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(54) Abstract Title
Timber frame building panel

(57) A panel for a timber frame for use in building construction comprises an upright member (68, 70) and upper and lower lateral timber members (76, 66) respectively extending across the top and bottom of the upright member and having free ends spaced from the upright. The free ends are arranged to abut the corresponding free ends of lateral members of other panels, and the panel can readily be reduced in width by sawing off at least part of the free ends, without affecting the upright member. The panel can be supplied in a kit of parts for making a timber frame, which kit includes elongate U - shaped channels (82,84) which extend along the lateral members of two or more abutting panels to hold them together.

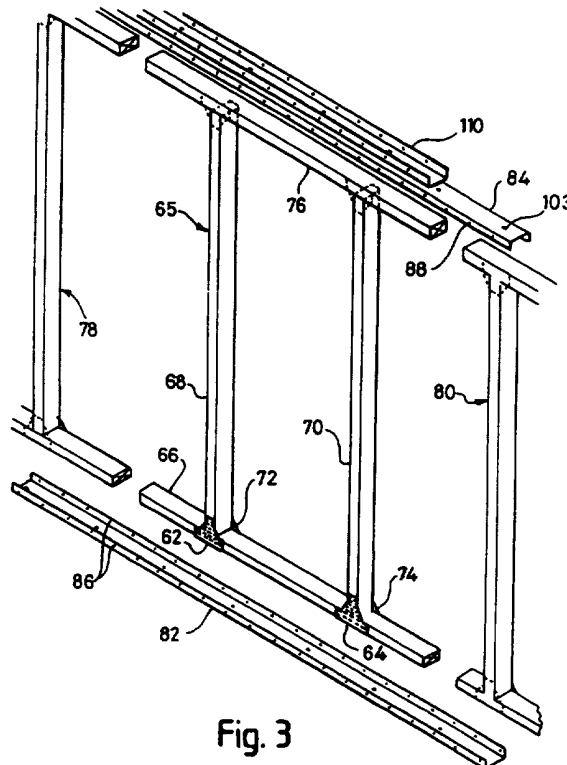


Fig. 3

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1995

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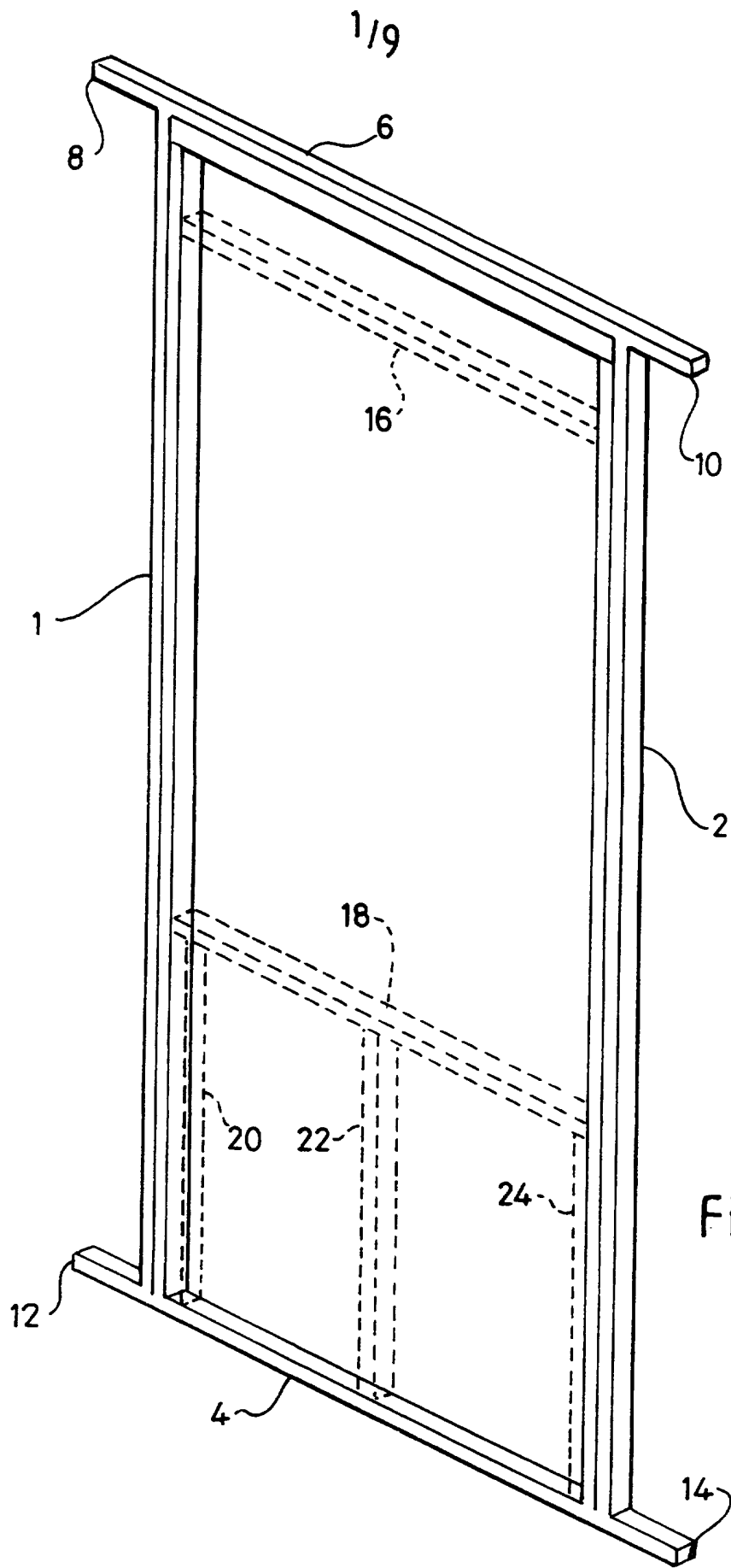


