming of walls using blocks, however, these methods have become more particular in the formation of walls using glass blocks, due to the aesthetic and fragile nature of glass and the especial configuration of glass blocks that predominate the market place.

Two systems that are used in the Australian market for the mounting of glass blocks and the erection of walls are described in Australian Patents 637665 and 680088. In order to facilitate the wall construction process, as has been



described in Australian Patent 680088, a rectangular frame is used comprising a sill frame section, a pair of jamb frame sections and a head frame section, within which the glass blocks may be laid upon each other to form a glass block wall matrix.

The applicant's International Patent Application PCT/AU02/00793 describes different styles of rectangular frames constituting the prior art and an improved type of rectangular frame.

The frame sections making up the rectangular frame are formed of straight aluminium extrusions and facilitate the laying of the glass blocks to form a precisely vertical wall with precise alignment of the blocks to ensure complete coverage of the requisite area whilst optimising the aesthetics in having regular spacing between the blocks. However, whilst the use of straight frame sections is convenient and satisfactory for the construction of rectilinear walls, a problem arises when it is desired to construct a curved wall, given the rigid nature of the frame sections.

In such applications, it is normal to fabricate a composite curved frame, which can replace the sill and head frame sections.

As shown in Figure 1 of the drawings, this curved frame 11' comprises a pair of T-bar members 13' and a transverse joiner bar 15', which is pop riveted at either end to the respective inwardly projecting toe portions 17' of the T-bars to laterally fix the bars in position and create a composite frame. In this arrangement, the T-bars 13' are rolled within a rolling machine, one bar with its toe on the inside and the other bar with its toe on the outside to achieve the requisite radius of curvature.

A particular difficulty however is that extruded aluminium bar has a temper which changes from material to material and which effects the degree of curvature arising for the same amount of applied stress to the bar. Consequently, in practice, the amount of curvature for different bars is difficult to control so as to achieve precisely the same radius of curvature for each bar.

Thus, forming composite frame sections in this manner is extremely arduous, time consuming and hence is very expensive, which naturally impacts upon the flexibility of providing block wall structures to suit the needs of the customer. Unfortunately, a highly desirable facet of incorporating block walls into a building design is the ability to provide curved portions of the wall, which have high aesthetic appeal.

Disclosure of the Invention

It is an object of the present invention to provide for the construction of curved and straight sections of block walls, which alleviates some or all the problems associated with the prior art methods described above.

In accordance with one aspect of the present invention, there is provided a modular interconnecting web member for forming curved block walls, comprising:

an elongated web portion having a male end, an opposing female end, a pair of side flanges coextending from an inner side of the web portion and forming a pair of legs for the member to stand upon a substantially planar surface, and a block supporting platform provided on the outer side of the web portion;

the male end has a convexly curved and radiused tongue having a deformable spigot projecting transversely thereof from the inner side of the web portion at the centre of the tongue radius, and the female end has a concavely curved and radiused recess of complementary size and shape to the tongue, and having a socket open on the outer side of the web portion and extending transversely thereof through towards the inner side of the web portion at the centre of the recess radius; and

the side flanges each being provided with a longitudinally extending groove on the outer side thereof to respectively accommodate a discrete external flange member along the outer side of the web portion;

wherein the male end of one web member may be interlockingly interconnected with the female end of another web member with the tongue snapping into the

recess in a friction fit on the spigot, the one member being disposed within the socket at a relative angular disposition of choice;

whereby the block supporting platforms present a contiguous, substantially planar surface on the outer side of the web members, and the bottom edges of the coextending side flanges of each member terminate in a common plane.

Preferably, the convex end of the tongue and the concave end of the recess are knurled with teeth precisely disposed to locate and frictionally retain an interconnecting tongue and recess of adjoining members at one of a predetermined set of angular alignments when the spigot of the adjoining male end is disposed in the socket of the adjoining female end.

Preferably, the spigot is annular having an inner aperture to accommodate a discrete locking pin, the pin being of substantially commensurate size to the aperture but having a flared portion to ensure fixed locking engagement between the spigot and the socket when corresponding male and female ends of adjoining members are interconnected and the locking pin is impressed into the aperture.

Preferably, the inner side of the web portion has an inner flange centrally disposed between the side flanges and coextending longitudinally therewith, to reinforce the socket.

Preferably, a transverse convex portion is disposed at the distal end of the inner flange symmetrical therewith and protruding axially from the female end, adjacent and radiused with respect to the socket; and the opposing distal end of the inner flange terminates with an abutting end, spaced from the centre point of the spigot a distance commensurate to the radius of the convex portion with respect to the socket; whereby the abutting end of one web member may be disposed in abutting relationship with the convex portion of another adjoining web member, when the spigot and socket of the respective web members are interconnected, irrespective of the relative angular relationship adopted between the adjoining web members, thereby providing and maintaining planar stability to the block supporting platforms thereof.

