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### (54) Improvements relating to floor panels

Verbesserte Fussbodenplatte

Panneaux de plancher améliorés

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## Description

This invention relates to floor panels, particularly of the kind used in industrial situations, such as in the provision of gratings supported on structural elements, in the provision of walkways, platforms, and access flooring, hereinafter referred to as a floor panel of the kind specified.

One kind of floor panel of the kind specified comprises longitudinal beams, conventionally of T-section secured together at successive positions along the length by transverse bars to provide a transversely and longitudinally extensive grating. This construction is utilised in the provision of open flooring, in which the longitudinal beams bear downward load to provide a grating, whilst the transverse bars are intended primarily to hold the longitudinal beams in the required relative positions. Such a floor panel is disclosed in our UK Patent No. 2036149 (WO-A-78/00002).

Generally in the provision of such a floor panel, it is desirable to provide the floor panel as large as possible, whilst providing adequate strength and minimal spacing between longitudinal beams. However, a floor panel of this type suffers from the disadvantage that it is necessary to assemble the floor panels, and this is a time consuming operation.

CA-A-989134 is an assembled structure made up of a plurality of adhesively secured together assembled components. It discloses flooring made up of a plurality of "grate" sections, each "grate" section being assembled from a plurality of relatively narrow T-shaped flooring members, which may have one or two vertical support members, in which the floor members must be assembled together and held to tie bars by adhesive. The "grate" sections are joined together by separate clips. Such individual flooring members are described as being made by pultrusion. The flooring suffers from the same disadvantages as discussed hereinbefore and in particular requires assembly from a plurality of components and application of adhesive.

EP-A-413 500 is another assembled structure made up of a plurality of adhesively secured together components. It discloses a building system made by pultrusion having a curved top surface with two opposed side walls and a plurality of shorter ribs. It is generally unsuitable for use as a floor panel which is transversely extensive as it is supported only by opposite side walls. The T-shaped shorter members are assembled, by sliding engagement, with transverse stiffeners. In all cases it is intended that the described wall member is connected via separate connector plates and adhesive to other identical wall members to provide a transversely extensive floor panel.

EP-A-108 576 discloses another assembled structure made up of a plurality of planks which must be assembled to adjacent planks using separate connector members to provide a transversely extensive floor panel. The individual planks are made as a rigid hollow

structure filled with plastic foam, although the walls are made of pultruded material.

Another floor panel of the kind specified utilises moulded floor panels, the size of which is limited essentially by the size of moulding it is possible to make economically.

According to one aspect of the invention there is provided an elongate floor panel comprising a plate part having beam parts depending downwardly from, and integral therewith, the panel having been moulded in one piece by a pultruding operation, characterised in that the plate part is transversely and longitudinally extensive having an upper surface which provides a generally planar and continuous floor surface and said beam parts comprise a pair of end longitudinally extending beam parts and a plurality of intermediate longitudinally extending beam parts, the beam parts being of equal depth and each pair of adjacent beam parts defining therebetween a channel which extends from end-to-end of the beam parts, the end beam parts having each means for the connection with a contiguous panel.

The panel may have end beam parts having a configuration whereby a tongue portion of one panel can be received in a groove portion of an adjacent panel.

The panel may be provided with a longitudinally extending groove portion on one side and a longitudinally extending tongue portion at the other side whereby the tongue portion and groove portion of one panel may interengage with a groove portion and tongue portion respectively of two other adjacently juxtaposed panels to transfer load between the adjacent panels.

Intermediate longitudinal beam parts may be of inverted T-shape in cross-section, a stem of the T is being integral with the plate part and a head of the T providing oppositely directed flanges at the ends of the beam parts remote from the plate part.

Preferably the upper face of the floor surface is provided with longitudinal ribbing or other protruberences, to improve grip.

The plate part may be provided with a plurality of apertures intermediate the beam parts.

The apertures may be punched apertures.

The panel may comprise fibre reinforced synthetic plastics material with the fibres aligned or substantially aligned in the longitudinal direction of the panel thereby improving the strength of the panel.

The pultruding operation may cause the fibres to become aligned or more aligned in the longitudinal direction.

The reinforcing fibres may comprise uni-directional rovings to provide properties in the longitudinal direction of the member and continuous strand mat to provide transverse properties.