Fig. 1

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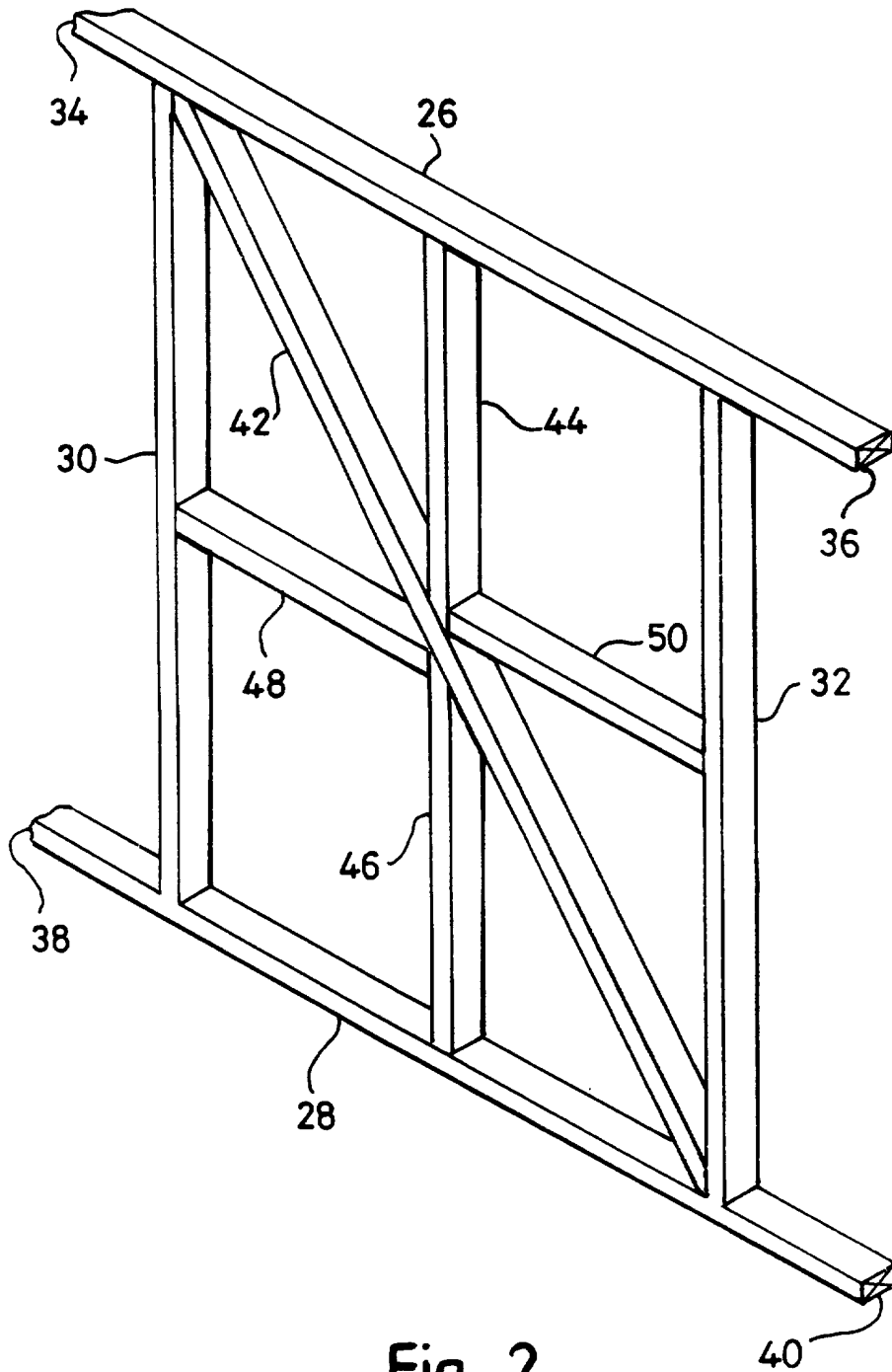