Preferably, a plurality of transversely extending and opposing inner ribs are disposed on the inner side of the web portion to define a pair of tapered grooves extending longitudinally in conjunction with the side flanges, one tapered groove being disposed adjacent one side flange, and the other tapered groove being disposed adjacent to the other side flange, symmetrically about the centre of the web member, each tapered groove being provided for selectively accommodating a further discrete external flange member for forming a fin projecting externally through the common plane.

Preferably, the side flanges are each formed with a longitudinally extending groove internally thereof for forming a screw flute to facilitate affixing the web member orthogonally to an end frame member.

In accordance with another aspect of the present invention, there is provided a framing system comprising a system for constructing a curved block wall comprising:

a modular interconnecting web member for forming a track along which the blocks may be laid, the member having opposing parts of a positive interlocking means at opposing ends thereof so that the members can be serially interconnected together to form the track at prescribed angular orientations to each other;

a pair of external flange members for affixing one to each side of the web member so that the flange members adopt the prescribed angular orientation of the web members when interconnected;

wherein the external flanges combine with the web members to form a channel within which the ends of a block may be situated to follow the line of the track.

Preferably, the framing system includes a further external flange member for affixing to the inner side of the web member for forming an externally projecting fin that also follows the line of the track to facilitate locating the track upon a cavity wall.

Preferably, the web member is of the form defined in the preceding aspect of the invention.

In accordance with a further aspect of the present invention, there is provided a method for constructing a block wall comprising:

laying a track of modular interconnecting web members along a surface where the wall is intended to be constructed;

fixedly locking adjacent web members together at a prescribed angular disposition corresponding to the intended line and curvature of the wall;

affixing external flange members to each side of the track so that the flange members adopt the prescribed line of curvature of the track and create a channel within which the ends of a block may be situated to follow the line of the track.

Preferably, the method includes affixing a further external flange member to the inner side of the web members for forming an externally projecting fin that also follows the line of the track to facilitate locating the track upon a cavity wall.

Preferably, the modular interconnecting web member is of the type defined in the first aspect of the present invention.

Brief Description of the Drawings

Figure 1 of the drawings is a fragmentary perspective view of a portion of a composite frame section typical of the prior art.

The remaining drawings depict various aspects of the preferred embodiment of the invention for the purposes of describing the best mode for carrying out the invention, wherein:-

Figure 2 is a perspective view of the modular interconnecting web member from above;

Figure 3 is a perspective view of the interconnecting web member from below;

Figure 4 is a top plan view of the Interconnecting web member;

Figure 5 is a front-end view of the interconnecting web member;

Figure 6 is a side view of the Interconnecting web member;

Figure 7 is an underside plan view of the interconnecting web member;

Figure 8 is a rear end view of the interconnecting web member;

Figures 9 show the before and after positions of two adjoining interconnecting web members before and after pinning, whereby

Figure 9A shows one web member elevated relative to the other and with the pin shown prior to Interconnection;

Figure 9B shows the two web members positively joined to each other in a rectilinear arrangement with the pin in place;

Figure 9C is a similar view to Figure 9B, but showing the two members adjoined to each other at a fixed angular orientation disposed from the rectilinear position;

Figure 10 is a schematic perspective view showing a series of the interconnecting web members adjoined to each other to form a track and with one of the external side flanges and an end jamb member in position performing part of the framing system and showing where two blocks in dotted outline would be positioned when initially constructing the block wall; and

Figure 11 is an underside view showing a further external flange member positioned within a pair of aligned tapered grooves formed between the inner flanges of two adjoining interconnecting web members so as to form a weather fin.

Best Mode(s) for Carrying Out the Invention

The best mode for carrying out the invention will now be described by way of one specific embodiment of the invention, which is described with reference to the accompanying drawings, briefly described above.

The embodiment is directed towards a composite framing system for constructing a curved wall from glass blocks of standard design, a method for forming the framing system and the block wall, and a modular elongated web member that is integral to the system.

As shown in figures 2 to 8, the modular interconnecting web member 11 is a specially configured element which is injection moulded from plastic.

The web member 11 effectively forms an elongated web portion having an outer web portion 12a and an inner web portion 12b, which when affixed to external flanges forms a composite frame section that constitutes both a sill section and a head section of a frame within which the glass blocks may be laid to construct a glass block wall matrix.

