Nov. 15, 1966 J. A. WHELAN 3,285,635

PREFABRICATED STRUCTURE

Filed Oct. 16, 1964

FIG. 1.

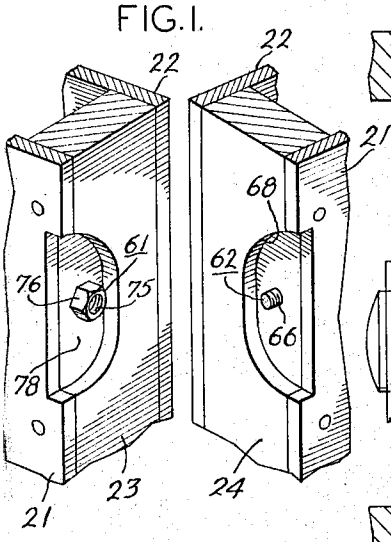


FIG. 2.

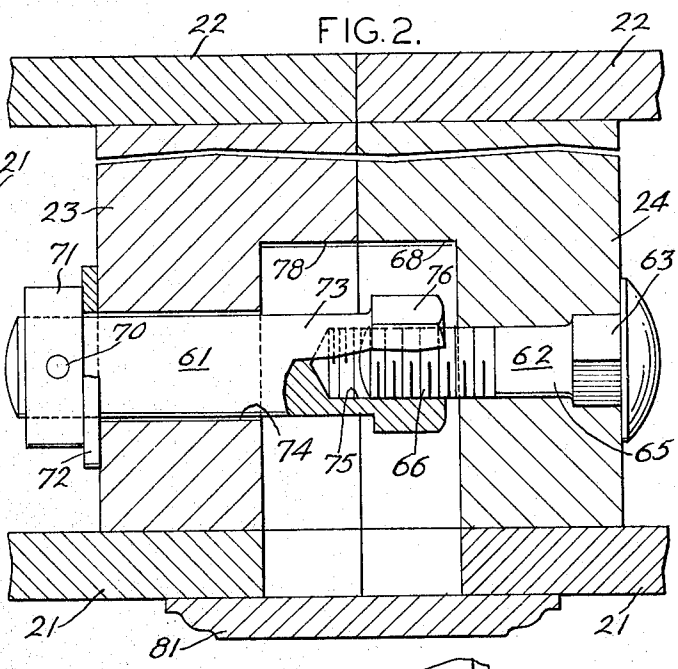


FIG. 4.

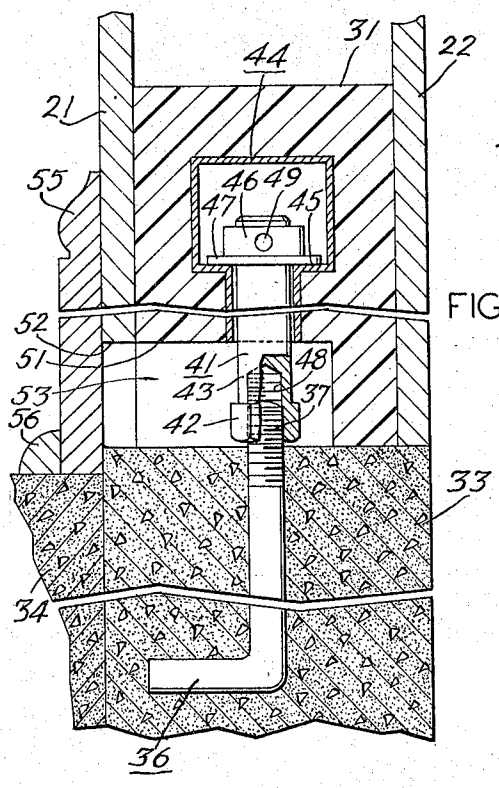
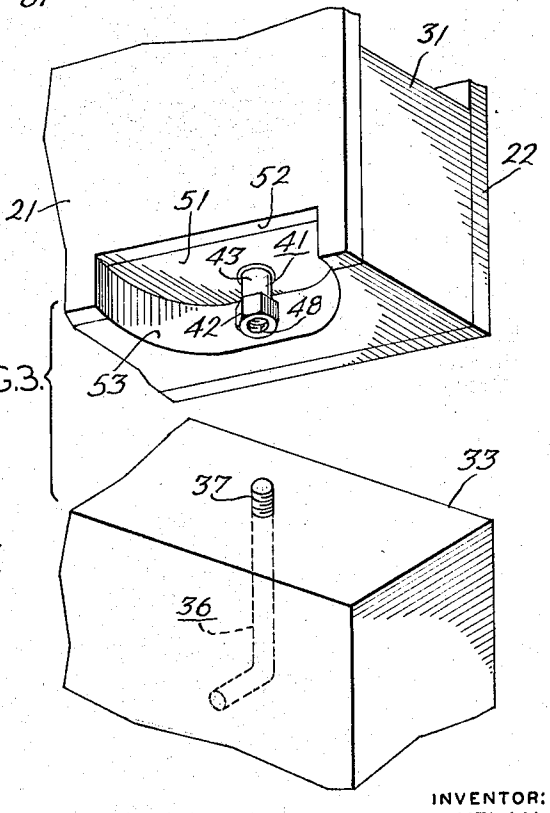


