(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 1 251 220 A2

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
23.10.2002 Bulletin 2002/43

(51) Int Cl.[7]: **E04F 15/024**, E04B 5/12, E04B 5/48

(21) Application number: **02251736.1**

(22) Date of filing: **12.03.2002**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE TR
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **21.04.2001 GB 0109854**
15.01.2002 GB 0200788

(71) Applicant: **Marlow & Co. Ltd.**
Bury St. Edmunds, Suffolk IP32 7AP (GB)

(72) Inventor: **Smith, Roger**
Bury St Edmunds, Suffolk IP31 3PB (GB)

(74) Representative: **Nash, Keith Wilfrid et al**
KEITH W. NASH & Co.,
90-92 Regent Street
Cambridge CB2 1DP (GB)

(54) Improvements in and relating to flooring

(57) A building component is described comprising a moulding adapted to be secured to the top surface of flooring joists either along the length thereof or transversely thereacross, having a rebate along its length to provide a ledge on which a floorboard edge can rest. The depth of the rebate accommodates at least the thickness of the floorboard, and the thickness of the moulding below the ledge creates a services void between the floorboard and the upper surface of the joists. The moulding may also include a second parallel rebate leaving a ridge therebetween. The two floorboards are spaced apart by the ridge. A further rebate can be provided to accommodate at least part of another member. Where a floor covering is laid over the floorboards the rebate(s) is/are sufficient to accommodate both boards and covering. A floor panel including such mouldings comprises a plurality of spaced apart joists secured at their ends to rim boards, elongate mouldings secured to the joists, flooring boards located on the rebates and secured to the mouldings, to create a void between the floorboards and the tops of the joists. A services supporting platform is formed by flat panels between and supported on the lower flanges of parallel I-beam joists.

EP 1 251 220 A2

Description

Field of Invention

[0001] This invention concerns flooring and in particular the provision of services such as electrical wiring, telecommunications and data cabling and pipes for water supplies and heating, below a floor in a building. The invention is of particular relevance where flooring is to be constructed from prefabricated panels, but is not restricted to prefabrication and can be employed in on-site construction of floors and may be incorporated into buildings having timber framed or masonry walls.

Background to the invention

[0002] Traditionally flooring for first and higher floors in a building has been constructed by laying timber joists in a parallel spaced array between pairs of load-bearing walls or other load-bearing devices such as transverse joists or steel beams themselves carried by load-bearing walls. Floorboards having tongued and grooved edges have then been laid transversely to the run of the floor joists and nailed or screwed to the joists. Whilst relatively narrow boards were favoured in the past, larger area boards formed from woodchip have been used in more recent years and are now the norm especially in domestic property.

[0003] The installation of services below the floorboards has usually been carried out during the construction of the building before the boards are screwed to the joists. Where possible pipes and cables have been run parallel to the joists, in the gaps between the joists, and have been secured by proprietary clips to the sides of the joists. Where a pipe or cable run has to run transversely to the run of the joists the latter have been notched in their upper surface to allow pipes or cables or ducting to run just below the floorboards in alignment with the desired pipe, cable or ducting run so as to extend transversely to the joists just below the floorboards.

[0004] In general joists have comprised lengths of solid sawn timber of rectangular cross-section. However an alternative to solid timber joists is now available in the form of timber I-beams such as those supplied by TJM Europe SPRL under the TJI trademark. These beams are constructed from upper and lower rails (chords) which may be of solid timber or laminated veneer lumber, which are routed to accommodate OSB web material to which they are secured by adhesive, to form an I-section timber beam. The widths of the rails are similar to the thickness of the solid timbers used for flooring joists hitherto, and substituting these timber I-beams during construction, for solid timber, has allowed floorboards to be secured thereto in the usual way using nails or screws as desired. The I-beams tend to have equally good load-bearing characteristics as solid timber joists, and also tend to be more stable and less likely to shrink or bow or twist as can happen with solid timber, resulting in squeaks and dips characteristic of conventionally constructed floors using solid timber joists.

[0005] The use of timber I-beams as floor joists does however create a problem in relation to the location of pipes, cables and ducting below the floorboards laid thereover, in that the structural integrity of the I-beam is severely affected if any notch is formed in the rails (chords). Indeed the design of such beams is such that any cutting away of material from either rail would probably cause the beam to fail under load. Thus although it is still possible to run pipes, cables and ducting parallel to the I-beam joists, it is not possible to notch them to permit transverse runs as has hitherto been the case with solid timber joists.

[0006] With the trend towards prefabrication of building components, such as flooring panels and wall panels, off site, there is a benefit to be gained in terms of the reduced weight of such components, if timber I-beam joists of the type described, can be used wherever possible in place of heavier solid timber. However there remains the problem of installing services below the floorboards used to clad such joists.

[0007] It is one object of the present invention to provide a flooring member for use in conjunction with joists and floorboards, to enable services to run transversely to the run of the joists without the need to notch the latter.

[0008] It is a further object of the invention to provide a form of construction for a prefabricated flooring panel which can be transported to site and simply lifted into place by crane, which allows the use of timber I-beam joists yet still allows services to be installed below the level of the floorboards cladding the panel, after the latter has been positioned on the load-bearing walls of the building of which it is to form a part.

Summary of the invention

[0009] According to one aspect of the invention a building component is provided in the form of a moulding adapted to be secured to the top surface of flooring joists either along the length thereof or transversely thereacross, and by virtue of a rebate along the length of the moulding to provide a ledge on which the edge of a floorboard can rest, the depth of the rebate being such as to accommodate at least the thickness of the board, so that the upper surface of the moulding will be flush with the upper surface of a floorboard when positioned thereon (or with a floor covering if the boards are covered or to be covered therewith), and wherein the thickness of the moulding between the upper surface of the board-receiving rebate and its underside is such as to create a void between the underside of the boards and the upper surface of the joists sufficient to accommodate services such as pipes and/or cables and/or ducting therein.

[0010] This aspect of the invention is applicable to any type of flooring joist and can be used in combination with solid timber joists or timber I-beam joists or steel beams, since there is no requirement to notch the joists to ac-

commodate transverse services runs of pipes or cables or ducting. This aspect of the invention is also of particular advantage where the joists are timber I-beams of the type described and where a flooring panel is to be constructed off-site, using such I-beam joists as the supports for floorboards. However it is to be understood that the invention (and this aspect in particular) is not limited to prefabricated panel construction but can equally be employed in on-site floor construction in any form of building whether having timber framed or masonry walls, although in the latter case no rim beams will normally be required.

[0011] The moulding may be formed from timber or metal or plastics or a composite material such as GRP and may be formed by extrusion or moulding or machining as appropriate.

[0012] The moulding may be secured to the upper surface of the joist for example by nails, screws, bolts, adhesive, nail plates, or clips.

[0013] Where the moulding is to be situated between two floorboards, a second rebate may be formed parallel to the first, so that the parallel edges of the two floorboards can be rested on, and be secured to, the moulding, spaced apart by a ridge in the upper surface of the moulding left between the two rebates. By making the depth of each rebate equal to the thickness of the floorboard the edge of which is to be accommodated thereon, so the upper surface of the floorboards and the upper surface of the ridge will present a smooth flat floor surface.

[0014] If a floor covering is to be planted on the floorboards the depth of the rebate may be increased to accommodate the combined thickness of board and covering, or a strip of material of appropriate thickness may be planted on the exposed surface of the moulding, to provide a coplanar surface.

[0015] Where the moulding is to co-operate with other floor or wall members, one or more further rebates may be formed in the cross-section of the moulding to accommodate the other member or members.

[0016] According to a second aspect of the invention a method of creating a void below floorboards and above the joists over which the boards extend comprises the steps of securing to the upper face of the joists at positions corresponding to the edges of the boards, lengths of moulding which are rebated to receive the floorboard edge, positioning floorboards so that their edges rest on the rebates in the mouldings, wherein the depth of the rebate in the moulding is commensurate with the thickness of the floorboards, so that when secured in place the upper surface of the boards and the exposed faces of the mouldings are co-planar to present a substantially flat floor surface.

[0017] The joists may be of solid timber or metal or may be timber I-beams of the type described and the step of securing the mouldings to the joists may for example involve nailing, screwing, bolting, or adhesively joining the two.

[0018] According to a further aspect of the invention a floor panel which includes provision for the laying of services below the floor surface thereof after the panel has been installed in a building during construction, and which can be constructed off-site and delivered thereto for craning into position, comprises:-

(a) a plurality of parallel spaced apart joists,

(b) a plurality of transversely extending rim boards secured to the ends of the joists,

(c) mouldings as aforesaid secured to the upper surfaces of the joists to define rebated openings into which flooring boards can be fitted with the edges of the boards resting in the rebates in the mouldings,

(d) flooring boards located in the said openings and secured to the mouldings, with the upper surface of the boards flush with the exposed faces of the mouldings, whereby a void exists between the undersides of the floorboards and the tops of the joists within which cables or pipes or ducting can be run, without the need of notching the upper surfaces of the joists.

[0019] The floorboards are typically sheets of chipboard or the like, typically of standard size such as 600mm by 2400mm by 22mm thick.

[0020] Securing the boards to the joists to form a prefabricated floor panel, creates a stable panel which has little tendency to distort as by twisting or bending or moving out of square, when being stored or transported or lifted into position using a crane or the like.

[0021] If at least some of the floorboards are secured to the mouldings by removable securing means, such as screws or bolts, the boards can be removed after the panel is in situ, to allow access to the services void, to enable pipes and/or cables and/or ducting to be laid over the joists, before the boards are finally secured in place.