This elongated web portion has a male end 13, an opposing female end 15, a pair of side flanges 17, an inner side 19 and an outer side 21.

The male end 13 has a convexly curved and radiused tongue 23, which has a deformable spigot 25 protecting transversely thereof on the inner side 19 of the web portion. The spigot 25 is annular, being provided with a central aperture 27 that extends through from the upper side 21 to the inner side 19. The spigot 25 is split with three slots 29 to be deformable radially of the aperture 27.

The female end 15 has a concavely curved and radiused recess 31, which is of complementary size and shape to the tongue 23. As shown in the drawings, the recess 31 extends axially along the outer side 21 of the web portion to define a planar face 33 which is stepped down from the remainder of the outer surface which is contiguous with the tongue 23.

The female end 15 also has a socket 35 formed therein which is open on the outer side 21 of the web portion and extends transversely therethrough towards

the inner side of the web portion at the centre of the recess radius. The socket 35 is also formed with an annular wall 37, which is not split, but to the contrary, is reinforced by a centrally and axially extending inner flange 39 on the inner side 19 of the web portion. The inner flange 39 assists with radial deformation of the socket walls 37 to facilitate locking engagement of the spigot 25 of an adjoining member, which will be described in more detail later. Thus, the socket 35 is of commensurate size to the external diameter of the spigot 25 so that the spigot of an adjoining member may be positively engaged therein.

A transverse convex portion 38 is disposed at the distal end 39a of the inner flange 39, symmetrical therewith. The outer surface of the convex portion 38 protrudes axially of the female end 15 marginally beyond the corresponding distal ends 17a of the side flanges 17, and is adjacent and radiused with respect to the socket 35. The opposing distal end 39b of the inner flange 39 similarly projects marginally beyond the corresponding distal ends 17b of the side flanges 17 at the male end of the web member, and terminates with an abutting end 40. The abutting end 40 is spaced from the centre axis of the spigot 25, a distance that is commensurate to the radius of the convex portion from the centre axis of the socket 35. In this manner, the abutting end 40 of one web member may be disposed in abutting relationship with the outer surface of the convex portion 38 of another adjoining web member, when the spigot and socket of the respective web members are interconnected. This will be described in further detail later.

The side flanges 17 coextend from the inner side 19 of the web portion and form a pair of legs for the member to stand upon a substantially planar surface when forming the framing system. The side flanges 17 are equidistant so that the bottom edges 41 thereof terminate in a common plane, which is parallel to the plane defined by the outer surface 21.

Each of the side flanges 17 are provided with longitudinally extending grooves 43 on the outer side thereof. The grooves 43 are effectively disposed at the junction between the outer web portion 12a and the inner web portion 12b. The grooves 43 are sized to respectively accommodate the toe portion of an external flange member in the form of a T bar that will be described in more detail later.

As can be seen in the drawings, the side flanges 17 are substantially rectangular. In cross section and are formed with a series of transverse ribs 45 and flutes 47 to facilitate the moulding and strengthening thereof. The side flanges are also each formed with a longitudinally extending inner groove 49 which forms a screw flute to facilitate affixing the web member orthogonally to an end frame member that will also be described in more detail later.

The inner side 19 of the web portion is also formed with a plurality of inner ribs 51 extending transversely from confronting faces on the inner side 17a of the side flanges 17 and the inner flange 39. The distal ends of the transverse ribs 51 define a pair of tapered grooves 53, whereby the grooves are at their widest spacing 53a towards the opposing ends of each of the side flanges 17 and are at their narrowest spacing 53b adjacent the median of the side flanges.

The tapered grooves are provided for accommodating a further external flange member that forms a weather fin that will similarly be described in more detail later.

The outer side 21 of the web portion is divided into an outer web portion 12a and an inner web portion 12b. The outer web portion 12a defines a planar block supporting platform and the inner web portion 12b defines a planar surface for receiving the underside of the tongue 23 of an adjoining web member.

The size of the step of the recess 31 is commensurate to the thickness of the tongue 23 so that when the tongue is juxtaposed with the face 33, the upper surface of the outer web portions of the adjoining members are contiguous and coplanar.

The convex end of the tongue 23 and the concave end of the recess 31 are both knurled with teeth 55, which are precisely disposed to locate and frictionally retain an interconnecting tongue and recess of adjoining members at one of the predetermined set of angular alignments when the spigot of the adjoining male end is disposed in the socket of the adjoining female end of two adjoining web members.