The plastics material may comprise polyester or vinylester resin and may also comprise at least one of filler, pigments, curing agents and processing aids as appropriate and ultra-violet inhibitor.

The panel may have a surface veil of polyester non-

woven fabric which encases the fibre reinforcement and provides a layer of resin at the surface of the panel.

The veil may be capable of providing additional protection against ultra-violet degradation, preventing fibre blooming and increasing corrosion resistance.

The plate may comprise from the top surface downwardly,

a plurality of continuous filament mats,  
a filling of uni-directional rovings,  
a plurality of continuous filament mats the beam parts comprise, from one side surface to the other,  
a continuous filament mat,  
a filling of uni-directional rovings,  
a continuous filament mat and/or the surface of the panel is provided with a surface veil.

The filaments and the rovings may comprise glass filaments and rovings respectively.

According to a further aspect of the invention we provide a floor according to the first aspect of the invention wherein the or each panel is supported on supports with the beam parts lowermost and engaging the supports and with the floor surface uppermost.

When the floor has opposite tongue and groove portions a tongue portion and a groove portion of adjacent panels may be interengaged.

There will now be given a detailed description, to be read with reference to the accompanying drawings, of a floor panel which is a preferred embodiment of this invention, having been selected for the purposes of illustrating the invention by way of example.

In the accompanying drawings:

FIGURE 1 is a plan view showing a portion of the floor panel which is the preferred embodiment of this invention;  
FIGURE 2 is an end view of the panel of Figure 1;  
FIGURE 3 is a fragmentary enlarged end view of one side of the panel;  
FIGURE 4 is a fragmentary enlarged view of the opposite side of the panel;  
FIGURE 5 is a diagrammatic cross-section to an enlarged scale showing how a panel embodying the invention is fixed to a support;  
FIGURE 5a is a fragmentary perspective view showing the fixing arrangement of Figure 5;  
FIGURE 6 is a fragmentary cross-section showing the internal structure of the panel of Figures 1 to 5, and  
FIGURE 7 is a schematic perspective view showing a portion of a conventional floor panel.

The floor panel shown in Figure 7, which is not part of the claimed invention, comprises a plurality of elongate bars 10 secured together at spaced intervals by transverse bars 12, the upper limb 11 of the longitudinal beams cooperating together to provide a floor surface

having gaps 13 between adjacent longitudinal beams.

Conversely, in accordance with the present invention, an elongate floor panel 20 is provided, having been made in one piece by a pultruding operation, from glass fibre reinforced plastics material. The panel 20 comprises a transversely and longitudinally extensive plate part 21 having an upper surface 22 which provides a generally planar and continuous floor surface. Depending downwardly from the plate part 21 and formed integrally therewith are a plurality of longitudinally extending beam parts 23, 23a, 23b. Except for first and second end beam parts 23a, 23b respectively, all the beam parts 23 are of the same shape which, in end elevation and in cross-section, is of inverted T-shape each having a vertically downwardly depending stem 24 formed integrally at one end with the plate part 21 and at the lower end a transversely extending head 25.

As best shown in Figures 3 and 4, the first beam part 23a has a configuration so as to provide a longitudinally extending rib or tongue portion 26 whilst the second end beam part 23b has a configuration to provide a longitudinally extending groove portion 27. Accordingly, a tongue portion 26 of one panel 20 can be received within the groove portion 27 of an adjacent panel so that a load can be transferred between adjacent panels.

Suitable clip means may be provided to clip interengaged end beam parts 23a, 23b together or any other suitable means may be provided to join adjacent panels together, or separate joining means may not be provided, reliance being placed on the fixing of the panels to a support structure to maintain the parts in a desired juxtaposition.

The beam parts 23, 23a, 23b provide resistance to deformation of panel part 21 under load.

Elongate ribs 28 are provided on the upper surface 22 to improve grip although, if desired, the other patterns of ribbing or other grip providing means may be provided, or indeed omitted in any particular application.

A plurality of apertures 29 are provided distributed throughout the extent of the plate part 21, as shown in Figure 1. In the present example each aperture 29 is identical and comprises semi-circular longitudinally opposite ends interconnected by parallel side wall parts.