[0022] One or more service runs may be provided in the main panel by floorboard panels or traps, running parallel to the edges of the main panel, and having a reduced width of the order of 250-300mm, supported by and secured to parallel and appropriately spaced apart mouldings, at least one of which is adapted by means of a second rebate to accommodate the edge of a full size floorboard, the latter being secured to the mouldings during manufacture of the main panel, and the reduced width panels being removably secured to the main floor panel during manufacture or simply supplied loose therewith for securing thereto after the main floor panel has been installed in the building of which it is to form a part.

[0023] In a rectilinear prefabricated floor panel bounded by rim boards and spanned between the rim boards by timber I-beams of the type described, to form floor-

board supporting joists, with mouldings between the joists and the undersides of the floorboards to provide a services void above the joists, a first additional timber I-beam is secured at corners thereof between the rim board and the first of the array of I-beam joists parallel to the rim board, spaced from the rim board by a distance commensurate with the width of the load-bearing wall on which the edge of the prefabricated floor panel is to rest, so as to form with the rim board, and upper and lower elongate closure plates, a box section, for transmitting the load of walling above the edge of the floor panel to walling therebelow, and a second additional timber I-beam is secured perpendicular to the first additional I-beam, and located between the other rim board forming the corner of the prefabricated structure and the part of a plurality of transversely extending timber I-beams secured between the first mentioned rim board and the said first of the parallel array of I-beams parallel thereto, to provide transversely extending joists within the prefabricated structure for bearing on the load supporting wall, and the second additional I-beam serves as a support for mouldings laid in line therewith and transversely thereto, for supporting the inner edges of panels overlying the services void created by these mouldings and the first mentioned mouldings.

[0024] Preferably a tray provides a cable platform at the bottom of each services run, formed by locating one or more flat panels resting on and optionally secured to the lower rails of parallel timber I-beam joists situated on either side of the services run. Typically cabling is laid directly on the platform so formed. Alternatively or in addition ducting is laid thereon to contain at least some of the cables.

[0025] Where a services run is to extend transversely to parallel spaced apart timber I-beam joists, holes are preferably formed in the OSB web of the I-beam joists, through which cables or pipes, especially plastics pipes, can be threaded.

[0026] Since small openings in the web of an I-beam, albeit clear of the ends thereof, do not significantly affect the load carrying capabilities of such a beam, when used as a joist, each I-beam to be employed as a joist in a prefabricated flooring panel is preferably formed with a plurality of such holes in its web, typically as by drilling, before assembly of the I-beams to form the joists in the panel.

[0027] Preferably all said pre-formed holes are located at similar positions along the length of each I-beam, so that when assembled, the holes are in substantial alignment when the I-beams are arranged in a parallel spaced array, and are viewed in a direction transverse to the run of the I-beams.

[0028] Where the services run extends transversely to parallel spaced apart I-beams, the upper rails of the I-beams provide a support for pipes, cables or ducting extending along the run just below the floorboards. However no such support exists along the length of a services run which extends parallel to an array of I-beam joists, and according to a preferred feature of the invention, struts are provided which extend transversely below the mouldings defining the services run, the struts being spaced apart along the length of the run in the form of the rungs of a ladder.

[0029] The struts may be secured as for example by adhesive or clips or friction fit joints or firtree connectors, to the mouldings.

[0030] Alternatively and preferably each strut includes a central region adapted to span the gap between the upper rails of the two I-beam joists on either side of the services run, and is stepped at each end to extend over the upper rails of the I-beam joists to support the central region below the mouldings.

[0031] In a preferred embodiment each stepped end which is to overlie an I-beam joist has a thickness commensurate with the height of the floorboard supporting ledges of the mouldings. Preferably each extends over an I-beam by not more than the width of each upper rail.

[0032] Each strut may be formed from metal or plastics or a composite material such as GRP, or from three lengths of timber, a first longer length no longer than the spacing between the rails of the two I-beam joists, and two shorter lengths secured to the upper surface of the strut one at each end, so as to extend beyond the ends of the longer length to fit over the tops of the two rails.

[0033] Where the strut is formed from timber, as aforesaid, the two shorter lengths may be joined to the longer length for example by adhesive, or nails, or screws, or nail-plates, or bolts, or any combination thereof.

[0034] Alternatively the struts may be formed from an elongate element carried at each end by miniature joist hangers which clip over or are secured to the upper rails of the I-beam joists and receive the ends of the elongate element. The latter may be formed from timber or plastics or a composite material such as GRP, or metal.

[0035] According to a preferred feature pipe and/or cable retailing clips may be provided in each strut and where at least the central section spanning the gap between the two I-beam joists is moulded from plastics material, the clips may be moulded integrally with the strut.

[0036] Where the thickness of the parts of each strut which extend over rails of the I-beam joists is commensurate with the thickness of the mouldings below the floorboard supporting ledges thereof, the parts of the strut which extend over the I-beam rails provide additional support for the floorboards.

[0037] Where mouldings are to extend parallel to and between I-beam joists, the central span of each transverse strut not only provides support for pipes, cables and the like, but also for the mouldings.

[0038] The invention also lies in a services supporting strut adapted to fit between a pair of I-beam joists having end regions which extend beyond and above the ends of a main section of the strut for support on the upper rails of the two I-beams.

[0039] A similar services supporting platform (especially for cables or plastics pipes), may be provided be-

tween I-beam joists which extend transversely to a services void by locating flat panels between the webs of the I-beam joists, with their ends supported on (and optionally secured to) the lower rails of the I-beam joists, and the invention also lies in a method of creating such a platform by fitting flat panels between the webs as aforesaid, and in flat panels adapted to be so fitted.

[0040] The invention also lies in a building having load bearing walls on which prefabricated floor panels as aforesaid having an accessible services void below floorboards secured thereto, is located on the load bearing walls.

[0041] The invention also lies in a timber framed building in which prefabricated timber wall panels comprise load bearing walls thereof and a flooring panel as aforesaid having an accessible services void below floorboards secured thereto, is sandwiched along at least one edge region thereof, between timber wall panels above and below the floor panel.

[0042] Where a load-bearing wall is to be supported above an edge region of the flooring panel, the latter is preferably reinforced in the said edge region thereof, to enable the weight of the wall above the panel to be reliably transferred to the wall therebelow.

[0043] It is to be understood that except where inappropriate to the context, all of the foregoing underfloor construction techniques, construction of services runs and supports for cabling and pipework can be employed in flooring supported by timber framed or masonry walls or any combination thereof, and may be employed during on-site floor construction or in prefabrication of flooring panels.

[0044] The invention will now be described by way of example with reference to the accompanying drawings, in which:-

Fig 1 is a schematic plan view of a flooring deck constructed from two flooring panels each constructed in accordance with the invention,

Fig 2 is a section AA of Fig 1,

Fig 3 is a section BB of Fig 1,

Fig 4 shows the sole plate layout for the flooring deck of Fig 1,

Fig 5 shows how wall panels can be mounted on the peripheral regions of the flooring deck of Fig 1,

Fig 6 is a cross-section to an enlarged scale through the lower RH corner of the structure of Fig 2,

Figs 7 and 8 are plan views of the two panels which can be joined to form the deck of Fig 1, showing the run of the mouldings defining the edge of the service void,

Fig 9 is a scrap section on DD in Fig 8 to an enlarged scale, showing how these different mouldings may be employed,

Figs 10, 11 and 12 are sectional views of the three mouldings employed in Figs 7-9,

Figs 13 and 14 are plan views if the rim-board and I-beam joist layouts in the panels of Figs 7 and 8,

Figs 15, 16 and 17 are side elevations of different I-beam joists employed in the panels of Figs 13 and 14,

Fig 18 is a section through a part of the services void provided in accordance with the invention in the panel of Fig 1,

Fig 19 is a perspective view of a part of a services void between two parallel spaced I-beam joists showing how transverse struts can fit over and between the I-beams, and

Fig 20 is a section through a flooring arrangement where a floor covering is applied to the floorboards and to the services cover.

Detailed description of the drawings

[0045] Fig 1 illustrates in plan view a flooring deck constructed by joining two pre-fabricated floor panels P1 and P2 along two longer edges each made up of a timber I-beam joist 10, 12. The two joists can be secured by screws or bolts or any other convenient means, side by side as shown. Rimboards 14, 16 define the parallel edges of the two panels P1 and P2 and similar but shorter rimboards 18, 20 define the other two sides of P1 and rimboards 22, 24 define the other two sides of P2.

[0046] Each panel is formed by one or more timber I-beam major joists 26, 28 in the case of P1, and 30 in the case of P2 with shorter lengths of similar I-beam forming cross joists spanning the gaps between joist 26 and rimboard 14 (identified by 32 - 42) and between joist 30 and rimboard 16 (identified by 44 - 54). Additional I-beam joists are provided at each corner, denoted 56, 58, 60 and 62 respectively.

[0047] The spacing (measured perpendicular to the joists) between the shorter cross joists, such as 46, 48 is substantially the same as the spacing between the major joists, such as 26, 28, and the purpose of the cross joists will become apparent as later Figures are described. This spacing is selected to correspond to the width of standard floorboards such as are currently manufactured from chipboard and the like, namely 600mm.

[0048] The major joists and the cross joists are secured to the rimboards and the cross joists to the major joists, using the joining techniques described in our corresponding Patent applications filed under case refer-

ences C1335/M and C1336/M.

[0049] Figs 2 and 3 show how pre-fabricated wall panels 64, 66 and 68, 70 can be located on the peripheral regions of the floor panel, with the timber I-beams transferring the weight of the walls (and any structures carried by them) to the footings or the walls of the floor below.