FIG. 3.



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PREFABRICATED STRUCTURE

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The present invention relates to prefabricated buildings and similar structures and has particular application to the connections of prefabricated panel sections thereof.

Prior to the present invention, it was impractical to preassemble complete panel sections for erection in a building or other structure because of the difficulty of properly connecting the panel sections. To overcome this difficulty, it is the conventional practice to preassemble the panel sections partially, omitting the final facing sheet or wallboard panel so as to expose the interior portions of the panel section to permit access for tightening fasteners or for nailing the panel sections together. It has also been proposed to provide the panel sections with hooks or other releasable fasteners along the marginal edges to enable interconnection of adjacent or adjoining panel sections. However, the conventional hooks or other fasteners of this character do not permit secure tightening of the fastener so as to provide a rigid joint which is proof against inadvertent disconnection or dislodgment.

More specifically, the present invention provides a connector for prefabricated building panel sections which may be disposed in recesses in the marginal portion thereof to permit interconnection of the panel sections and tightening thereof without needing access to the interior of the panel section.

The present invention provides a novel arrangement for prefabricated panel sections wherein the connections between adjacent panel sections are confined to the marginal portions thereof, whereby the connectors per se may be hidden by the conventional cover strips which are applied about the periphery of the sections and to the joints between adjacent panel sections to conceal the line of juncture thereof.

The present invention therefore provides a structural assembly comprising a plurality of preformed panel sections, said panel sections being adapted to be mounted in abutting or adjoining relation, one of said panel sections being provided with a number of internally-threaded members and the other of said panel sections being provided with a like number of externally-threaded members adapted to threadably engage said internally-threaded members; one of said members being fixed against rotation in its associated panel section and the other of said members being rotatably mounted in its associated panel section to permit a threaded connection of said panel sections.

In a preferred embodiment of the present invention, the rotatable threaded member is provided with means affording longitudinal displacement thereof to enable said member to be positioned within the outline of its associated panel section for shipping and storage, but which affords projection thereof beyond said outline for engagement with the complementary threaded member when being assembled.

All of the objects of the present invention are more fully set forth hereinafter with reference to the accompanying drawing wherein:

FIG. 1 is a fragmentary view of a pair of adjoining panel sections prior to assembly illustrating an arrangement of connecting means in accordance with the present invention;

FIG. 2 is a horizontal section through a completed assembly of panel sections in accordance with the present invention;

FIG. 3 is a view similar to FIG. 1 showing a connection of a panel section with a foundation support in accordance with the invention; and

FIG. 4 is a vertical section of an assembly of a panel section to a foundation support in accordance with the present invention.