Provision of apertures permits drainage of water from the panel and also reduces the weight of the panel. The apertures 29 are made by punching and each aperture in a row may be punched at the same time and thus a relatively rapid rate of production may be achieved. If desired, suitable sealant may be provided to the walls of the punched apertures.

The panel is arranged to be supported on a support structure 30 with the undersurface 31 of the heads 25 engaging the upper surface of the support structure 30. A fixing clip assembly, shown generally at 32 in Figure 5, is provided to fix the panel to the support 30. The clip assembly 32 comprises a glass fibre reinforced plastic holder plate 33 which engages the upper surface 34 of flanges 35 of the heads 25. A stainless steel bottom clip

36 is clamped beneath a flange 37 of the support structure 30 by a screw 38 and nut 38a, access to the head 39 of the screw being provided through one of the apertures 29. To assemble the fixing assembly the screw 38 is inserted through the holder plate 33 and the stainless steel bottom clip 36 and the nut 38a engaged with the screw. The assembly is then slid along the flanges 35 to the desired location and then a plodring, not shown, may be positioned on the support 30. The fixing assembly 32 is then slid into position, as shown in Figure 5a and then the screw 38 is rotated with a screwdriver from above through the aperture 29 with nut 38a being prevented from rotation by the configuration of the bottom clip 36.

If desired, any other suitable means for holding the panel to a support structure may be provided.

Referring now to Figure 6, the panel, as mentioned before, is made by a pultrusion process. The plate part 21 has the following structure. Starting at the top surface 22, there is a 20g/m<sup>2</sup> chemical resistant surface veil 40 of a polyester non-woven fabric to encase the glass fibre reinforcement and add a layer of resin to the surface. This is to provide additional protection against ultra-violet degradation, to prevent the fibre blooming and increase corrosion resistance.

Below the veil are four 600g/m<sup>2</sup> E glass continuous filament mats 41a-d and then a uni-directional E glass roving filling 42. Beneath the roving 42 are two further 600g/m<sup>2</sup> E glass continuous filament mats 44a,b.

The uppermost mat 41a extends downwardly over the side edges 43 of the plate part 21 and over a majority of the tongue part 26 and groove part 27. A further 600g/m<sup>2</sup> E glass continuous filament mat 44c is overlapped by an end part of the mat 41a in the groove 27 and extends around the head 25 of the associated beam part 23b and provides a third mat for the plate portion 21 beneath the mats 44a, 44b. A further similar mat 44d extends around the next adjacent beam part 23 and overlaps an end part 44c' of the mat 44c, the mats 44a, 44b being deflected as shown to make the undersurface 47 of the plate part 21 between the beam parts 23 planar. An end part 44d' of the mat 44d is similarly overlapped by a further mat 44e which extends around the next adjacent beam part 23 and this is repeated across the transverse extent of the panel.

A penultimate beam part 23 has a further mat 44f. At the first end beam part 23a, the uppermost mat 41a extends past the majority of the tongue portion 26 and overlaps an end part of a further mat 44g which overlaps an end part 44f' of the mat 44f. A polyester surface veil 40, as described above, extends over the whole of the external surface of the panel including the beam parts.

Each beam part 23, 23a, 23b, in addition to the polyester mats 44c-f previously described, comprises uni-direction E glass rovings 45 to fill.

The above mentioned mats and rovings reinforce a suitable synthetic plastics resin such as polyester or vinyl ester resin which may also comprise pigment, curing

agent and processing agent as appropriate, as well as ultra-violet inhibitor to impart resistance to the effects of ultra-violet radiation.

If desired the panel may have, for example, three mats above the rovings or may contain more than four and three mats respectively above and below the rovings. If desired more layers of rovings may be provided between different mats. The beam parts may have more mats distributed as desired. The mats and rovings may be made of other suitable material.

The panels described hereinbefore have a cross-sectional area of approximately 5200mm<sup>2</sup> and may be 500mm wide, 40mm deep and 6 metres long.

The panel has a weight of approximately 20kgs per square metre which is considerably lighter than the equivalent steel panel, which is of a weight of approximately 81kgs. The above mentioned 20kg weight is the weight prior to the provision of apertures 29. Of course, the weight is further reduced when the panel is thus slotted.

The panel of the present invention, being a one-piece construction, has the necessary strength and deflection resistance without any need to assemble individual components, thereby avoiding problems hitherto associated with jointing.