[0050] Fig 4 shows how the sole plate, (made up of four lengths of 38m x 89mm timber 72,74,76 and 78) can be constructed for fitting below the floor panels P1, P2 as denoted in Figs 2 and 3.

[0051] Fig 5 is a plan view showing the four wall panels 64, 66, 68, 70 in situ.

[0052] In accordance with the invention services void is created by laying the flooring boards (generally designated by 80 in Figs 2 - 3) over mouldings (illustrated in more detail in later Figures), so as to permit pipes an/or cables and/or ducting to be located between the underside of the boards 80 and the upper surfaces of the major joists (such as 10, 12) and the cross joists (such as 32, 34).

[0053] In general this is sufficient to support pipes at 600mm intervals, and by running any pipes parallel to any one of the four sides of the deck made up of P1 and P2, close to the edge of the deck (at least within 600mm from the edge) it will be seen that this degree of support is readily obtained.

[0054] Fig 6 shows the floor construction to an enlarged scale. The I-beam joist 28 includes a web 82 and upper and lower rails 84, 86 respectively, routed to receive the upper and lower edges of the web. The wall panel 66 is spaced from the upper surface of the I-beam 28 and rimboard 20 by a length of 22mm chipboard 88 and the sole plate 76 is shown engaging the underside of the I-beam 82 and rimboard 20.

[0055] The web is formed with two 38mm diameter holes 90, 92 and the 22mm chipboard flooring boards 80 are carried on mouldings laid over and secured to the I-beam joists. One of the mouldings is shown in cross-section in Fig 6 and is denoted by reference numeral 94. It will be seen that the 22mm chipboard spacer 88 extends beyond the inside face of the wall panel 66, and to this end the moulding 94 is undercut to accommodate the protruding 22mm thickness in much the same way as the upper surface of the moulding in the diametrically opposite corner of the section, is rebated to accommodate the 22mm thickness of the flooring board 80.

[0056] Figs 7 and 8 show panels P1 and P2 to a larger scale and show overlaid thereon mouldings and flooring boards, and Figs 9 - 12 show the three different mouldings 94 (as already illustrated and described with reference to Fig 6), (see Fig 10), 96 in Fig 11 and 98 in Fig 12. Fig 9 shows how each of the three mouldings is used.

[0057] Thus 94 is located around the periphery of the deck formed by P1 and P2, and provides a ledge 100 to receive an edge of a services cover board 102; 96 provides two such ledges 104, 106, the first to support the other parallel edge of the services cover boards 102 and the other (106) to support an edge of a flooring board 108 which is cut to extend halfway across the width of the moulding 98. The edge of the next board 112 abuts the edge of board 108 and is supported by the other half of the width of the moulding 98 (as shown in Fig 9).

[0058] An upstand 114 extends along the length of the moulding 96 between the two ledges 106, 106, the height of the upstand being equal to the 22mm thickness of the flooring boards such as generally designated at 80 in Fig 6.

[0059] The line of abutment of the edges of the boards 108, 112 is denoted by 116, also visible in Fig 9.

[0060] The remaining boards are outlined in Fig 8 and are denoted by reference numerals 118 to 124, while services cover boards are denoted by 102 (already described), 126 and 128.

[0061] In a similar way the boards are outlined in Fig 7 and denoted by reference numerals 130140, and the three services cover boards are denoted by reference numerals 142, 144 and 146.

The mouldings shown in Figs 7 and 8 are denoted by the same reference numerals as employed in Fig 9, but where they do not correspond to the actual mouldings identified in Fig 9, they include a suffix, such as 94a to 94e, 114a to 114e, and the abutment lines over the mouldings corresponding to moulding 98 in Fig 9 are denoted by 116a - 116i.

[0062] Figs 13 and 14 illustrate the way in which the different component parts of the panels are joined. Each joint is labelled with an identifier the code for which is indicated in the drawing.

[0063] I-beam to rimboard joints are denoted by an asterisk and the joints are of the type described in our corresponding Application reference C1335/M, and each joint is formed by:

1) forming two holes a short distance from the end of the I-beam to be butt-jointed to the rim-joist, one in each of the upper and lower rails (or flanges) of the I-beam section, the two holes being coaxial and generally aligned with and parallel to the web of the I-beam section,

2) locating the rim-joist in place and forming two further holes through the rim-joist and into the ends of the upper and lower rails (flanges) of the I-beam joist, generally perpendicular to and intersecting the first two holes,

3) inserting two cross-dowels into the two first holes, each having a transverse threaded opening, and aligning the openings with the holes which intersect the holes containing the cross-dowels,

4) inserting threaded bolts into the intersecting holes to engage in the threaded openings in the cross-dowels, and tightening the bolts so as to draw

the rim-joist towards the abutting end of the I-beam joist, and thereby clamp the rim-joist thereto.

[0064] The cross-dowels may be formed from metal, or from a rigid plastics material or from a composite material.

[0065] The bolts are typically formed from metal or a rigid plastics material.

[0066] A load spreading washer may be located between the head of each bolt and the rim-joist, or each bolt head may include an integral load spreading flange for increasing the area of the bolt head which is to make contact with the rim-joist.

[0067] The ends of the holes through the rim-joist through which the bolts pass into the rim-joist may be enlarged to accommodate the heads of the bolts, so that the latter are wholly contained within the rim-joist.

[0068] Where the upper and lower rails (flanges) of the I-beam joist are laminated, the holes which are to receive the cross-dowels preferably extend generally perpendicular to the laminations.

[0069] I-beam to I-beam joints are denoted by the superimposed circle and cross symbol and are of the type described on our corresponding Application reference C1336/M, and each joint is formed by:

1) fitting the end of the web of the first I-beam between the two side cheeks of a rigid channel member,

2) securing the web to the channel member by means of through fastenings such as bolts, the bridging section of the channel member having at least one stud protruding therefrom in line with the web of the first I-beam for securing to the web of the second transverse I-beam,

3) forming a hole in the web of the second I-beam through which the or each stud can pass, and

4) screwing the two beams together by fitting a closure member to the protruding end of the stud and tightening thereover.

[0070] Preferably the stud is formed with a screw thread and the closure is a nut which may be a locking nut, with a washer sandwiched between it and the web of the second beam, if desired, and the joint is formed by screwing the nut onto the stud, until the web is tightly sandwiched between the nut (and washer if fitted) and the rear of the channel member attached to the web of the first beam.

[0071] The load bearing capacity of a joint formed in accordance with the invention can be increased to advantage by enlarging the opening in the web of the second beam which is to receive the stud, and fitting into the enlarged opening a dished shear ring so as to be a tight fit therein, the shear ring having a small central opening through which the stud protrudes and the engagement of the closure device on the stud serves to clamp the shear ring to the web of the second beam and to the rear of the channel member attached to the web of the first beam.

[0072] The closure member may be formed from metal or a rigid plastics material or from a metal reinforced plastics combination, or a composite such as GRP.

[0073] The stud or studs and the closures are typically formed from metal but may be formed from a rigid plastics material or a metal reinforced plastics combination.

[0074] The shear ring if fitted may be formed from rigid plastics or metal or GRP or a metal reinforced plastics configuration.

[0075] In order to improve the fit between the end of the first beam and the side of the second beam, the upper and lower rails (or flanges) of the first beam may to advantage be cut back by an amount commensurate with the overhang of the corresponding rails (flanges) on the second beam relative to the web of the latter less the thickness of the bridging bar of the channel member, so that the web of the first beam extends beyond the end faces of the upper and lower rails (flanges) thereof.

[0076] Preferably the side cheeks of the channel member extend over substantially the whole height of the web of the first beam so that the channel member is a snug fit between the upper and lower rails (flanges) of the first beam.

[0077] Preferably the side cheeks of the channel member are formed with pairs of aligned holes and similar holes are formed in the web of the first I-beam, to allow bolts to be pushed through the hole in the end of the web and the two aligned holes on either side of the side cheeks of the channel member.

[0078] The panels P1 and P2 (as shown in Figs 7 and 8) are made using three different lengths of timber I-beam joists, labelled type A, B and C.

[0079] The type A joist is shown in Fig 16, the type B in Fig 15 and the type C in Fig 17.

[0080] It will be seen that pairs of 38mm diameter holes are formed in the web 148 of joist C, adjacent each end thereof, as denoted by 150, 152 and 154, 156. By locating these holes at the same distance from each end, in all the C-type joists, cables or pipes, especially flexible pipes) or ducting can be threaded through these holes from one joist to the next, either during or after assembly.

[0081] Similar pairs of holes are provided in the web 158 of joist type A at 160, 162 and in the web 164 of joist type B at 166, 168. Again by carefully locating the holes relative to the ends of these shorter joists the holes will be generally aligned when the joists are in position, to permit services such as cables or pipes (especially flexible pipes) or ducting to be threaded therethrough so as to extend from and through one joist to the next.

[0082] Fig 18 illustrates how underfloor supports can be formed for supporting services, and where necessary, mouldings which run parallel to the run of the joists

so that the latter cannot themselves be used for support.

[0083] Two supports are shown, an upper one generally designated 170 and a lower one 172. Support 170 comprises an elongate timber strut 174 which extends between the side faces of the upper rails of two parallel spaced apart I-beam joists generally designated 176, 178 and two shorter lengths of timber 180, 182 overlying the ends of strut 174 and protruding a short distance therebeyond to form overhangs which will rest on the upper faces of the rails 184, 186 of the I-beam joists 176, 178 respectively. As shown these overhanging items 180, 182 are secured to the ends of the strut 174 by nail plates two of which are shown at 188, 190. Similar nail plates (not shown) are driven into the timbers on the opposite side of the overhang.