Fig. 2

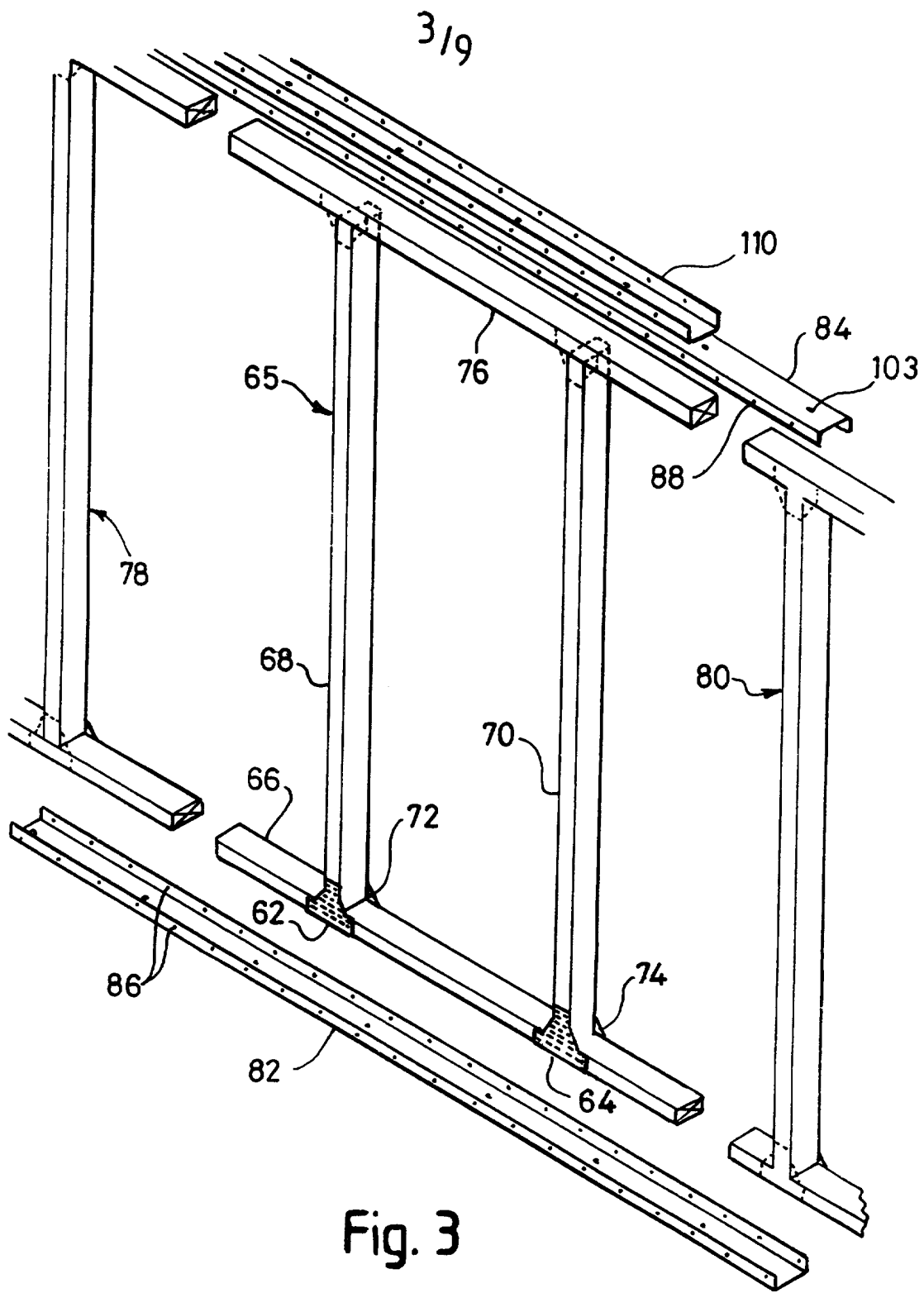


Fig. 3

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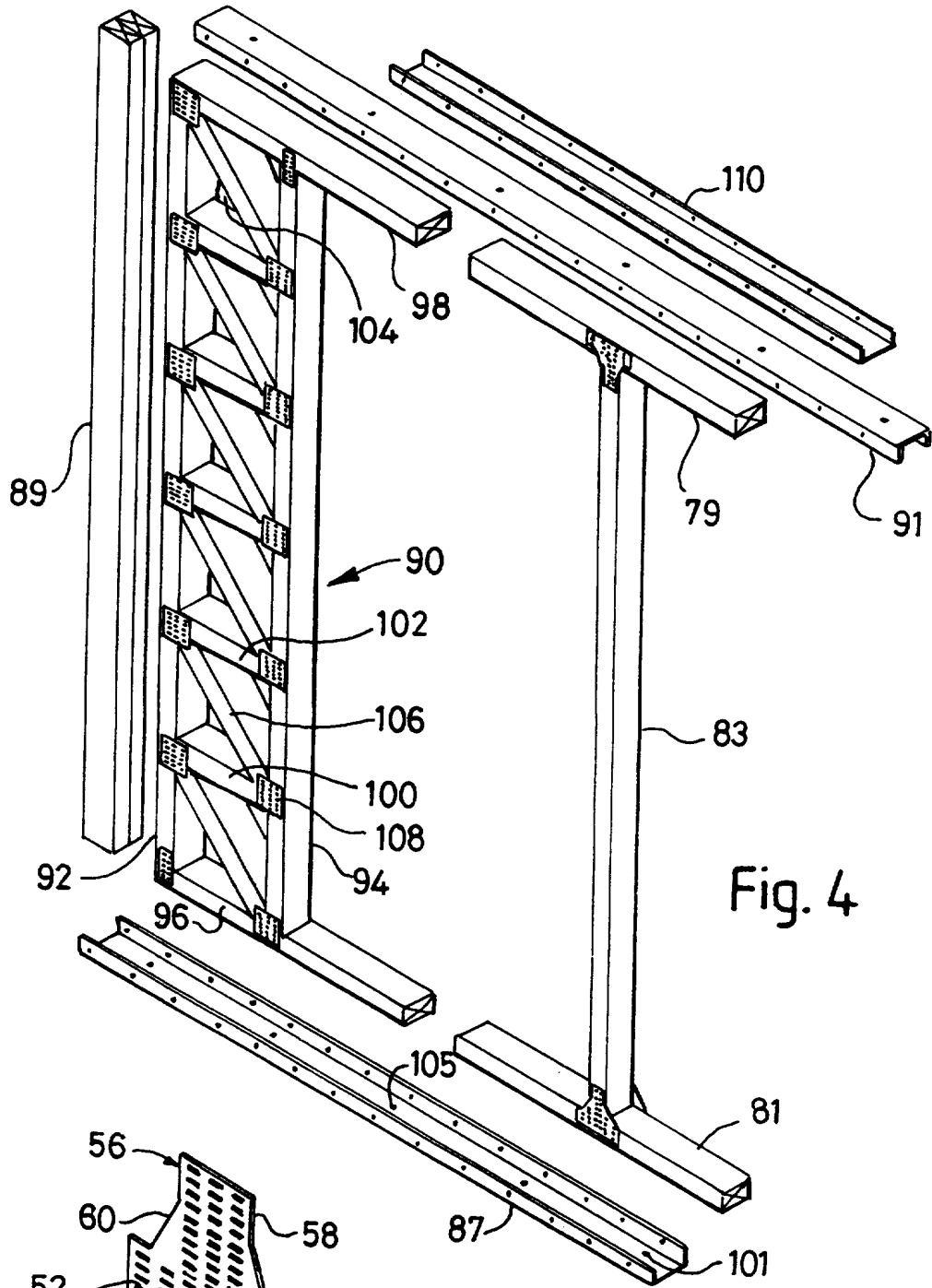


Fig. 4

Fig. 15

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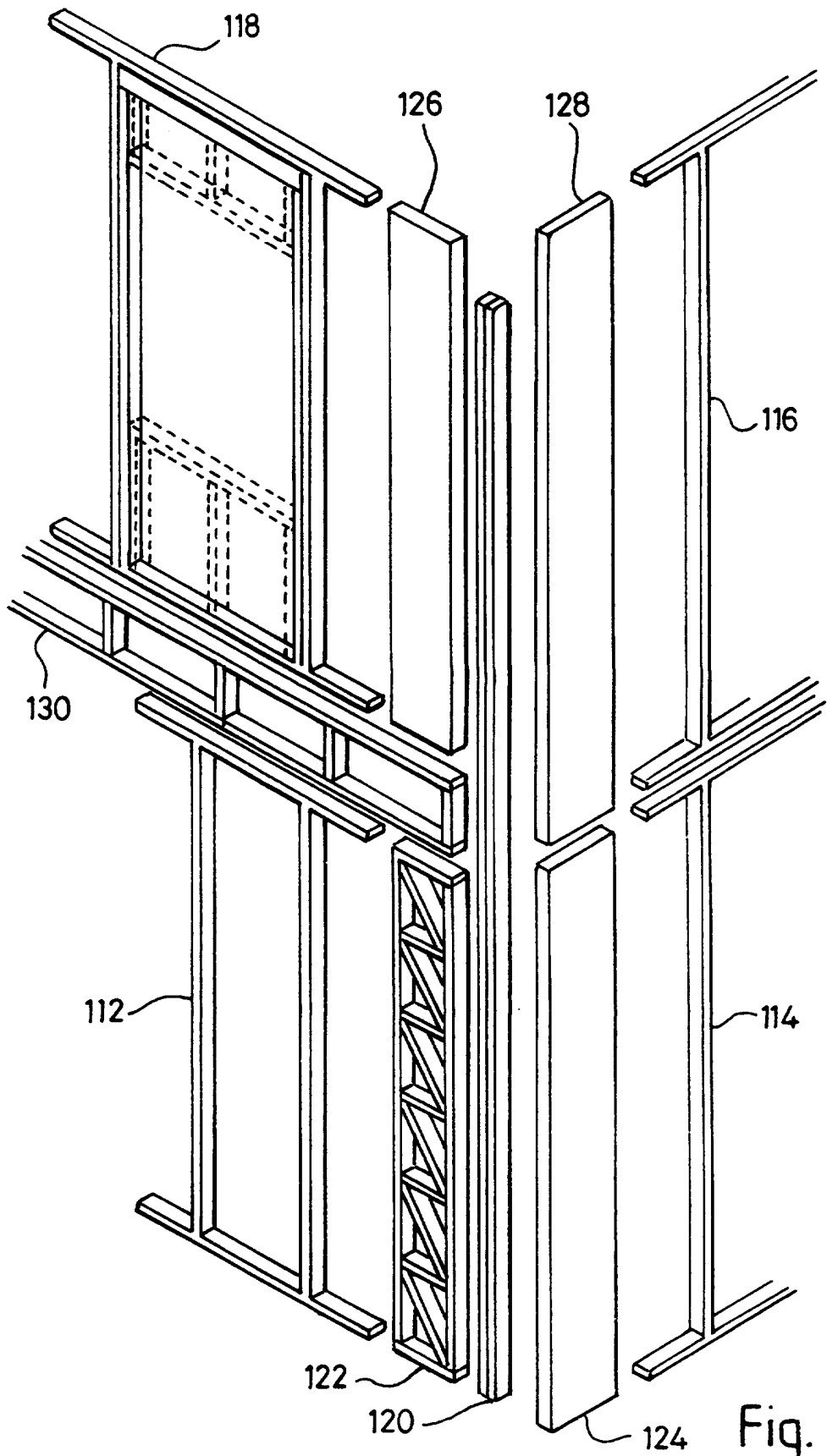