The conventional wall construction for buildings and similar structures includes horizontal floor and ceiling plates and a plurality of vertical studdings spanning between and supporting the floor and ceiling plates. Facing panels, in the form of wallboard, plywood, clapboard, composition board, and the like, are mounted on the studdings and plates with or without insulation therebetween, depending on the use to which the structure will be put. In precut and custom structures, the studding is erected and assembled in situ and the facing is secured in place. Normally, the exterior facing of an outdoor structure is assembled concurrently with the studding and plates, providing additional structural rigidity thereto prior to the application of the interior facing to the wall structure. This final step requires considerable skill and artistry to insure a neat and workman-like job and it is apparent that the erection of precut and custom structures entails a considerable expenditure of skilled and semi-skilled labor at the building sites.

In order to reduce the expenditure for skilled and semi-skilled labor at the building site, prefabricated buildings have come into wide usage. In prefabricated buildings, substantial portions of the building are assembled remote from the building site and are shipped as assembled panel sections to the building site where they may be erected and assembled on the foundation or other support. It has been the practice, however, to only temporarily attach the interior facing to the panel sections in order that this facing may be removed to permit access to the interior of the panel assembly to permit connection of adjacent panel sections to each other and to the foundation. After the sections of the structure are assembled, the interior facings are permanently secured to the sections. Not infrequently, in the course of the construction, considerable damage is done to the facing elements, resulting in loss.

In accordance with the present invention, a novel panel section is provided which eliminates the need for removing the facing to provide access to the interior thereof for erection and assembly. To this end, each panel section is of substantially conventional construction comprising interior supports including ceiling and floor plates and a plurality of uprights, forming the studding. In the embodiment shown in the drawing, the interior and exterior facing elements are shown at **21** and **22** respectively. The upright at one end of the section is shown at **23** and the complementary upright at the opposite end is shown at **24** (see FIGS. 1 and 2). In the present instance, the bottom support or floor plate **31** (see FIGS. 4 and 5) is molded or otherwise formed of plastic material, preferably a plastic which is nailable so as to permit nailing, which enables securing the facings **21** and **22** thereto. In the present instance, as shown in FIGS. 3 and 4, the panel section is designed to be mounted on a concrete support or footing **33** surrounding in the present instance a cement floor **34**. The interior panel support elements and the facings are preassembled into sections which may be conveniently handled and shipped to the construction site for erection on the footings **33**. As shown in FIGS. 3 and 4, the footings have been designed to accommodate the preformed panel sections and to this end, are provided at predetermined spaced intervals with upstanding studs **36** which, in the present instance, are externally threaded and project above the upper surface of the supporting footing a predetermined amount.

In order to anchor the panel sections to the footings, a complementary threaded fastener is mounted in the bottom supports or floor plates **31** to register with each of the upstanding fasteners **36**. In the present instance, the complementary fastener comprises a shaft **41** whose hollow shank **43** is internally threaded at **48** and has a tool grip portion **42** at its outer extremity, in the present instance in the form of a polygonal, wrench-receiving head. The fastener **41** is received in a casing **44** embedded in the bottom support **31** and having a stepped hollow portion providing a bearing surface **45**. The internal end of the fastener **41** is provided with an enlarged bearing **46** and washer **47** adapted to bear on the surface **45** so that upon engagement of the internal threads **48** with the threads **37** of the fastener **36**, and tightening of the fastening by the application of a wrench to the grip **42** affords secure anchoring of the panel section to the footing. It is noted that the fastener **41** is mounted in the casing **44** for both vertical and rotational displacement so as to enable easy tightening of the fastener **41** on the fastener **36**, and to permit retraction of the fastener **41** out of the path of the fastener **36** during initial erection of the panel section on the footing. In the present instance, when the bearing head **46** and washer **47** bear against the surface **45**, the free end of the fastener **41** is spaced above the lower terminal edge of the panel section so that the fastener **41** does not project outwardly from the outline of the panel section during shipment. The extent to which the fastener projects from the casing may be varied by adjusting the bearing head on the shank **43**, for example by the pinned connection indicated at **49**.