[0084] The strut 174 provides support for mouldings such as 192, 194 having rebates on which panels of 22mm floor grade chipboard 196, 198, 200 are received. The thickness of the overhangs 180, 182 must not exceed the thickness of the floor panels 196 etc., and to advantage is made the same as that thickness so as to further support the flooring panels 196 etc.

[0085] A lower support is provided by a panel 172 dimensioned to fit between the webs 202, 204 of the I-beam joists 176, 178 and rest on the inner ledges 206, 208 of the lower rails 210, 212 of the I-beam joists. The support may be continuous (by providing long lengths of panel 172) or more preferably, discontinuous by locating short length panels at regular intervals along the length of the joists 176, 178. Cables or pipes or ducting can be laid between the joists to rest on the panels, which may be secured at their ends to the rails 210, 212 by means of nails, screws, clips or adhesive.

[0086] Although preferably formed from timber or OSB, the panels 172 and struts 170 may be formed from plastics or metal or a composite material such as GRP, or any combination thereof.

[0087] Although not shown in Fig 18 pipe or cable clips may be provided in the upper edge of the strut 170 or upper face of the lower panel 172. Where these are moulded from plastics the clips may be integrally formed with the primary device during the moulding process.

[0088] Fig 19 is an exploded perspective view of a region of a floor panel showing a pair of parallel I-beam joists 214, 216 having secured to their upper rails lengths of moulding 218, 220, 222, 224 which leave gaps 226, 228 into which the overhanging ends 230, 232 can fit so as to rest on the rails 234, 236 with the bridging section 238 spanning the gap between the rails 234, 236. Intermediate type B mouldings 240, 242 running parallel to and between the rails 234, 236 rest on, and can be secured to the bridging section 238 and pipe or cable clips 244, 246 are secured to or formed integrally with the section 238.

[0089] The gap between the upstands 248, 250 of two B-type mouldings 240, 242 is bridged by a services cover panel (or series of such panels) an example of which is denoted by reference numeral 252, while similar floorboards 254, 256 rest on the other rebates of the B-type mouldings 240, 242 and extend over, or partially over the flat topped type C mouldings 218, 222, 220, 224.

[0090] Although not shown clips may be secured to or formed integrally with the lower support panel(s).

[0091] In the flooring example shown in Figs 9-12 the flooring boards 108 and services cover board 102 are shown as standard 22mm chipboard. In this event the height of the upstand 114 of moulding 96 and the corresponding edge support in moulding 94 need only be 22mm, to just accommodate the 22mm chipboard thickness. If however it is desired to cover the chipboard with a floor covering such as thin timber flooring, floor tiles or vinyl, which is to be secured to the chipboard by an adhesive, it is important that the floor covering does not extend in a continuous manner over the removable services cover board such as 102 in Fig 9.

[0092] To this end the mouldings 94, 96 may be modified as shown in Fig 20 so that the upstand 96 and edge support region of 94 are of increased height to accommodate the thickness of the floor covering.

[0093] As shown in Fig 20 this can be achieved by simply increasing the overall height of each of the mouldings, in which event the top surface of the upstand 114 (of 96) and the edge support region of 94 will be visible, but will be coplanar with the surface of the floor covering sheet material 117, 119.

[0094] By colouring the mouldings (or at least the upper surface which will be visible) so the upper surface of the mouldings can be made either to appear as a contrasting feature in the floor, or to blend in colour and texture with the floor covering material.

[0095] Alternatively mouldings having upstands and edge support heights just sufficient to accommodate the floor boarding may be employed, as shown in Figs 9-12, and a narrow strip of material may be planted on the upper exposed surface of the mouldings, so as to produce the desired visual effect (i.e. either a contrast or to blend with the floor covering material). The strip material should have a similar thickness to the floor covering material, so that the upper surfaces are coplanar, and may be secured in place by means of an adhesive and may to advantage be self-adhesive with a peel-off backing strip, to facilitate installation.

Claims

1. A building component comprising a moulding adapted to be secured to the top surface of flooring joists either along the length thereof or transversely thereacross, having a rebate along the length of the moulding to provide a ledge on which the edge of a floorboard can rest, **characterised in that**:-

    1) the depth of the rebate is such as to accommodate at least the thickness of the floorboard, and

2) the thickness of the moulding between the upper surface of the floorboardreceiving rebate and its underside is such as to create a void between the underside of the floorboard and the upper surface of the joists sufficient to accommodate services such as pipes and/or cables and/or ducting therein.

2. A building component according to claim 1 **characterised by** a second rebate similar to and formed parallel to the first leaving a ridge along the length of the moulding therebetween, so that the parallel edges of two floorboards can be rested on, and be secured to, the moulding, spaced apart by the ridge between the two rebates

3. A building component according to claim 1 or 2 **characterized by** a further rebate in the cross-section of the moulding to accommodate at least part of another wall or floor member

4. A building component according to any of claims 1 to 3 when incorporated in a floor formed by floorboards carried by the component in which the floorboards are covered by a floor covering, **characterised in that** the or each rebate is sufficient to accommodate the combined thickness of the boards and floor covering.

5. A building component according to any of claims 1 to 4 when incorporated in a floor formed by floorboards carried by the component **characterised in that** the or each rebate equals the thickness of the floorboards, and the latter are covered by a floor covering, and a strip of material of the same thickness as the covering is planted on the exposed surface of the moulding, to provide a coplanar surface, adjacent or between floorboards carrying the said floor covering.

6. A method of creating a void below floorboards and above joists over which the floorboards extend, **characterised by** the steps of securing to the upper face of each of the joists at positions corresponding to the edges of the boards, lengths of building component moulding each of which is rebated to receive an edge of a floorboard, and positioning floorboards so that their edges rest on the rebates, wherein the depth of the rebate is selected to be at least commensurate with the thickness of the floorboards, so that when secured in place the upper surface of the boards and the exposed faces of the building component mouldings present a substantially flat surface.

7. A method according to claim 6 **characterised by** a floor-covering over the floorboards and the depth of the rebate is such as to accommodate the combined thickness of the boards and the floor covering thereon.

8. A method according to claim 6 **characterised by** a floor-covering over the floorboards and a strip of material of the same thickness as the floor covering is secured to the exposed face of each of the lengths of building component moulding.

9. A floor panel which includes provision for the laying of services below the floor surface thereof after the panel has been installed in a building during construction, and which is constructed off-site, **characterised by**:-

a) a plurality of parallel spaced apart I-beam joists,

b) transversely extending rim boards secured to the ends of the joists,

c) elongate building component mouldings secured to the upper surfaces of the joists, each building component moulding having at least one rebated edge, into which edges of flooring boards can fit, and

d) flooring boards located on the rebates and secured to the building component mouldings, whereby an elongate void exists between the undersides of the floorboards and the tops of the joists within which cables or pipes or ducting can be run to form a services run, without the need for notching the upper surfaces of the joists along a run which extends transversely to the joists.

10. A floor panel according to claim 9 **characterised in that** the depth of the or each rebate is such that the upper surface of the floorboards is flush with the exposed faces of the mouldings.

11. A floor panel according to claim 9 or 10 **characterised in that** at least some of the floorboards are secured to the building component mouldings by removable securing means, whereby the boards can be removed after the panel is in situ, to enable pipes and cables and ducting to be laid below the boards, before the boards are secured in place, and subsequently to allow subsequent access to the pipes, cables and ducting.

12. A floor panel according to claim 11 **characterised in that** one or more service runs are provided in the overall panel by floorboard panels or traps, running parallel to the edges of the overall panel, **characterised in that** each floorboard panel or trap has a reduced width and is supported by, and removably

secured to parallel, and appropriately spaced apart, building component mouldings, at least one of which is adapted by means of a second rebate to accommodate the edges of adjoining floorboards, the latter being secured to the building component mouldings during manufacture of the overall panel, and the removable reduced width panels or traps are supplied with the main floor panel.

13. A floor panel according to any of claims 9 to 12 **characterised in that** a floor covering is laid over the boards and **characterised in that** the depth of the or each rebate is such as to accommodate the thickness of the floorboards together with the thickness of the covering.

14. A rectilinear prefabricated floor panel bounded by rim boards and spanned by a parallel array of timber I-beams, to form floorboard supporting joists to which floorboards are attached, **characterised by** building component mouldings according to any of claims 1 to 4 located between the joists and the undersides of the floorboards to provide a services void above the joists, wherein a plurality of parallel spaced apart shorter timber I-beams are secured transversely between two of the rim boards and the first and last of the parallel array of main I-beams, the main joists and shorter joists providing transversely extending joists within the prefabricated structure for bearing on load supporting walls therebelow, adjacent each of the four edges of the panel.

15. A floor panel according to claim 9 wherein a services run is parallel to and extends between an adjoining pair of I-beam joists **characterised by** a cable or pipe supporting platform at the bottom of the services run, formed by locating one or more flat panels so as to rest on the lower rails of the two adjoining parallel timber I-beam joists.