Fig. 5

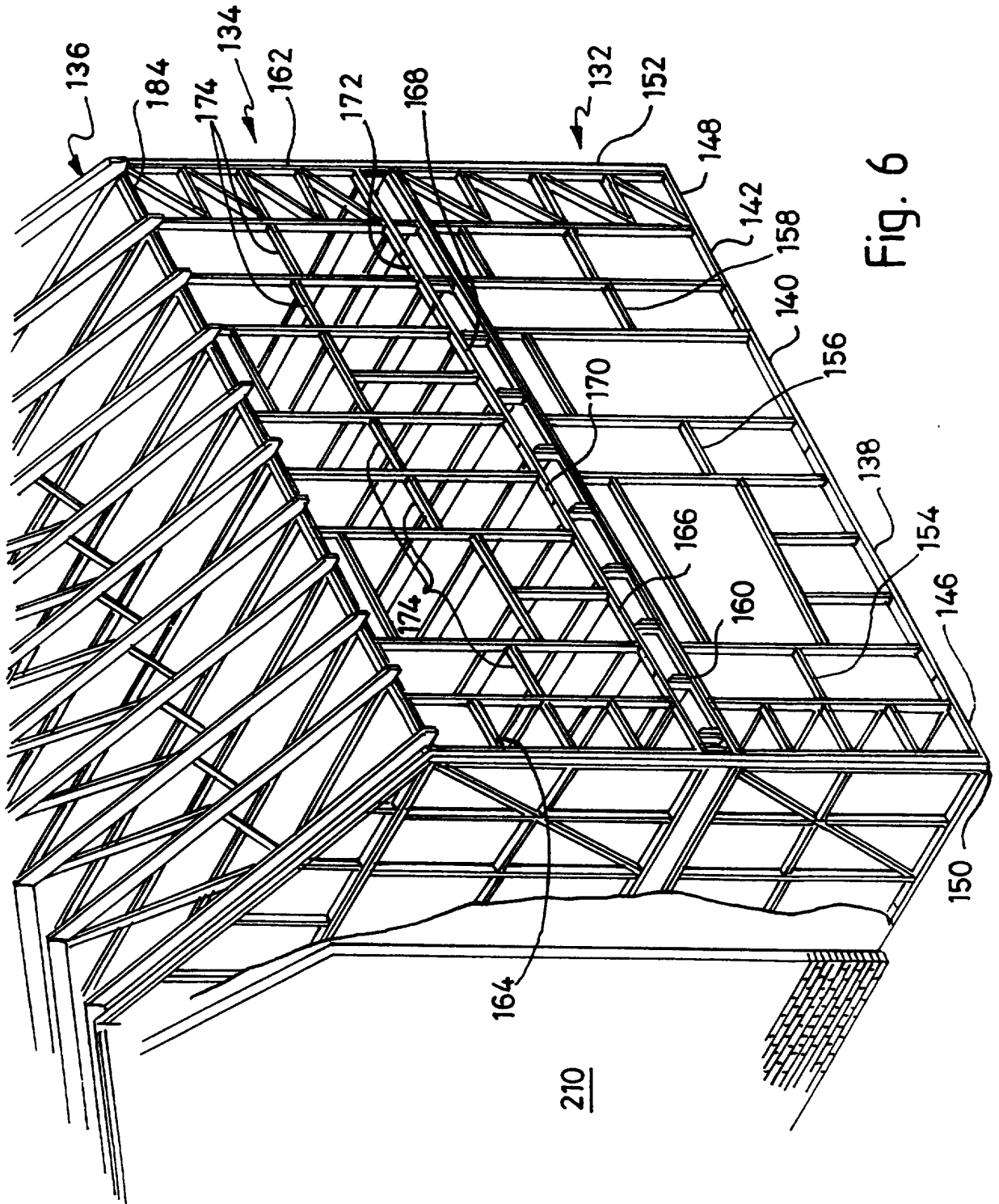


Fig. 6

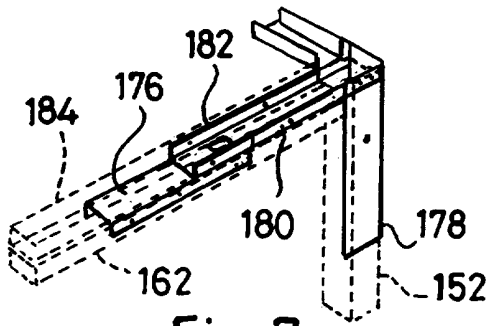


Fig. 7

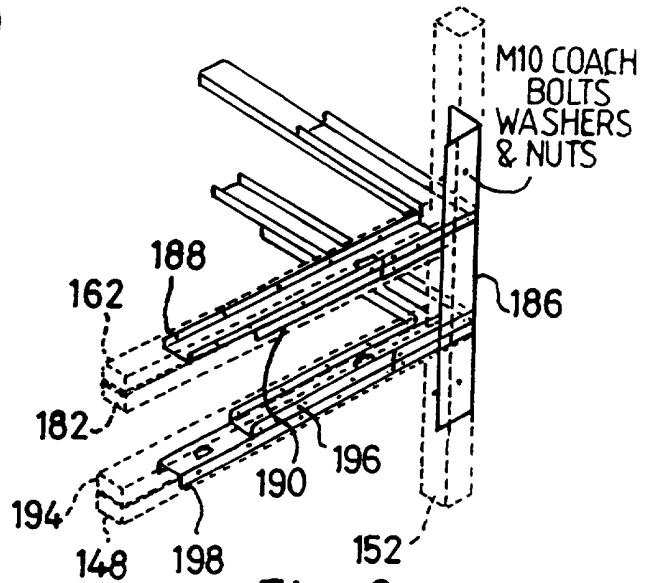


Fig. 8

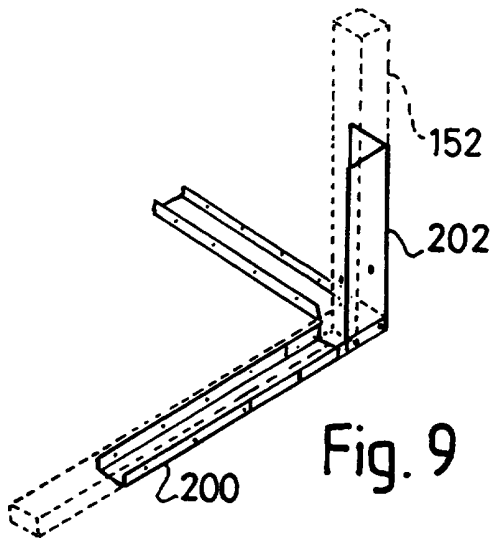


Fig. 9

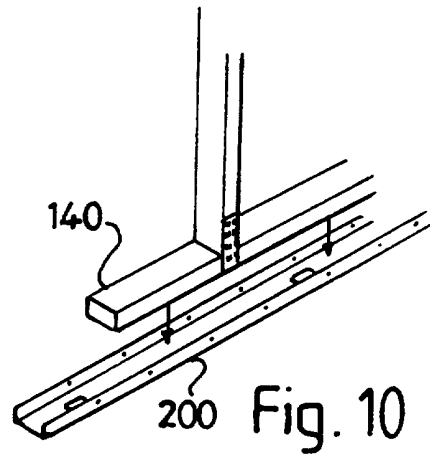


Fig. 10

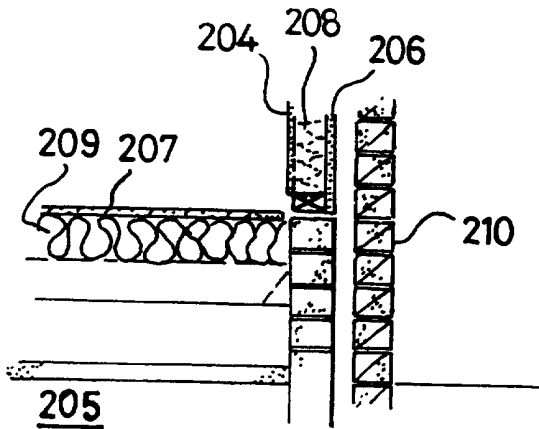


Fig. 11

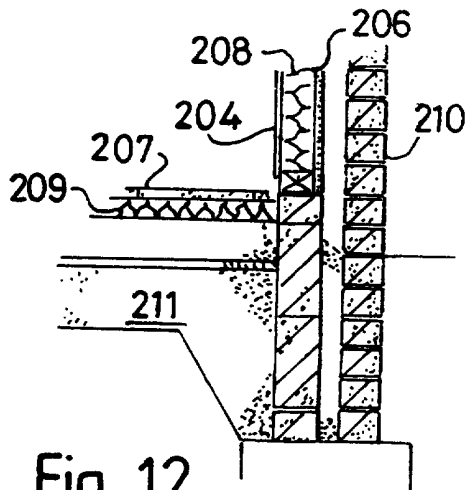


Fig. 12

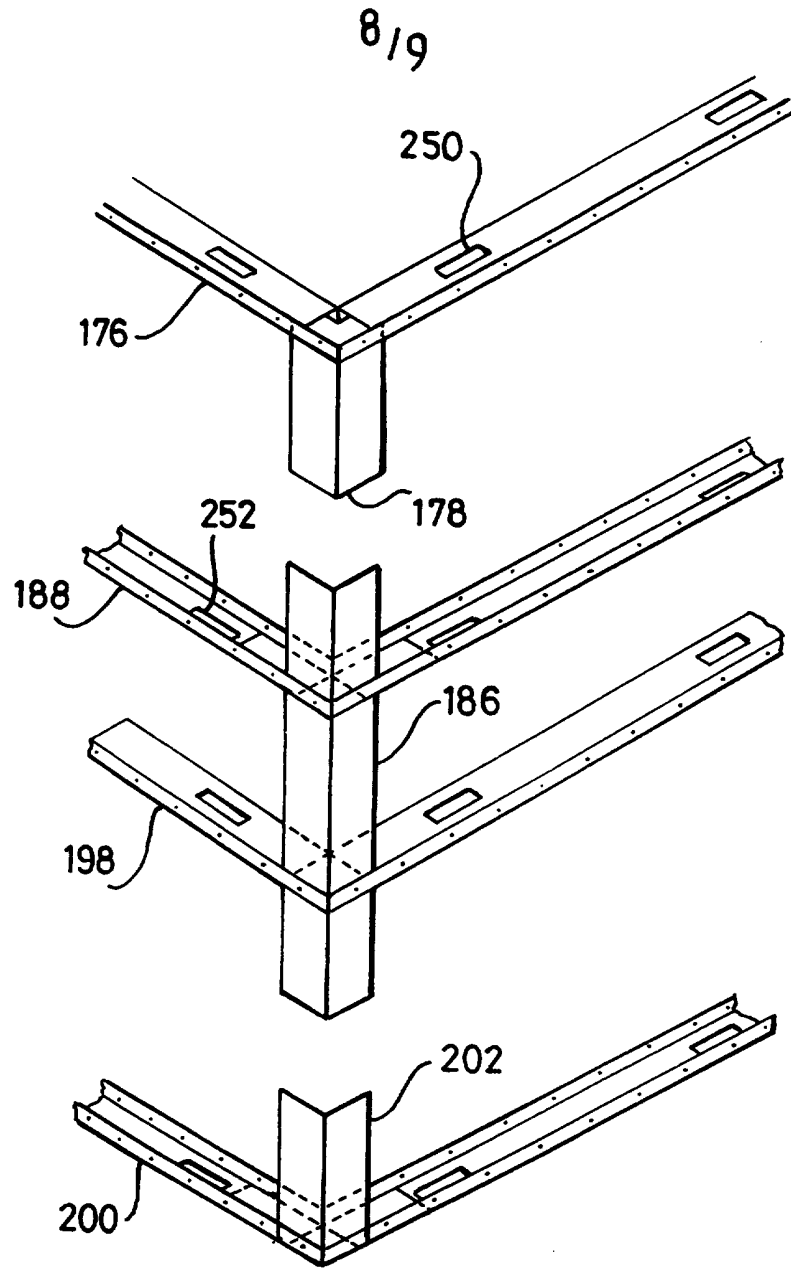


Fig. 13

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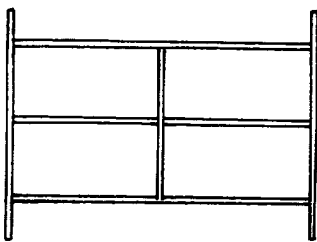
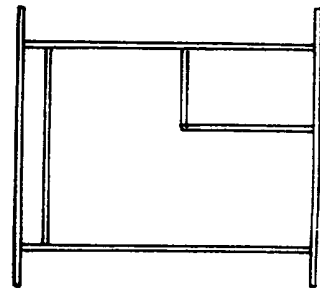
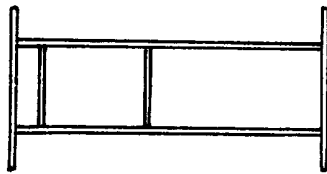
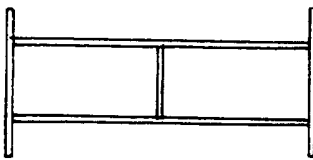
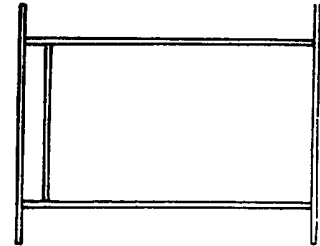