In order to provide access for the tightening of the fastener **41** on the fastener **37**, the support **41** and the facing **21** are cut away as indicated at **51** and **52** to provide a marginal recess designated generally at **53** along the lower marginal edge of the panel section. The marginal recess **53** enables a wrench or other tool to engage the free end of the fastener **41** and provides operating room for the wrench or other tightening tool. After the panel section is tightened to the support **33**, the recesses **53** along the bottom marginal edge of the section are covered by finishing strips such as a suitable cove or baseboard **55** and quarter-round **56**. The finishing strips may be mounted on the panel section in any desired manner, either by clips engaging in the recesses **53** therealong or by nailing or screwing directly through the facing **21** into the floor joist **31**. The height of the recesses **53** is sufficiently small to permit covering by a conventional finishing strip, but is amply large to afford a secure connection of the section to its support by the fasteners.

A similar arrangement is provided for anchoring the panel sections to one another. To this end, one of the internal end supports in the present instance the upright **23**, is provided with a female fastener **61** similar to the fastener **41**; and the complementary end support, the terminal upright **24**, is provided with a male fastener **62**. In the present instance, the fastener **62** comprises a carriage bolt having a head portion **63** embedded in the support **24** and a shank **65** having its free terminal end threaded as indicated at **66**. In the present instance, the shank **65** is of a length corresponding substantially to the thickness of the upright **24** so that the free end of the shank does not project beyond the outline of the panel section. To permit access to the threaded shank, the upright support and the facing panels are recessed at **68** so as to expose the threaded portion **66** of the shank **65**.

The female fastener **61** is mounted in the support **23** for rotational and longitudinal displacement therein. The inner end of the fastener is provided with a bearing head **71** and washer **72** adapted to bear against the inner surface of the support **23**. The fastener **61** has a shank **73** mounted in an aperture **74** of the upright support **23** and has at its outer extremity, a hollow portion **75** which is internally threaded for engagement with the threaded

end of the shank **65** of the male fastener **62**. The terminal portion of the shank **73** is provided with a tool-grip portion **76**, in the present instance, in the form of a polygonal head for receiving a wrench or other suitable tool. The aperture **74** permits free rotation of the shank **73** therein so as to permit threaded engagement of the fastener **61** with the fastener **62**. In the present instance, the projection of the fastener **61** from the upright is controlled by adjusting the bearing portion **71** on the shank **73** by means of a pinned connection, indicated at **70** in FIG. 2. If desired, other adjustment means may be provided; for example, the bearing may consist of a nut threaded on the shank and anchored thereon by a cotter pin.

Prior to assembly of adjoining panel sections, the tool-grip portion **76** is retracted into a recess **78** in the upright support **23** corresponding to the recess **68** in the upright support **24**. In this way, the two panel sections may be readily aligned without the fasteners interfering with one another. When the assemblies are in proper alignment, the fastener **61** is displaced axially into engagement with the fastener **62** and is threadably engaged therewith so as to tighten the panel sections into secure engagement. It is noted that the recesses **68** and **78** are generally arcuate in form so as to provide for space permitting engagement of a wrench or other tool with the tool-grip **76** and operation of the tool to effect proper tightening of the fasteners. The depth of the recess is sufficient to expose a sufficient length of threads **66** to provide a firm engagement of the fasteners and also to receive the tool-grip portion **76** completely within the confines of the recess. After assembly and securement of the fasteners between adjacent assemblies, a cover strip **81** is secured along the joint between the assemblies, thereby covering the recesses. The finishing strip **81** may be mounted in any desired manner, either by clips engaging in the recesses **68** and **78**, or by nailing or screwing directly through the facing **21** into the uprights **23** and **24**. If desired, a similar cover strip (not shown) may be employed to cover the joint between the panel assemblies on the opposite side of the assembly.