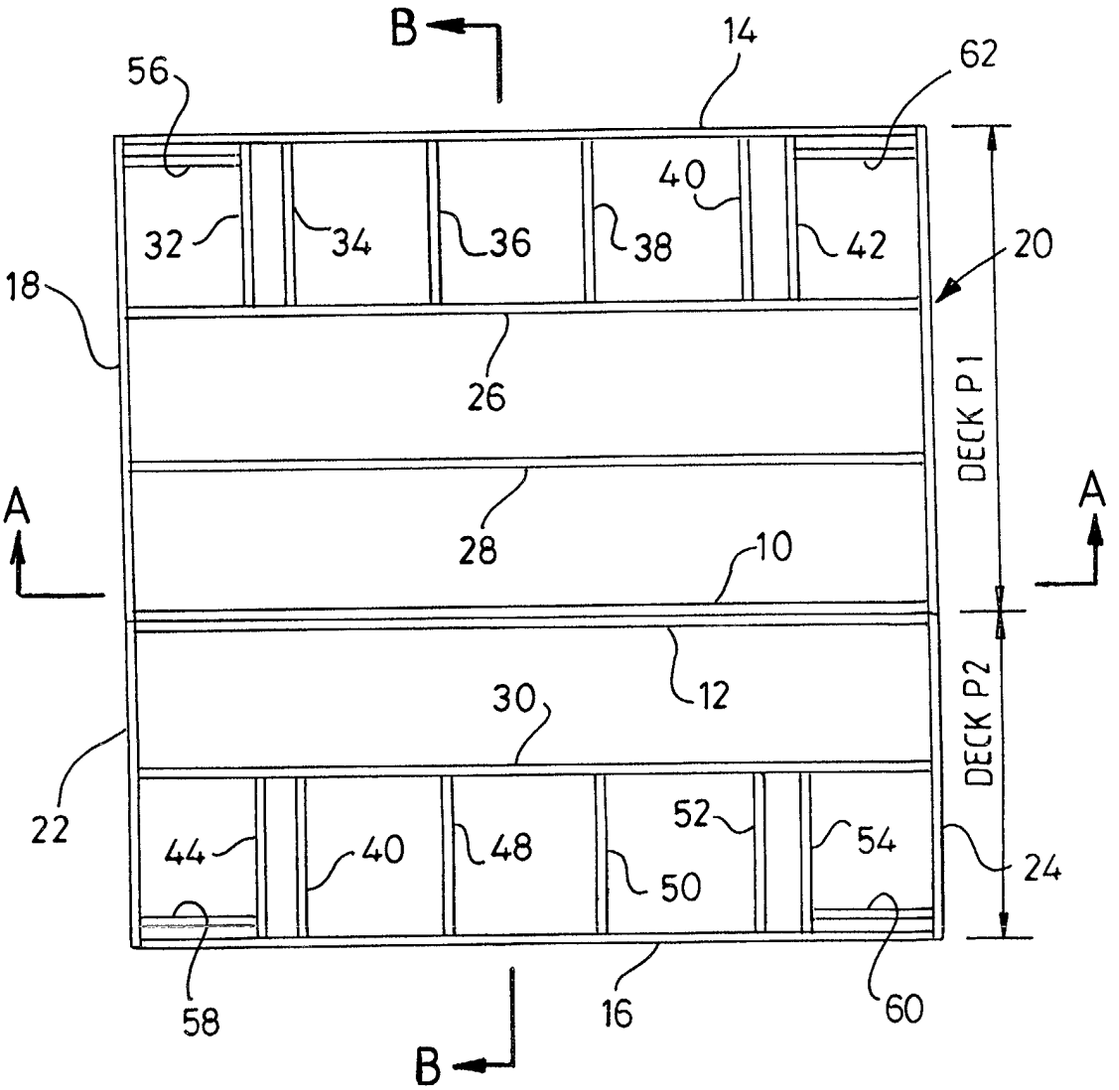

B
14
62
56
40
32
34
36
38
42
20
18
26
DECK P1
A
A
28
10
12
30
DECK P2
22
44
40
48
52
54
24
50
58
16
60
B

Fig. 1

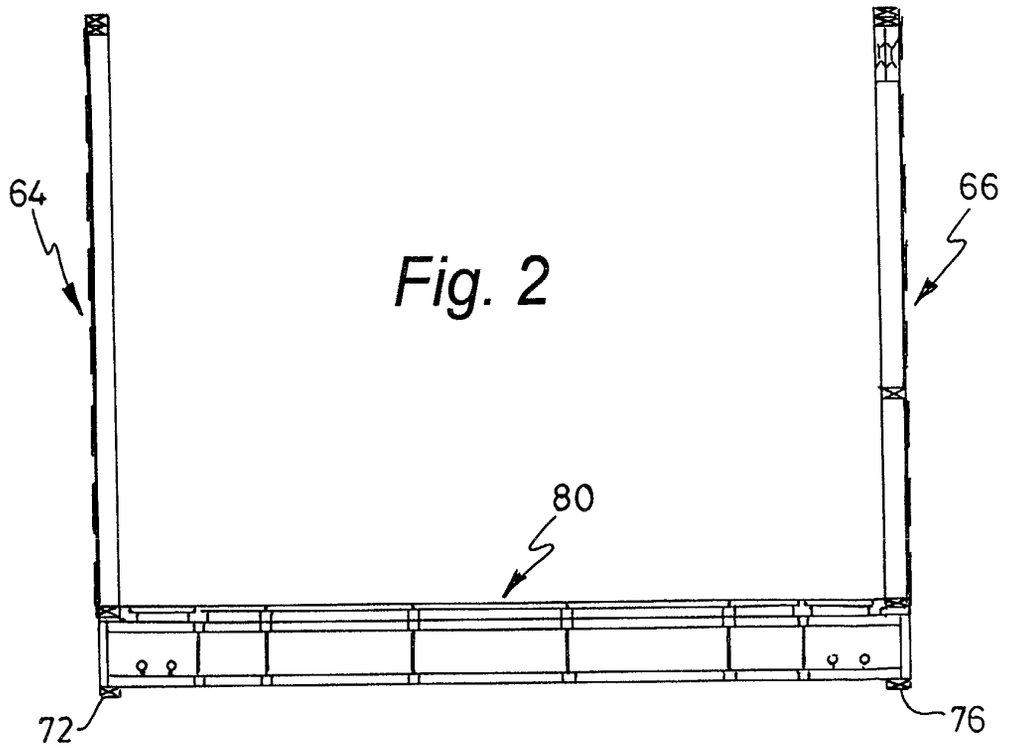


Fig. 2

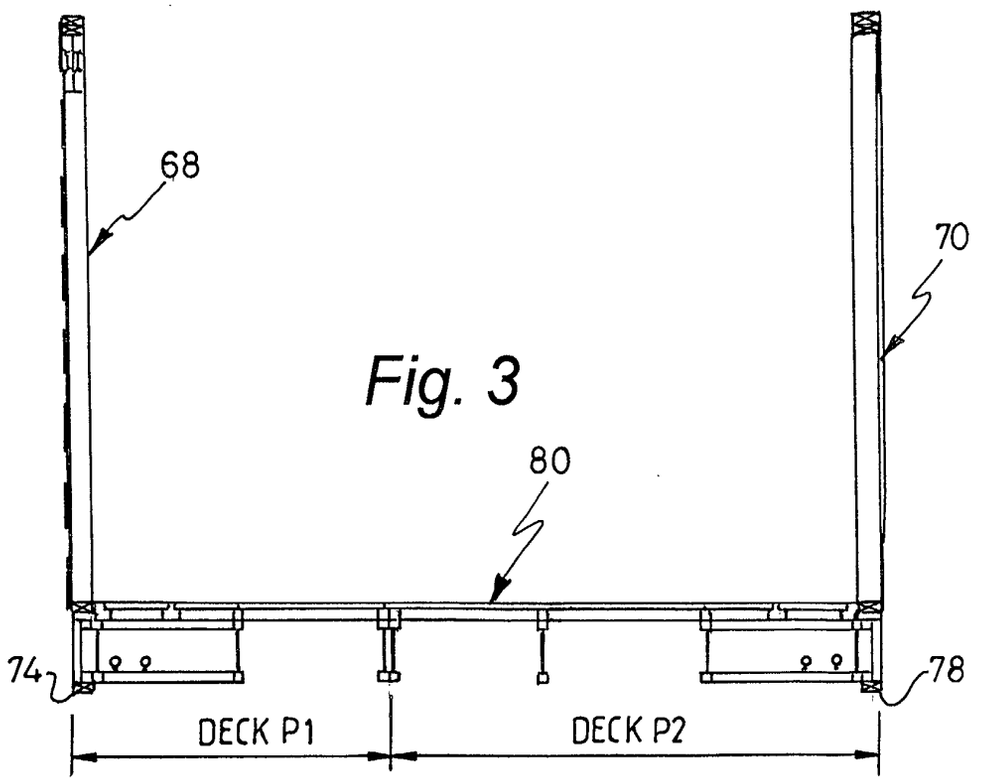


Fig. 3

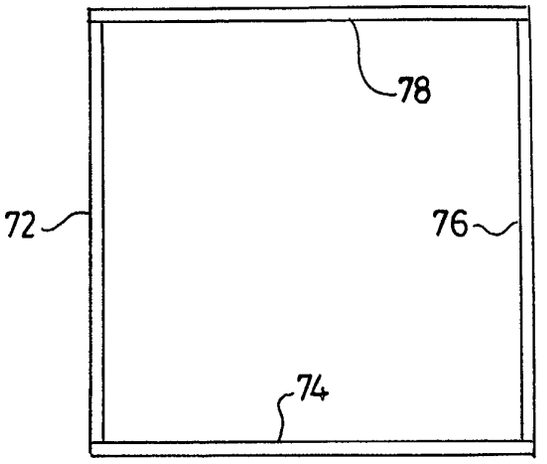


Fig. 4

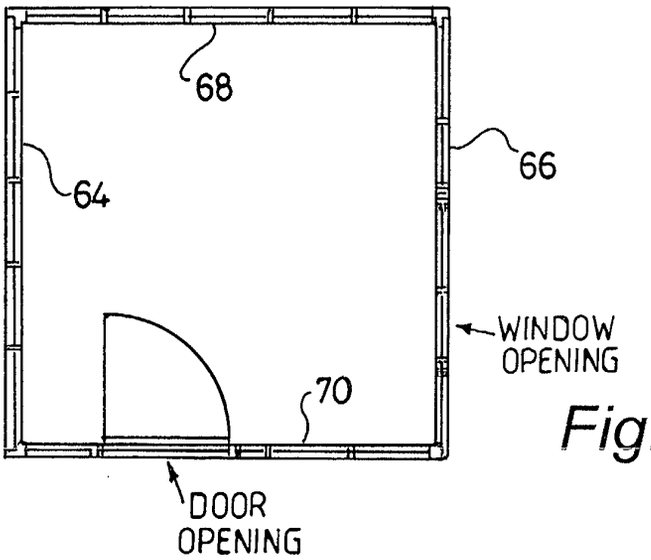