A panel embodying the invention, described hereinbefore, was tested and found to have the following properties:-

Modulus of Elasticity (Full section)	GPa	30
Flexural Strength (Full section)	MPa	300
Short beam shear strength	MPa	30
Bearing strength	MPa	200

The strength provided to the plate part 21 by the generally continuous nature that the floor surface improves the overall strength of the panel, allowing the beam parts 23 to be provided at more greatly spaced intervals than floor panels of the assembled type.

Thus the invention provides the benefit of a moulded floor panel, with the benefits of an elongate assembled floor panel, without the need for assembly, particularly in that gaps between the longitudinal beams is obviated.

The panel is made by a pultrusion process in which the mats and rovings are fed into a pultrusion die together with the resin, there being means continuously to draw the mats and/or rovings through the die.

## Claims

1. An elongate floor panel (20) comprising a plate part (21) having beam parts (23, 23a, 23b) depending downwardly from, and integral therewith, the panel (20) having been moulded in one piece by a pultrusion process.

ing operation, characterised in that the plate part (21) is transversely and longitudinally extensive having an upper surface (22) which provides a generally planar and continuous floor surface and said beam parts (23, 23a, 23b) comprise a pair of end longitudinally extending beam parts (23a, 23b) and a plurality of intermediate longitudinally extending beam parts (23), the beam parts (23, 23a, 23b) being of equal depth and each pair of adjacent beam parts defining therebetween a channel which extends from end-to-end of the beam parts, the end beam parts (23a, 23b) having each means for the connection with a contiguous panel (20).

2. A panel according to claim 1 wherein the panel (20) has end beam parts (23a, 23b) having a configuration whereby a tongue portion (26) of one panel (20) can be received in a groove portion (27) of an adjacent panel (20).

3. A panel according to claim 1 or claim 2 wherein the panel (20) is provided with a longitudinally extending groove portion (27) on one side and a longitudinally extending tongue portion (26) at the other side whereby the tongue portion (26) and groove portion (27) of one panel may interengage with a groove portion (27) and tongue portion (26) respectively of two other adjacently juxtaposed panels to transfer load between the adjacent panels (20).

4. A panel according to any one of the preceding claims wherein intermediate longitudinal beam parts (23) are of inverted T-shape in cross-section, a stem (24) of the T is being integral with the plate part (21) and a head (25) of the T providing oppositely directed flanges at the ends of the beam parts (23) remote from the plate part (21).

5. A panel according to any one of the preceding claims wherein the plate part (21) is provided with a plurality of apertures (29) intermediate the beam parts (23).

6. A panel according to claim 5 wherein the apertures (29) are punched apertures.

7. A panel according to any one of the preceding claims wherein the panel (20) comprises fibre reinforced synthetic plastics material with the fibres aligned or substantially aligned in the longitudinal direction of the panel (20), thereby improving the strength of the panel (20).

8. A panel according to claim 7 wherein the reinforcing fibres comprise uni-directional rovings to provide properties in the longitudinal direction of the member and continuous strand mat to provide transverse properties.

9. A panel according to claim 7 or claim 8 wherein the plastics material comprises polyester or vinyl ester resin and may also comprise at least one of filler, pigments, curing agents and processing aids as appropriate and ultra-violet inhibitor.

10. A panel according to any one of claims 7 to 9 wherein the panel (20) has a surface veil (40) of polyester non-woven fabric which encases the fibre reinforcement and provides a layer of resin at the surface of the panel.

11. A panel according to any one of claims 7 to 10 wherein the plate part comprises, from the top surface downwardly,

a plurality of continuous filament mats, (41a - d),  
a filling of uni-directional rovings, (42),  
a plurality of continuous filament mats (44a - g) the beam parts comprise, from one side surface to the other,  
a continuous filament mat, (41a, 44c - g),  
a filling of uni-directional rovings (45),  
a continuous filament mat (41a, 44c - g), and/or the surface of the panel is provided with a surface veil (40).

12. A panel according to any one of claims 7 to 11 wherein the filaments and the rovings comprise glass filaments and rovings respectively.