It will be apparent, therefore, that the present invention provides a panel section for a building structure or the like which may be completely preassembled remote from the building site and may be connected to similar panel sections without special tools to provide a secure and rigid structural assembly. The connections between the sections and between the section and the supporting foundation are confined to the extreme marginal portions of the panel sections and are therefore readily concealed by cover strips disposed about the marginal edge of the sections. Since the panel sections may be assembled at a location remote from the building site, the components may be designed to accommodate mechanized assembly and need not conform to the standard building materials which must be used when the panel sections must be partially assembled at the building site.

While particular embodiments of the present invention have been herein illustrated and described, it is not intended to limit the invention to such disclosure, but changes and modifications may be made therein and thereto within the scope of the following claims.

I claim:

1. In a prefabricated structure, at least one panel section having spaced parallel facing elements and supports therebetween, said supports including a support member coextensive with and disposed along at least one marginal edge of said section, a female fastener rotatably mounted in said support member to pass therethrough, the inner end of said fastener having a bearing portion adapted to engage against an inner surface on said support member, the outer portion of said fastener being hollow and internally threaded and having a tool-grip portion adjacent to the free end thereof, said panel section being provided with a recess along the marginal edge thereof to house

said tool-grip portion and to permit engagement thereof by an actuating tool to forcibly and threadably engage said fastener with an externally-threaded male complementary fastener mounted on a support adjoining said panel section to thereby firmly anchor said panel section thereon.

2. A panel section according to claim 1 wherein said female fastener is mounted for axial displacement in said support member between retracted and extended positions, in the retracted position said fastener being housed completely within said recess so as to lie within the outline of said panel section in axially spaced relation to the complementary male fastener on the adjoining support, said female fastener operable to be extended to threadably engage said male fastener, whereby said female fastener avoids interference with said male fastener during erection of said panel section.

3. A panel section according to claim 2 wherein said female fastener comprises a shank portion having an enlarged polygonal head at its free end forming said tool-grip portion, said bearing portion being adjustable on said shank to determine the extent of said axial displacement.

4. A panel section according to claim 3 wherein said support member mounts a hollow casing for receiving said female fastener, said casing being stepped to provide said inner bearing surface for engaging said bearing portion of said fastener.

5. A prefabricated structure comprising at least two panel sections mounted in abutting relation, each section comprising a support member, the support members of said panel sections adapted to be mounted in abutting relation, means defining marginal recesses in said panel section, said recesses cooperating to provide a tool-receiving opening, an externally-threaded male fastener mounted in the support member of one panel section having a shank passing therethrough and terminating in said opening, an internally-threaded female fastener mounted in the support member of the other panel section having a shank passing through said member and terminating in said opening, said fasteners being longitudinally aligned and mounted for relative longitudinal and rotatable displacement to permit threaded engagement of the free ends thereof, bearing portions at the opposite ends thereof adapted to bear against an inner surface on said support member whereby upon tightening of said fasteners said support members are rigidly anchored in engagement.

6. A structure according to claim 5 wherein said male member is fixedly mounted in its associated support against rotary and longitudinal displacement, the female member having a tool-grip portion disposed in said opening for being engaged by a tool for effecting forcible threaded engagement of said male and female fasteners.

7. A structure according to claim 6 wherein said male fastener terminates at its free end within the recess of said one panel section, and the free end of said female fastener is displaceable longitudinally between a retracted position within the recess of said other panel section and an extended position engaging said male fastener within the recess of said one panel section, whereby when the female fastener is retracted said panel sections may be erected in abutting relation without interference between said fasteners.

8. A structure according to claim 7 wherein said tool-grip portion comprises an enlarged polygonal head operable to limit the inward axial displacement of said female fastener.

9. A structure according to claim 5 including a cover strip mounted along the joint between said panel sections and covering the openings therein.

10. A fastener comprising a male and female member, the male member consisting of a shank, externally threaded at the connecting end and having means for securely positioning said member at the other end, the female member being rotatable and axially displaceable and consisting of an elongated shank having at one connecting end an internally threaded hollow connecting end portion and an enlarged polygonal tool-grip portion, said shank of the female member having at its opposite end a separate bearing portion and means to adjust said portion on said shank to determine the extent of axial displacement.

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