Fig. 5

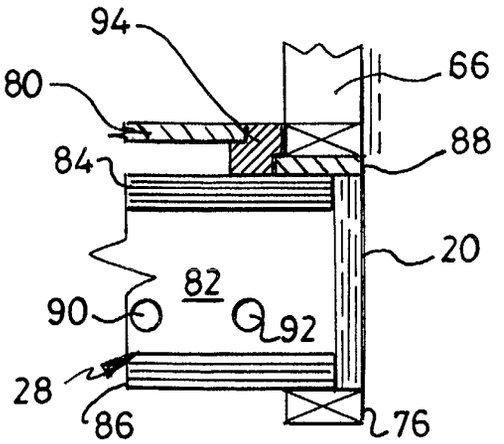


Fig. 6

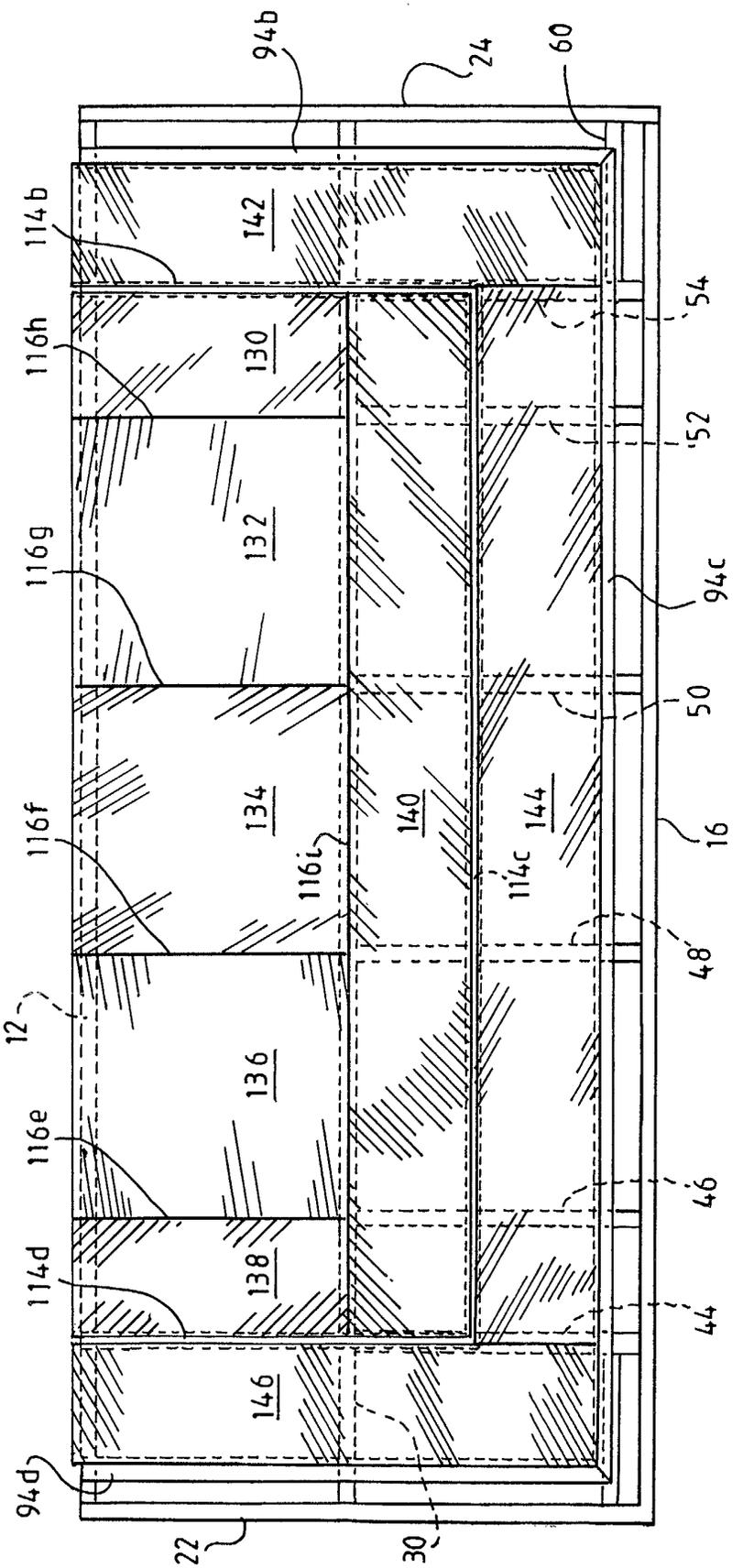

94b
24
60
114b
142
54
116h
130
52
116g
132
94c
50
116f
134
140
144
16
116i
114c
48
12
136
116e
46
114d
138
44
146
94d
22
30

Fig. 7

P2

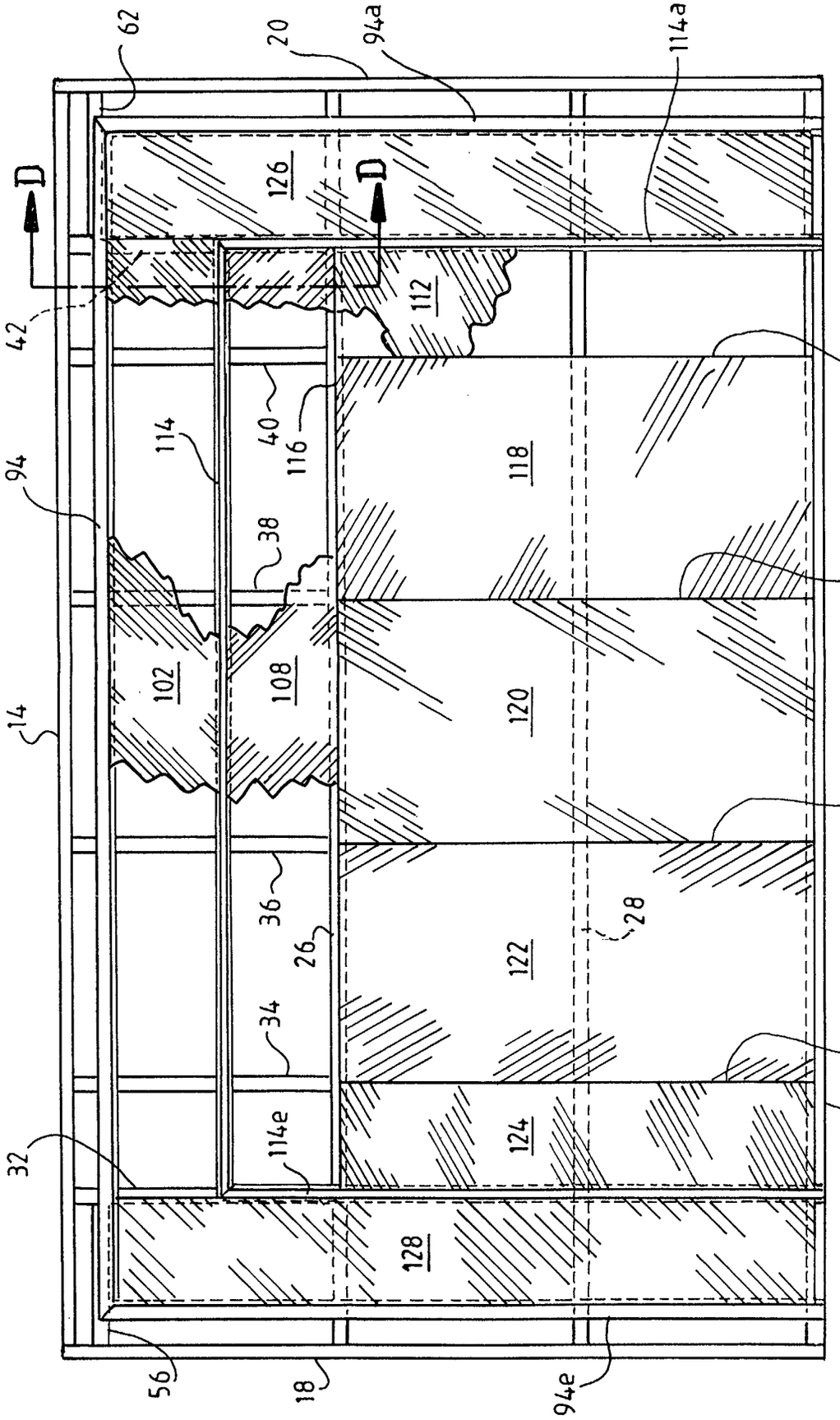
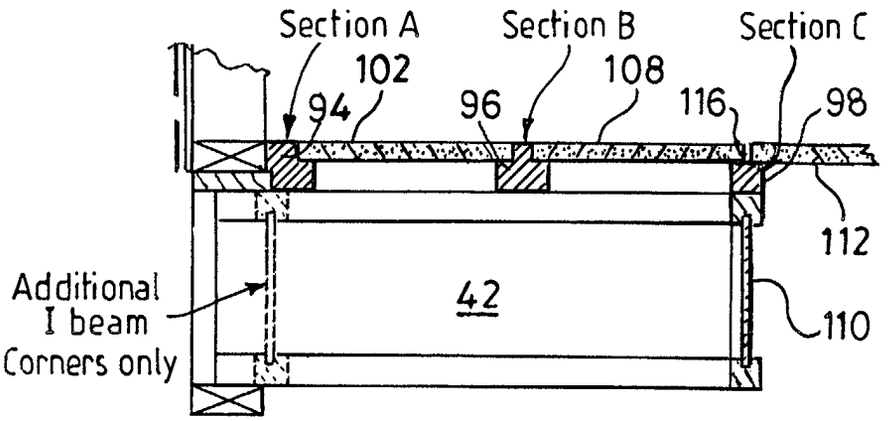