13. A floor comprising at least one panel (20) according to any one of the preceding claims wherein the or each panel (20) is supported on supports 30 with the beam parts (23, 23a, 23b) lowermost and engaging the supports 30 and with the floor surface (22) uppermost.

14. A floor comprising at least two panels (20) according to claim 2 or claim 3 or any one of claims 4 to 12 when dependent on claim 2 or claim 3 wherein the tongue portion (26) and groove portion (27) of adjacent panels are interengaged.

#### Patentansprüche

1. Eine längliche Fußbodenplatte (20) mit einem Plattenteil (21), der Trägereile (23, 23a, 23b) aufweist, die davon herabhängen und damit einteilig ausgebildet sind, wobei die Platte (20) durch einen Profilziehvorgang einstückig geformt worden ist, dadurch gekennzeichnet, daß der Plattenteil (21) sich transversal und in Längsrichtung erstreckt und eine Oberseite (22) aufweist, die eine im allgemeinen ebene und durchgehende Bodenfläche bereitstellt, und die Träger (23, 23a, 23b) ein Paar sich in

- Längsrichtung erstreckende Seitenträger Teile (23, 23b) und mehrere sich in Längsrichtung erstreckende Zwischenträger Teile (23) umfassen, wobei die Träger Teile (23, 23a, 23b) gleich tief sind und jedes Paar von benachbarten Träger Teilen dazwischen einen Kanal bildet, der sich von einem Ende zum anderen Ende der Träger Teile erstreckt, wobei die Seitenträger Teile (23a, 23b) jeweils eine Einrichtung zum Verbinden mit einer angrenzenden Platte (20) aufweisen.
2. Eine Platte nach Anspruch 1, dadurch gekennzeichnet, daß die Platte (20) Seitenträger Teile (23a, 23b) mit einer Konfiguration aufweist, bei der ein Zungenabschnitt (26) einer Platte (20) in einem Nutabschnitt (27) einer benachbarten Platte (20) aufgenommen werden kann.
  3. Eine Platte nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Platte (20) mit einem sich in Längsrichtung erstreckenden Nutabschnitt (27) auf einer Seite und einem sich in Längsrichtung erstreckenden Zungenabschnitt (26) an der anderen Seite versehen ist, wobei der Zungenabschnitt (26) und Nutabschnitt (27) einer Platte jeweils mit einem weiteren benachbart nebeneinanderliegender Platten in Eingriff treten können, um eine Belastung zwischen den benachbarten Platten (20) zu übertragen.
  4. Eine Platte nach irgendeinem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die sich in Längsrichtung erstreckenden Zwischenträger Teile (23) im Schnitt die Gestalt eines umgekehrten T aufweisen, wobei der Stiel (24) des T einteilig mit dem Plattenteil (21) ausgebildet ist und der Kopf (25) des T entgegengesetzt gerichtete Flansche an den Seiten der Träger Teile (23) auf der vom Plattenteil (21) abgewandten Seite bereitstellt.
  5. Eine Platte nach irgendeinem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß der Plattenteil (21) mit mehreren Öffnungen (29) zwischen den Träger Teilen (23) versehen ist.
  6. Eine Platte nach Anspruch 5, dadurch gekennzeichnet, daß die Öffnungen (29) gestanzte Öffnungen sind.
  7. Eine Platte nach irgendeinem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die Platte (20) faserverstärktes synthetisches Kunststoffmaterial umfaßt, wobei die Fasern in Längsrichtung der Platte (20) ausgerichtet oder im wesentlichen ausgerichtet sind, wodurch die Stärke der Platte (20) verbessert wird.
  8. Eine Platte nach Anspruch 7, dadurch gekennzeichnet, daß die verstärkenden Fasern unidirektionale Rovings zum Bereitstellen von Eigenschaften in der Längsrichtung des Elements und durchgehende Faserbündelmatten zum Bereitstellen von transversalen Eigenschaften umfassen.
  9. Eine Platte nach Anspruch 7 oder 8, dadurch gekennzeichnet, daß das Kunststoffmaterial Polyester oder Vinylester-Harz umfaßt und auch wenigstens einen Bestandteil aus der Gruppe mit Füller, Pigmenten, Vulkanisationsmitteln und geeigneten Verarbeitungshilfsmitteln und Ultraviolett-Inhibitoren umfaßt.
  10. Eine Platte nach irgendeinem der Ansprüche 7 bis 9, dadurch gekennzeichnet, daß die Platte (20) eine Oberflächen umhüllung (40) aus Polyester-Vliesfolie aufweist, die die Faserverstärkung umhüllt und eine Harzschicht an der Oberfläche der Platte bereitstellt.
  11. Eine Platte nach irgendeinem der Ansprüche 7 bis 10, dadurch gekennzeichnet, daß der Plattenteil von der Oberseite nach unten
    - mehrere durchgehende Filamentmatten (41a bis d),
    - eine Füllung mit unidirektionalen Rovings, (42),
    - mehrere durchgehende Filamentmatten (44a bis g) umfaßt,
    - die Träger Teile von einer Seitenfläche zu der anderen eine durchgehende Filamentmatte, (41a, 44c bis g),
    - eine Füllung mit unidirektionalen Rovings (45),
    - eine durchgehende Filamentmatte (41a, 44c bis g) umfassen und/oder
    - die Oberfläche der Platte mit einer Oberflächen umhüllung (40) versehen ist.
  12. Eine Platte nach irgendeinem der Ansprüche 7 bis 11, dadurch gekennzeichnet, daß die Filamente und Rovings jeweils Glasfilamente und -rovings umfassen.
  13. Ein Boden mit wenigstens einer Platte (20) gemäß irgendeinem der vorangehenden Ansprüche, dadurch gekennzeichnet, daß die oder jede Platte(n) (20) auf Haltern (30) gehalten wird, wobei die Träger Teile (23, 23a, 23b) zuunterst angeordnet sind und die Halter (30) eingreifen und die Bodenfläche (22) zuoberst angeordnet ist.
  14. Ein Boden mit wenigstens zwei Platten (20) nach Anspruch 2 oder 3 oder irgendeinem der Ansprüche 4 bis 12, sofern sie von Anspruch 2 oder 3 abhängig sind, dadurch gekennzeichnet, daß der Zungenabschnitt (26) und Nutabschnitt (27) von benachbar-