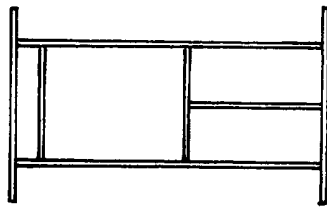
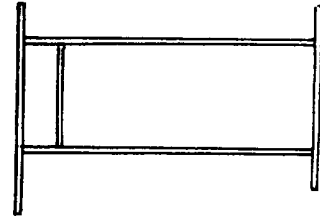
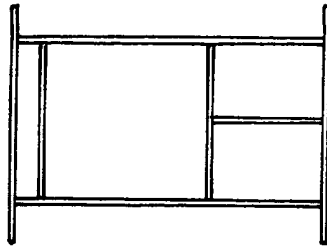
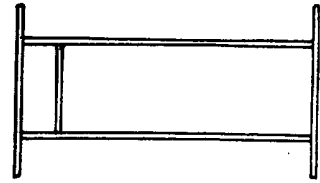
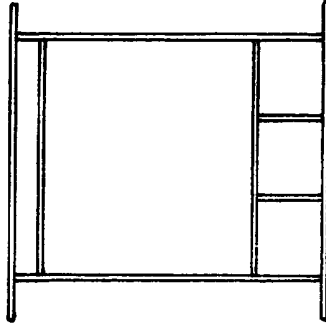
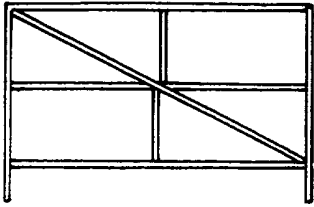
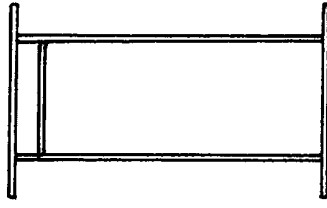
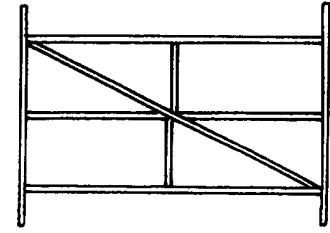


Fig. 14

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BUILDING PANEL

Field of the Invention

This invention relates to a panel for use in the construction of a building, in particular to a panel to form a portion of a timber frame for a building, and to a timber building frame comprising one or more such panels.