62
20
94a
114a
D
D
126
112
42
116a
40
116
114
118
94
38
116b
102
108
120
14
116c
36
28
26
122
34
116d
114e
124
32
10
128
56
18
94e

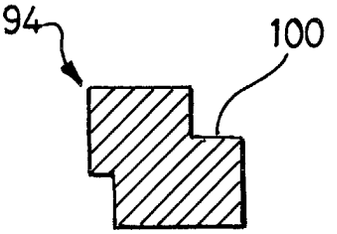
Fig. 8

P1



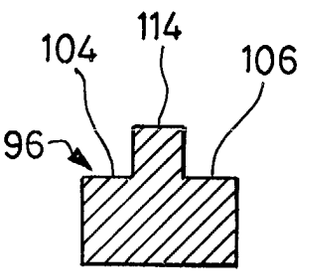
Section on D-D

Fig. 9



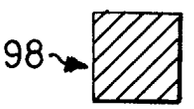
Section A

Fig. 10



Section B

Fig. 11



Section C

Fig. 12

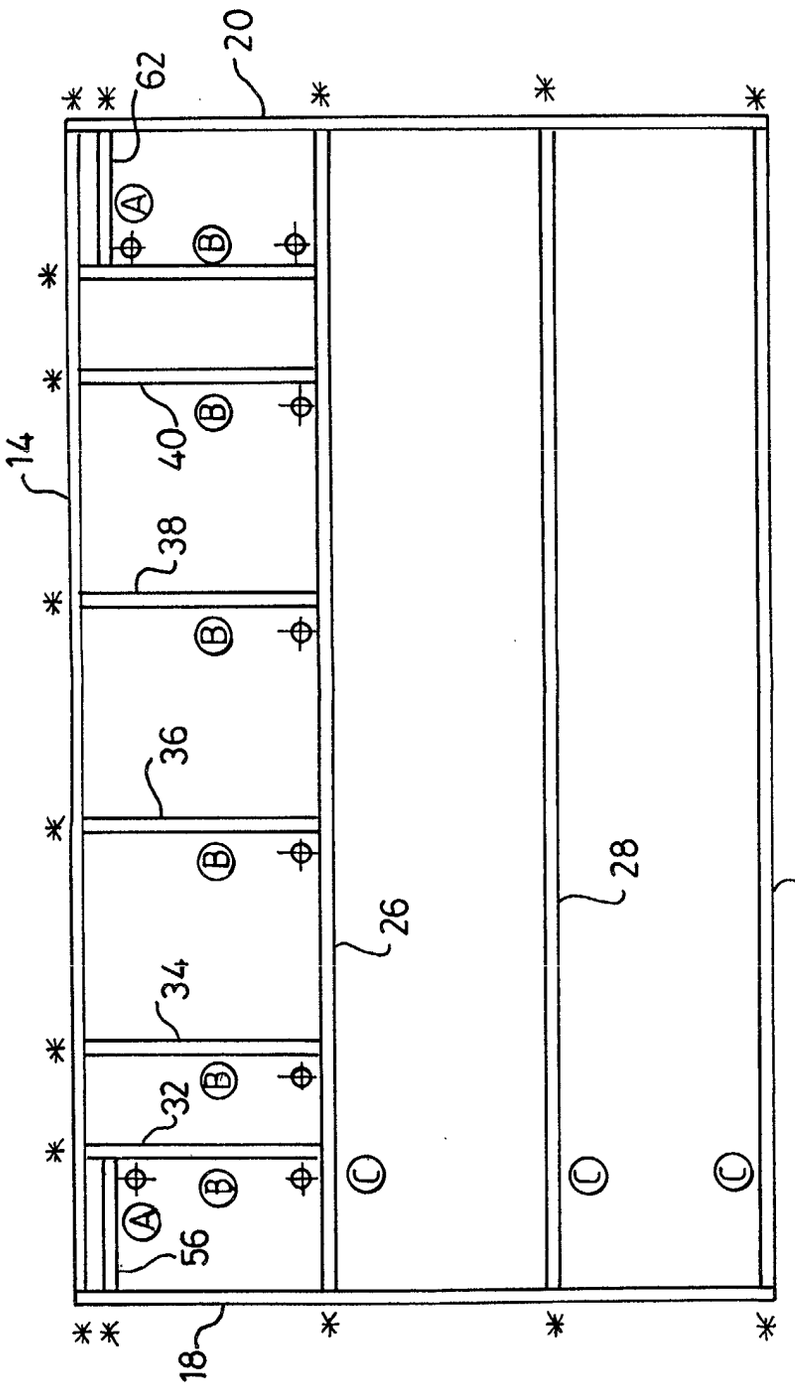


Fig. 13

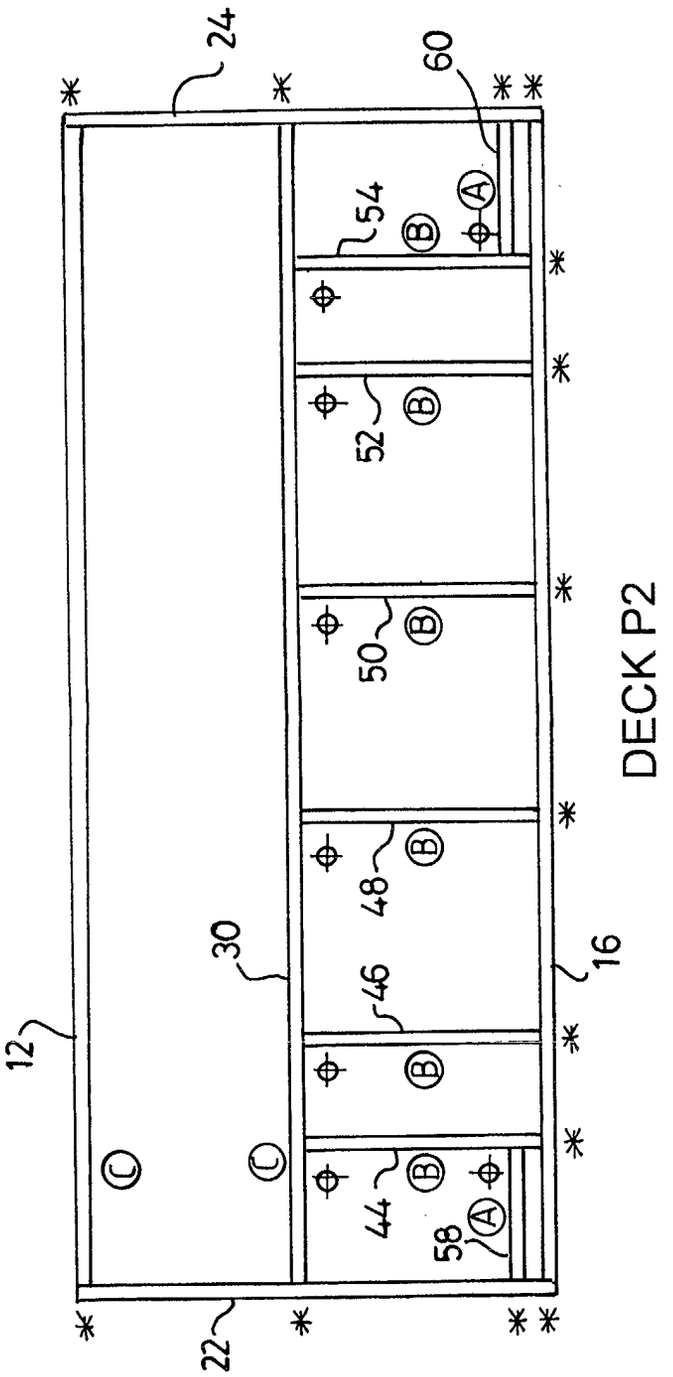


Fig. 14

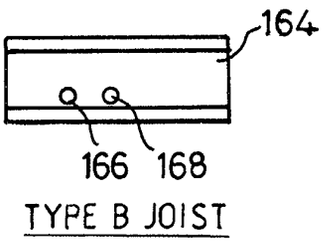