ten Platten miteinander in Eingriff stehen.

## Revendications

1. Un panneau de plancher allongé (20) comprenant une partie plate (21) ayant des parties de poutre (23, 23a, 23b) suspendue vers le bas au panneau (20), et solidaire de celui-ci, ayant été moulé en une seule pièce par une opération de pultrusion, caractérisé en ce que la partie plate (21) est transversalement et longitudinalement extensive ayant une surface supérieure (22) qui fournit une surface de plancher généralement plane et continue et lesdites parties de poutre (23, 23a, 23b) comprennent une paire de parties de poutre d'extrémité s'étendant longitudinalement (23a, 23b) et une pluralité de parties de poutre intermédiaires s'étendant longitudinalement (23), les parties de poutre (23, 23a, 23b) étant d'épaisseur égale et chaque paire de parties de poutre adjacentes définissant entre elles un canal qui s'étend d'une extrémité à l'autre des parties de poutre, les parties de poutre d'extrémité (23a, 23b) ayant chacune des moyens pour l'assemblage à un panneau contigu (20).

2. Un panneau selon la revendication 1, dans lequel le panneau (20) comporte des parties de poutre d'extrémité (23a, 23b) ayant une configuration par laquelle une partie à languette (26) d'un panneau (20) peut être reçue dans une partie à rainure (27) d'un panneau adjacent (20).

3. Un panneau selon la revendication 1 ou la revendication 2, dans lequel le panneau (20) comporte une partie à rainure (27) s'étendant longitudinalement sur un côté et une partie à languette (26) s'étendant longitudinalement de l'autre côté, grâce à quoi la partie à languette (26) et la partie à rainure (27) d'un panneau peuvent s'engager respectivement avec une partie à rainure (27) et une partie à languette (26) de deux autres panneaux juxtaposés de manière adjacente pour transférer la charge entre les panneaux adjacents (20).

4. Un panneau selon l'une quelconque des revendications précédentes, dans lequel des parties de poutre longitudinales intermédiaires (23) sont de section de forme en T inversé, une âme (24) du T étant solidaire de la partie plate (21) et une tête (25) du T fournissant des brides aux extrémités des parties de poutre (23), disposées à l'opposé et distantes de la partie plate (21).