Background to the Invention

Conventionally, prefabricated building timber frame panels have peripheral vertical and horizontal timbers which define a rectangular periphery to the panels. Some panels also include further vertical and/or horizontal timbers extending between the peripheral timbers and for larger panels, triangulating bracing timbers which extend across at least part of the panel at an angle to the peripheral timbers.

A timber frame assembled from such panels, bears the majority of the weight of the building and the loads imposed thereon and is normally covered with an exterior finish, for example, bricks. Such panels are known as structural panels.

Non-structural timber frame panels are used in partitioning walls which do not bear any significant structural load from the rest of the building.

The present invention is applicable to both structural and non-structural panels.

However, the dimensions of the panels can impose unwanted constraints on the allowable dimensions of the frame. Thus, for example, the length of a wall must be the sum of the lateral extents of the frame panel in the wall.

Summary of the invention

According to a first aspect of the invention, there is provided a panel use in the construction of a building, the panel comprising an upright member and upper and lower lateral timber members respectively extending across the top and bottom of the upright member, wherein each lateral member extends from a respective first position to a respective free end at a respective second position laterally spaced from the upright, said free ends defining a lateral extreme of the panel and being arranged to be placed in abutment with the corresponding free ends of lateral members of other panels.

Since at least one lateral extremity of the panel is defined by the free ends of the lateral members, rather than by a vertical member (as is the case with a rectangular frame panel), pieces of the lateral members at the free end regions can be cut off so as to reduce the length of each lateral member projecting beyond the upright and thus reducing the size of the panel. Thus if such a panel is incorporated into the timber frame for a wall, the length of the wall does not have to be the sum of the length of the panels, as pre-formed, of the portion of the frame in that wall.

Preferably the first positions are laterally spaced from the upright in the opposite direction to the free ends.

Preferably, the upright is one of a pair of uprights.

In this case, each lateral member preferably has a further free end at said respective first position, the free end and further free end both being laterally spaced, in opposite directions, from both the uprights.

Such a panel can be arranged, in situ, to have a number of lengths ranging from a maximum, corresponding to the panel as supplied to a minimum formed by cutting each end of each

lateral member back as far as the nearest upright member.

Preferably, with the panel installed in its normally intended attitude of use, the or each upright is substantially vertical, and the lateral members are substantially horizontal.

Preferably, each member of the panel is attached to at least one other member of the panel by means of a punched metal timber fastener, for example, a nail plate.

The invention also lies in a timber frame portion for a building, the timber frame portion comprising a plurality of panels as hereinabove described, each panel being a structural panel arranged so that its upper and lower lateral members abut, and are substantially aligned with, the corresponding lateral members of another of the panels, the frame portion also including attachment means for attaching the panels to each other at their upper and lower lateral members.

Preferably, the attachment means comprises an elongate bridging member which extends across the interface between abutting lateral members and is attached to said members at respective regions spaced apart from each other.

The bridging member not only provides a convenient means for locating the frame members in position, but also enables the frame portion to resist some or all of the racking loads on the frame. Racking is the pivoting of the upright members relative to the lateral members under the influence of a shear force, for example wind, exerted on the building. The bridging members also help the frame portion to resist torsional slip, (ie the pivoting of adjacent panels relative to each other in response to said shear forces).

The bridging member is preferably able to withstand tensile forces to prevent racking or torsional slip in the frame portions. To that end, the bridging member is preferably

metallic.

Preferably, the bridging member comprises an elongate channel which may to advantage be of sufficient length to extend across a plurality of interfaces between abutting members, thereby to connect together three or more panels, or to connect a pair of adjacent panels to a corner post or anti-racking panel of the frame.

Preferably, the channel is of a generally u-shaped cross section so as to embrace the lateral members which it connects. The channel may to advantage also be apertured to receive nails applied to said lateral members from a face of the panel.

Preferably, the channel is one of a pair of such channels, one of which is applied to the upper lateral members, the other to the lower lateral members.

The frame portion may to advantage also include a timber corner post, carrying a metal bracket for attachment to at least one of the channels.

According to a third aspect of the invention, there is provided a kit for assembly into a frame portion as hereinabove described, the kit comprising a plurality of panels, each as hereinabove described, and a plurality of channels for attachment to abutting pairs of lateral members of the panels to join the panels together.

The kit preferably also includes a corner post and bracket means for connecting the corner post to the channel.

Preferably, each channel includes means for connecting it to an overlying channel to enable a two or more interlinked tiered structure of panels to be erected.

Brief Description of the Drawings

The invention will now be described, by way of example only, with reference to the accompanying drawings in which:

Figure 1 is an isometric perspective view of a timber wall panel in accordance with the invention;

Figure 2 is a similar view of a larger wall panel also in accordance with the invention;

Figure 3 is an exploded isometric view of a portion of a timber wall frame which includes three panels, each in accordance with the invention;

Figure 4 is a similar view showing the frame portion at the corner of a wall;

Figure 5 is an exploded isometric view showing the relationship between various timber panels of part of a two tiered timber frame portion in accordance with the invention;

Figure 6 is an isometric, cut-away view of part of a house having a timber frame in accordance with the invention;

Figures 7 to 10 are detailed views, shown to an enlarged scale of various parts of the frame shown in Figure 6;

Figure 11 is a cut-away side view of part of the wall of the building shown in Figure 6;

Figure 12 is a similar view to Figure 11, and shows an alternative construction of wall;

Figure 13 shows the inter-relationship between various connectors for the frame shown in Figure 6;

Figure 14 shows various different frame panels, each in accordance with the invention; and

Figure 15 shows a nail plate for use in the construction of the frame panels.

Detailed description

With reference to Figure 1, a building panel in accordance with the invention comprises two vertical upright timbers 1 and 2 connected to their bottoms by a lower horizontal timber 4 and at their tops by another horizontal timber 6. The timbers are joined together by suitable means (not shown), for example by nails or nail plates. Each of the horizontal timbers 4 and 6 extends beyond the vertical timbers 1 and 2 to define free ends 8 and 10 on the timbers 6, and free ends 12 and 14 on the timber 4 which are spaced from the vertical members 1 and 2.

The free ends 8 and 12 thus define one lateral extremity of the panel, whilst the ends 10 and 14 define the opposite lateral extremity.

When in the condition shown in Figure 1, the panel is at its maximum width. However, the width of the panel can be reduced by sawing portions from the free ends 8, 10, 12 and 14 until the ends of the upper and lower horizontal members 6 and 4 are flush with the outer sides of the uprights 1 and 2. When in this condition, the panel is at its minimum effective width and the members 1, 2, 4 and 6 will define a rectangular periphery of the panel.

The panel shown in Figure 1 can include further timbers, shown in broken lines, in the region bounded by the members 1, 2, 4 and 6. In the present case, the frame includes a further horizontal member 16 in the upper part of that region and a lower horizontal member 18 positioned approximately a third of the way up the members 1 and 2 and supported on three short vertical members 20, 22 and 24. A window frame and vent can be mounted in the region bounded by the members 1, 2, 16 and 18.