Fig. 15

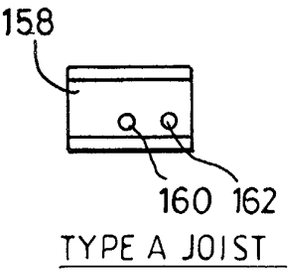


Fig. 16

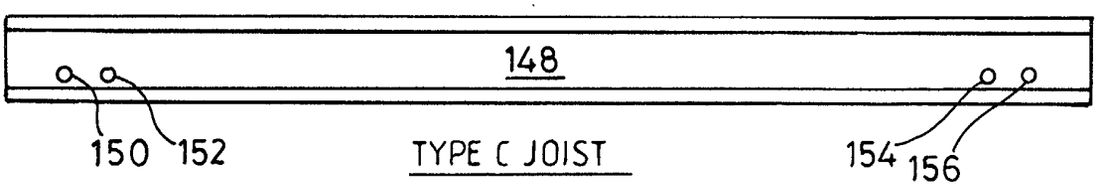


Fig. 17

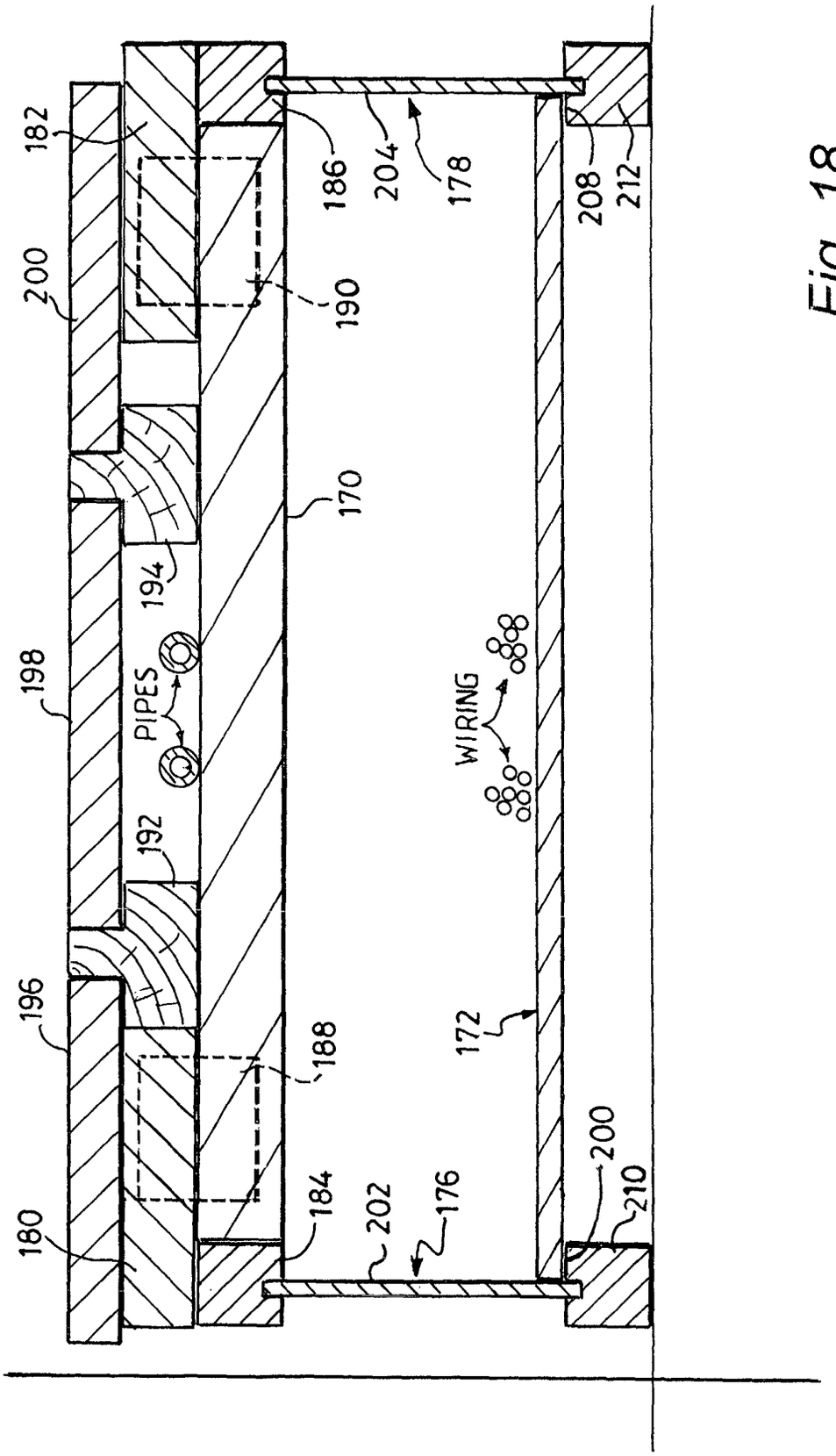

182
200
186
204
178
208
212
190
170
194
198
PIPES
WIRING
192
196
188
172
180
184
202
176
200
210

Fig. 18

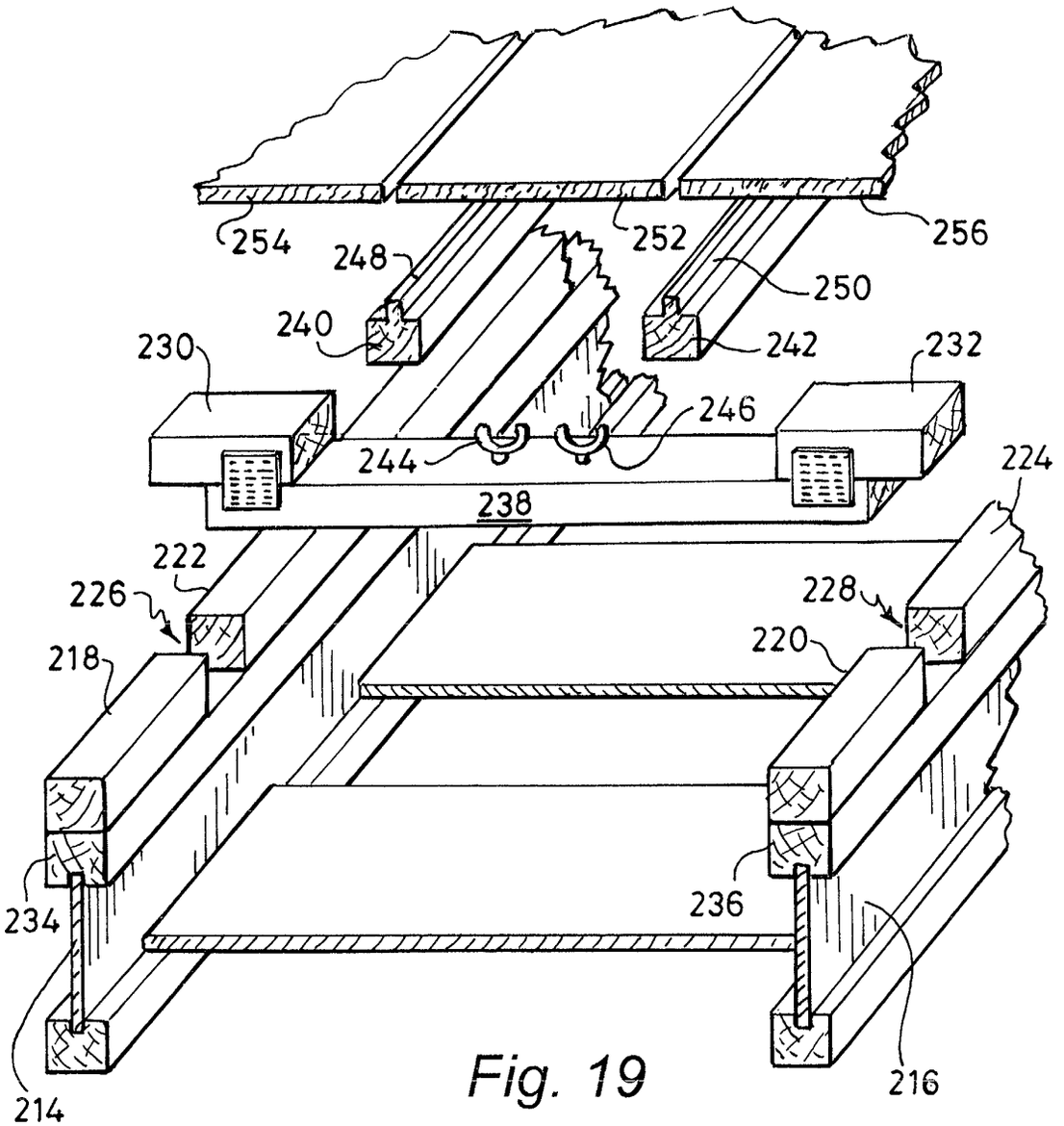

254
248
252
256
250
240
242
230
232
246
244
238
224
222
226
228
220
218
234
236
214
216

Fig. 19

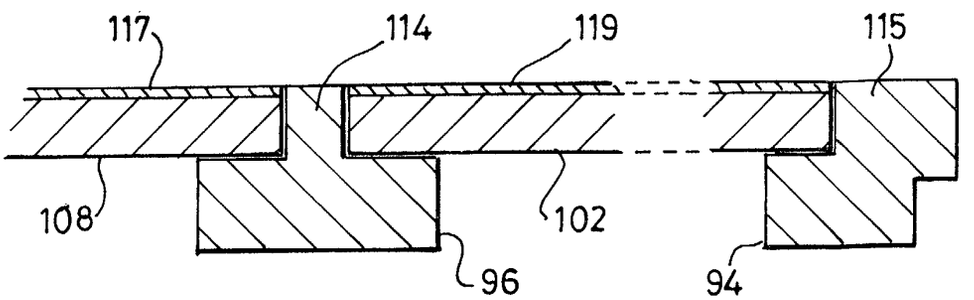

117
114
119
115
108
102
96
94

Fig. 20