Now describing the manner of interconnection between adjoining web members, as shown in Figure 9 of the drawings, one web member 11a is to be adjoined to a second web member 11b. As shown in Figure 9A, the web member 11a is disposed with the tongue 23 thereof above the recess 31 of the other web member 11b at the desired angular orientation of one to the other. In the case of a rectilinear alignment, the spigot of the one member 11a is located within the socket of the other member and the confronting teeth 55 of the tongue and recess engaged at the requisite alignment. When brought into mutual engagement, the abutting end 40 of inner flange 39 will be brought into confronting and abutting relationship with outer surface of the convex portion 38. This abutting relationship functions to provide and maintain planar stability of the block supporting platforms of the adjoining web members, irrespective of the relative angular relationship adopted between the web members. Once in this position, a pin 57 having a spigot portion of substantially commensurate shape to the aperture 27 of the spigot but with a flared portion of marginally larger configuration, is impressed into the aperture, expanding the spigot 25 to lockingly engaged against the wall 37 of the socket 35, and permanently adjoin the web members together at the adopted angular relationship.

To facilitate rectilinear alignment, a radial mark 59a is disposed on the outer edge of the tongue 23 and a corresponding mark 59b is disposed on the outer web portion adjacent the recess 31, at the requisite locations.

In the case of the two members being disposed at a predetermined angular orientation, the web member 11a is simply rotated into the correct rectangular orientation relative to the other web member 11b on inserting the spigot 25 into the socket 35, allowing the teeth of the respective tongue and recess to engage at the appropriately aligned position. The abutting end 40 will simply be angularly shifted in position along the outer surface of the convex portion 38, but will maintain its confronting and abutting relationship thereto, to provide the planar stability to the adjoining web members, irrespective of the particular angular position adopted between the two. Again, an appropriate mark 59c may be provided on the outer web portion adjacent the recess 31 that may be aligned with the mark 59a on the tongue of the member 11a to facilitate correct orientation of

the two members prior to the pin 57 being impressed to lockingly engage the members together.

Now describing the framing system, a series of interlocking web members 11 are adjoined to each other and locked in prescribed angular orientations to each other to define a track 61 upon which the glass blocks 63 forming the wall are laid as shown in Figure 10 of the drawings.

External flanges in the form of T-bar members 65 having an intermediate toe are rolled to adopt the general curvature of the track and are malletted into position with the toe being frictionally engaged within the longitudinal grooves 43. Due to the frictional engagement, the T-bars 65 will adopt the curvature of the track as opposed to their own curvature facilitating construction of the sill. An end jamb member 67 is disposed at either end of the track, whereby the jamb member abuts the corresponding end of the end web member and the threaded fasteners 69 are screwed in to position so that the shank of the fastener is accommodated within the screw flutes 49, affixing the jamb section to the track.

The web members are particularly sized so that the distance between successive centres of the pinned spigot and socket connections correspond to half a full block size and a full half block size. In this manner, half blocks can be used to form curved portions of the wall, as well as full blocks. In the case of full blocks following a curve, two adjoining web members will be interconnected rectilinearly and then will be angularly oriented and interconnected to a successive pair of rectilinear web members. The particular sizing also permits the tongue portion of the end web member to be docked at the appropriate end of the track so that a corresponding jamb section 67 can be positioned adjacent to the remaining side flanges of the end web member so that the screw flutes provided therein can be reached by corresponding fasteners 69.

As shown in Figure 11 of the drawings, the T-bar 65 can be used as a further external flange inserted into the tapered groove 53 to form a weather fin. The tapered nature of the groove is required to accommodate angular orientations of adjoining web members from the rectilinear position, allowing the T-bar to follow

the requisite contour from one web member to the successive web member within the same groove.

As shown in Figure 12 of the drawings, the T-bar is retainedly grooved at the toe end and one of the flange ends so that it may be used either as a side flange member with the grooved end of the toe of the T-bar engaged within the groove 43 of the side flange 17, or a weather fin with the grooved end of the flange of the T-bar engaged within the groove 53 of the web member.

It should be appreciated that the scope of the present invention is not limited to the particular embodiment described herein.

The Claims Defining the Invention are as Follows

1. A modular interconnecting web member for forming curved block walls, comprising:

an elongated web portion having a male end, an opposing female end, a pair of side flanges coextending from an inner side of the web portion and forming a pair of legs for the member to stand upon a substantially planar surface, and a block supporting platform provided on the outer side of said web portion;

said male end having a convexly curved and radiused tongue and a deformable spigot projecting transversely of the tongue from the inner side of said web portion at the centre of the tongue radius, and said female end having a concavely curved and radiused recess of complementary size and shape to said tongue, and a socket open on the outer side of said web portion and extending transversely thereof, through towards the inner side of said web portion at the centre of the recess radius; and

said side flanges each being provided with a longitudinally extending groove on the outer side thereof to respectively accommodate a discrete external flange member along the outer side of said web portion;

wherein said male end of one web member may be interlockingly interconnected with said female end of another web member, with said tongue and said spigot snapping into said recess and said socket respectively, in a friction fit, said one web member being disposed at a relative angular disposition of choice with respect to the other web member, about the spigot and socket connection;

whereby said block supporting platforms present a contiguous, substantially planar surface on the outer side of said interconnecting web members, and the bottom edges of the coextending side flanges of each member terminate in a common plane.