The panel shown in Figure 2 is wider than the panel in Figure 1 and lacks any openings for accommodating window. However, this panel also has upper and lower horizontal members 26 and 28 which connect vertical side members 30 and 32. The upper and lower members 26 and 28 also extend beyond the vertical members 30 and 32 and thus have free ends 34, 36, 38 and 40. Again removal of material from the ends of the timbers 26 and 28 can alter the effective width of the panel.

The panel also includes a diagonal bracing member 42 which extends from the corner defined by the timbers 32 and 28 to that defined by the timbers 26 and 30, and which serves to increase the resistance of the panels to distortion under racking forces. Such forces arise as a result of, for example, wind blowing on the building and applying a greater force along the member 26 and along the member 28, and thus gives rise to net skewing force on the panel.

Further structural supports for the panel is provided by a pair of aligned vertical members 44 and 46 which extend respectively from the upper and lower horizontal members 26 and 28 to the centre of the diagonal bracing member 42. In addition, the panel includes a pair of smaller horizontal members 48 and 50, each of which extends from a respective side vertical member 30 or 32 to a respective one of the central verticals 44 and 46.

As with the timbers at the panel shown in Figure 1, the timbers of the panel in Figure 2 can be joined together at their interfaces by means of nail plates, examples of which are shown in Figures 3, 4 and 15.

Each nail plate is a substantially planar plate of metal out of which a number of teeth have been pressed so as to extend substantially perpendicularly to the plate. In Figure 15, the side of the plate opposite the teeth is visible as are the apertures, such as aperture 52, created by the pressing of the

teeth. It can be seen from Figure 15 that, in this example, the teeth are arranged in rows on the plate. The plate shown in Figure 15 is intended to connect perpendicularly arranged timbers and has a generally rectangular portion 54 from which a further portion 56 projects, within the plane of the plate. The portion 56 includes a rectangular portion 58 connected to the portion 54 by a tapered region 60. In use the plate is driven onto the timbers so that the portion 54 engages one of the timbers and the other timber is engaged by the portion 56, with the teeth biting into both timbers to secure them together. Three such plates are shown at 62 and 64 in Figure 3, and connect a lower horizontal timber 66 to a pair of spaced apart vertical timbers 68 and 70 of a panel 65.

In order to strengthen the connection between the horizontal and vertical timbers, further nail plates 72 and 74 are provided, so that the junction between the timbers 68 and 66 is sandwiched between a pair of nail plates 62 and 72, whilst the interface between the timbers 66 and 70 is sandwiched between the pairs of plates 64 and 74. Similar pairs of plates (not shown) connect the tops of the vertical timbers 68 and 70 to an upper horizontal timber 76, and the same arrangement of plates is used to connect together the vertical and horizontal timbers of a pair of adjacent panels 78 and 80 which are identical to the panel 65.

When the frame portion shown in Figures 3 and 4 is assembled, the panels 65, 78 and 80 are all so positioned that the horizontal upper and lower timbers of adjacent panels abut each other. Both timbers are connected together by means of metal u-shaped channels 82 and 84 which extend along the lower and upper horizontal members respectively. The dimensions of the channels 82 and 84 are such that the upper and lower horizontal timbers are a close fit within each panel, and each of the channels includes side holes, for example 86 and 88, through which nails can be driven into the upper and lower timbers to secure the channels 82 and 84 thereto.

Each of the channels 82 and 84 extends from the panel 78, across the panel 65 to the panel 80. Further channels 87 and 91 (Figure 4) connect the panel 78, a panel 83, an anti-racking panel 90 and a corner post 89.

The channels, being metal, provide good resistance to tensile forces on the frame portion and can as a result help prevent so called torsional slip of the panel in which, due to a similar force to a racking force the panels are urged to rotate, within their own plane, relative to each other.

The corner post 89 abuts the anti-racking panel 90. The anti-racking panel 90 includes a pair of vertical timbers 92 and 94 connected at their tops and bottoms by upper and lower horizontal timbers 96 and 98, and between which five horizontal timbers such as 100 and 102 extend.

The smaller, horizontal timbers divide the space between the vertical timbers 92 and 94 into six substantially square areas for example 104, across each of which an angled bracing timber, for example 106, extends.

The nail plates provided at the junction of horizontal, vertical and angled timbers of the panel 90 are substantially rectangular. The reference numeral 108 denotes one such plate which has teeth which engage in the horizontal timber 100 the vertical timber 94 and the angled timber 106. Since the anti-racking panel 90 is connected to the channels 82 and 84 in a similar fashion to the other panels in the frame portion, it will be appreciated that the channels 82 and 84 effectively couple the anti-racking panel 90 to the rest of the frame portion, thereby to help prevent racking of the other panels in the portions. It will also be seen that the effective width of the anti-racking panel 90 can be reduced by sawing-off portions from the ends of the horizontal timbers 96 and 98 which extend away from the corner post 89 and beyond the vertical timber 94.

The free ends of the upper and lower timbers of the panel 78 opposite those which abut the panel 65 abut the horizontal upper and lower timbers 79 and 81 of the I-shaped spacer panel 83 which also abuts the anti-racking panel 90. A portion of each of the panels 82 and 84 which forms the base of the U also includes apertures, for example 101, 103 and 105 distributed at regular intervals along the channel these apertures enable further connections between the channels and the building panels by, for example, screws in addition, the apertures which are effectively at the top of the other channel 84 enable that channel to be attached to a further channel 110 which runs along the top of the channel 84, is inverted with respect to the latter, and constitutes the lower channel for a second tier of building panels similar to panels found in Figures 3 and 4. The tops of the panels in the second tier are joined together by a further similar channel (not shown).

Figure 5 shows another frame portion for a timber framed building in the region of the corner of the frame.

The portion of the frame shown in Figure 5 comprises a set of wall panels 112, 114 and 116 which are identical to the panel 65 and a window panel 118 identical to the panel shown in Figure 1. Interposed between each of the panels and a corner post 120 is a respective anti-racking panel, 122, 124, 126 and 128. As can be seen from the Figure, each anti-racking panel has been sawn back to its minimum width, the upper and lower horizontal members of each panel therefore having no "free ends".

In addition, the frame portion includes a spacer panel 130 which has a rectangular periphery, and supports the panel 118 at the desired height.

The timbers of each individual panel are held together by nail plates, whilst adjacent panels are connected by means of channels such as those shown in Figures 3 and 4. For the sake

of clarity, nail plates and channels have been omitted from Figure 5.

The cut-away portion of Figure 6 shows a larger portion of timber frame, but again a frame which includes two tiers, 132 and 134 of panels. The upper tier panels are connected along their tops to a conventional roof frame 136.

One of the walls of the frame has in its lower tier of panels a window panel 138 and two wall panels 140 and 142 arranged in abutting relationship between two anti-racking, end panels 146 and 148 and corner posts 150 and 152. The timbers of each of the panels are held together by means of nail plates (not shown). Three further horizontal timbers 154, 156 and 158 extend between adjacent pairs of the panels 146 and 138, 138 and 140 and 140 and 142 respectively.

A series of joists, for example 160, provide support for the floor of the first storey of the building, and separate the first tier 132 from the second tier 134. The portion of the second tier 134 which defines the same wall also has a pair of anti-racking panels 162 and 164 between which are interposed window panels 166 and 168 and further wall panels 170 and 172. The second tier of panels also includes horizontal timbers for example 174 spanning the gap between adjacent panels. The other walls of the building are formed from similar panels arranged in two tiers, although some of those walls can be formed with different shaped window panels or without any window panels at all.

The panels are held together by means of elongate metallic u-shaped channels which run along the tops and bottoms of panels, some of which are connected to the corner posts of the building frame. For the sake of clarity, the channels have been omitted from Figure 6, although lengths of some of the channels are shown in Figures 7 to 10.

Thus, for example, Figure 7 shows a channel 176 which runs across the tops of the panels 162 and 172, and which is nailed to the tops of the panels 162, 172 and 168 in a similar fashion to the channels shown in Figures 4 and 5. A further channel joins together the tops of the panels 170, 166 and 164, and is attached to the corner post 150. The end of the channel 176 adjacent the corner post 152 is attached to the latter via a v-sectioned bracket 178 which is bolted onto the corner post 152. The channel 176 is attached to the post 178 by means of a metallic connecting strip 180 which is bolted or riveted to both members. A similar arrangement is used to attach a channel 182 to the bracket 178. The channel 182 is inverted relative to the channel 176, is attached to the channel 176 by being bolted thereto at intervals along its length, and is also attached to a timber 184 forming part of the roof frame 136.

An enlarged bracket 186 is shown in Figure 8 and provides means for connection for four channels. Reference numeral 188 denotes part of a channel which extends along the underside of the bottom horizontal timbers of the panels 162 and 172.

The lower timbers of the remaining panels of that tier are joined together by a further channel which is itself attached to the post 150.

The channel 188 is also attached to a channel 190 which extends along the top of a timber 192 attached to the tops of the rafters in between the first and second tiers. A further timber 194 is attached to the bottom of the rafters, and to a channel part of which is shown at 196. The channel 196 is, in turn, attached to a channel 198 which joins the tops of the panels 140, 142 and 148, and is attached to the post 182. The tops of the remaining panels in that tier are joined together by another channel, itself attached to the post 150.

A further channel 200 extends along the bottoms of the panels 140, 142 and 148, and is attached to the corner post 152 via

a bracket 202 in a similar fashion to the other channels. Again, the bottoms of the other panels in the same tier are joined together by another channel, itself attached to the post 152.

Similar arrangements to those shown in Figures 7 to 9 are used to attach the other corner posts of the frame to the channels joining together the panels for the frame.

Figure 13 shows the brackets 178, 186 and 202 with some of the channels attached thereto. For the sake of clarity, the channels 182, 190 and 196 have been omitted. Each channel includes a cut-out, for example 250 or 252 each of which, in the case of the channels above the bottom of the frame, is in registry with a respective cut-out in the adjacent channel. Thus, for example, the cut-out 152 is in registry with a respective cut-out in the channel 190. The cut-outs enable service conduits, such as electrical cables or central heating pipes, to be passed through the channels.

In this example, the building has suspended timber floor joists and Figure 11 is a cut-away side view of the wall of the completed building at the region between the first storey and the foundations 205 of the building. The interior of the frame carries plaster board 204, whilst the frame exterior is sheathed in breather paper or a phenolic resin insulation board 206. An insulating material, such as rocksil 33, 208 is interposed between the plaster board and breather paper. In this example, the building also has an outer brick skin 210. The floor joists run parallel with the plane of the paper, and are overlaid by chipboard flooring 207. Insulating material, such as rocksil 133, 209 is contained between adjacent floor joists.

Instead of the suspended floor joist construction shown in Figure 11, the building can have a concrete oversite or pot and beam concrete floor as shown in Figure 12. Reference numeral

211 denotes the concrete floor. The remaining features correspond to the features of Figure 11, and are therefore indicated by the same reference numerals.

Figure 14 shows various examples of different panels which can be incorporated into a timber framed building.

It will be appreciated that various modifications to the design of the panels described herein are possible without departing from the scope of the invention. For example, the nail plates of the type shown in Figure 15 can be replaced by the rectangular nail plates such as are used on the anti-racking panel 90.

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Claims

1. A panel for use in the construction of a building, the panel comprising an upright member and upper and lower lateral timber members respectively extending across the top and bottom of the upright member, wherein each lateral member extends from a respective first position to a respective free end at a respective second position laterally spaced from the upright, said free ends defining a lateral extremity of the panel and being arranged to be placed in abutment with the corresponding free ends of lateral members of other panels.
2. A panel according to claim 1, in which the first positions are laterally spaced from the upright in the opposite direction to the free ends.
3. A panel according to claim 1 or claim 2, in which the upright is one of a pair of uprights.
4. A panel according to claim 3, in which each lateral member has a further free end at said respective first position, the free end and further free end both being laterally spaced, in opposite directions, from both the uprights.
5. A panel according to any of the preceding claims, in which, with the panel installed in its normally intended attitude of use, the or each upright is substantially vertical, and the lateral members are substantially horizontal.
6. A panel according to any of the preceding claims, in which each member of the panel is attached to at least one other member of the panel by means of a punched metal timber fastener, for example, a nail plate.
7. A timber frame portion for a building, the timber frame portion comprising a plurality of panels according to any of

the preceding claims, each panel being a structural panel arranged so that its upper and lower lateral members abut, and are substantially aligned with, the corresponding lateral members of another panel, the frame portion also including attachment means for attaching the panels to each other at their upper and lower lateral members.

8. A portion according to claim 7, in which the attachment means comprises an elongate bridging member which extends across the interface between abutting lateral members and is attached to said members at respective regions spaced apart from each other.

9. A portion according to claim 8, in which the bridging member is metallic.

10. A portion according to claim 8 or claim 9, in which the bridging member comprises an elongate channel of sufficient length to extend across a plurality of interfaces between abutting members, thereby to connect together three or more panels, or to connect a pair of adjacent panels to a corner post or anti-racking panel of the frame.

11. A portion according to claim 10, in which the channel is of a generally u-shaped cross section so as to embrace the lateral members which it connects.

12. A portion according to claim 11, in which the channel is apertured to receive nails applied to said lateral members from a face of the panel.

13. A portion according to any of claims 10 to 12, in which the channel is one of a pair of such channels, one of which is applied to the upper lateral members, the other to the lower lateral members.

14. A portion according to claim 13, in which the portion

includes a timber corner post, carrying a metal bracket for attachment to at least one of the channels.

15. A kit for assembly into a frame portion according to any of claims 10 to 14, the kit comprising a plurality of panels and a plurality of channels for attachment to abutting pairs of lateral members of the panels to join the panels together.

16. A kit according to claim 15, in which the kit also includes a corner post and bracket means for connecting the corner post to the channel.

17. A kit according to claim 15 or claim 16 in which each channel includes means for connecting it to an overlying channel to enable a two or more interlinked tiered structure of panels to be erected.

18. A panel substantially as described herein with reference to, and as illustrated in, the accompanying drawings.

19. A timber frame portion substantially as described herein with reference to, and as illustrated in, Figures 3-13 of the accompanying drawings.

20. A kit substantially as described herein with reference to, and as illustrated in, Figures 3-13 of the accompanying drawings.



Application No: GB 9701502.8
Claims searched: 1 - 20

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Search Report under Section 17**

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK CI (Ed.P): E1D: DCF, DF172, DLCB, DLCF, DLCKN, DLCKJ, DLEB, DLEF, DLEKJ, DLEKN
Int CI (Ed.6): E04B
Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	US 4648216 REAVES	-

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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