2. A modular interconnecting web member as claimed in claim 1, wherein the convex end of said tongue and the concave end of said recess are knurled with teeth precisely disposed to locate and frictionally retain an interconnecting tongue and recess of adjoining members at one of a predetermined set of angular alignments when the spigot of the adjoining male end is disposed in the socket of the adjoining female end.
3. A modular interconnecting web member as claimed in claim 1 or 2, wherein said spigot is annular having an inner aperture to accommodate a discrete locking pin, the locking pin being of substantially commensurate size to the aperture but having a flared portion to ensure fixed locking engagement between said spigot and said socket when corresponding male and female ends of adjoining members are interconnected and said locking pin is impressed into said aperture.
4. A modular interconnecting web member as claimed in any one of the preceding claims, wherein the inner side of said web portion has an inner flange centrally disposed between said side flanges and coextending longitudinally therewith, to reinforce said socket.
5. A modular interconnecting web member as claimed in claim 4, including a transverse convex portion disposed at the distal end of said inner flange, symmetrical therewith, and protruding axially from said female end, adjacent and radiused with respect to said socket; and wherein the opposing distal end of said inner flange terminates with an abutting end, spaced from the centre axis of said spigot a distance commensurate to the radius of said convex portion from the centre axis of said socket; whereby said abutting end of one web member may be disposed in abutting relationship with said convex portion of another adjoining web member, when the spigot and socket of the respective web members are interconnected, irrespective of the relative angular relationship adopted between the adjoining web members, thereby providing and maintaining planar stability to said block supporting platforms thereof.

6. A modular interconnecting web member as claimed in any one of the preceding claims, including a plurality of transversely extending and opposing inner ribs disposed on the inner side of said web portion to define a pair of tapered grooves extending longitudinally in conjunction with said side flanges, one tapered groove being disposed adjacent one side flange, and the other tapered groove being disposed adjacent to the other side flange, symmetrically about the centre of the web member, each tapered groove being provided for selectively accommodating a further discrete external flange member for forming a fin projecting externally through said common plane.
7. A modular interconnecting web member as claimed in any one of the preceding claims, wherein said side flanges are each formed with a longitudinally extending groove internally thereof for forming a screw flute to facilitate affixing the web member orthogonally to an end frame member.
8. A framing system for constructing a curved block wall comprising:
 - a modular interconnecting web member for forming a track along which the blocks may be laid, the member having opposing parts of a positive interlocking means at opposing ends thereof so that the members can be serially interconnected together to form the track at prescribed angular orientations to each other; and
 - a pair of external flange members for affixing one to each side of the web member so that the flange members adopt the prescribed angular orientation of the web members when interconnected;
 - wherein the external flanges combine with the web members to form a channel within which the ends of a block may be situated to follow the line of the track.
9. A framing system as claimed in claim 8, wherein the framing system includes a further external flange member for affixing to the inner side of the web

member for forming an externally projecting fin that also follows the line of the track to facilitate locating the track upon a cavity wall.

10. A framing system as claimed in claim 8 or 9, wherein the web member is of the form defined in the preceding aspect of the invention.

11. A method for constructing a block wall comprising:

laying a track of modular interconnecting web members along a surface where the wall is intended to be constructed;

fixedly locking adjacent web members together at a prescribed angular disposition corresponding to the intended line and curvature of the wall;

affixing external flange members to each side of the track so that the flange members adopt the prescribed line of curvature of the track and create a channel within which the ends of a block may be situated to follow the line of the track.

12. A method as claimed in claim 12, including affixing a further external flange member to the inner side of the web members for forming an externally projecting fin that also follows the line of the track to facilitate locating the track upon a cavity wall.

13. A method as claimed in claim 12 or 13, wherein the modular interconnecting web member is of the type as claimed in any one of claims 1 to 7.

14. A modular interconnecting web member for forming curved block walls, substantially as herein described with reference to the accompanying drawings as appropriate.

15. A framing system for constructing a curved block wall, substantially as herein described with reference to the accompanying drawings as appropriate.

16. A method for constructing a block wall, substantially as herein described with reference to the accompanying drawings as appropriate.