5. Un panneau selon l'une quelconque des revendications précédentes, dans lequel la partie plate (21) est munie d'une pluralité d'ouvertures (29) entre les parties de poutre (23).

6. Un panneau selon la revendication 5, dans lequel les ouvertures (29) sont des ouvertures perforées.

7. Un panneau selon l'une quelconque des revendications précédentes, dans lequel le panneau (20) comprend une matière plastique synthétique renforcée de fibres avec les fibres alignées ou sensiblement alignées dans le sens longitudinal du panneau (20), de manière à améliorer la résistance du panneau (20).

8. Un panneau selon la revendication 7, dans lequel les fibres de renforcement comprennent des fibres parallèles unidirectionnelles pour fournir des propriétés dans le sens longitudinal du membre et une natte à fils continus pour fournir des propriétés transversales.

9. Un panneau selon la revendication 7 ou la revendication 8, dans lequel la matière plastique comprend une résine polyester ou vinylester et peut également comprendre au moins l'un de matière de remplissage, des pigments, des agents de durcissement et des agents de mise en oeuvre, selon le cas, et un inhibiteur ultraviolet.

10. Un panneau selon l'une quelconque des revendications 7 à 9, dans lequel le panneau (20) a un voile de surface (40) de tissu non tissé en polyester qui enveloppe le renforcement de fibres et fournit une couche de résine à la surface du panneau.

11. Un panneau selon l'une quelconque des revendications 7 à 10, dans lequel la partie plate comprend, de la surface supérieure vers le bas,

une pluralité de nattes à fils continus (41a - d),  
une matière de remplissage de fibres parallèles unidirectionnelles (42),  
une pluralité de nattes à fils continus (44a - g),

les parties de poutre comprennent, d'une surface latérale à l'autre,

une natte à fils continus (41a, 44c - g),  
une matière de remplissage de fibres parallèles unidirectionnelles (45),  
une natte à fils continus (41a, 44c - g), et/ou la surface du panneau est munie d'un voile de surface (40).

12. Un panneau selon l'une quelconque des revendications 7 à 11, dans lequel les fils continus et les fibres parallèles comprennent, respectivement, des fils continus et des fibres parallèles de verre.

13. Un plancher comprenant au moins un panneau (20), selon l'une quelconque des revendications

précédentes, dans lequel le ou chaque panneau (20) est supporté sur des supports (30) avec les parties de poutre (23, 23a, 23b) au niveau le plus bas et s'engageant sur les supports (30) et sur la surface de plancher (22) au niveau le plus haut.

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- 14.** Un plancher comprenant au moins deux panneaux (20), selon la revendication 2 ou la revendication 3, ou l'une quelconque des revendications 4 à 12, lorsqu'elles dépendent de la revendication 2 ou de la revendication 3, dans lequel la partie à languette (26) et la partie à rainure (27) de panneaux adjacents sont engagées entre elles.

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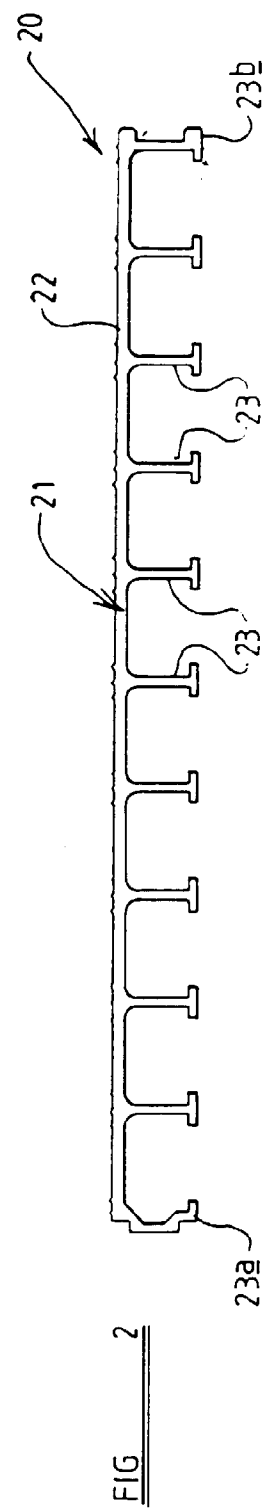
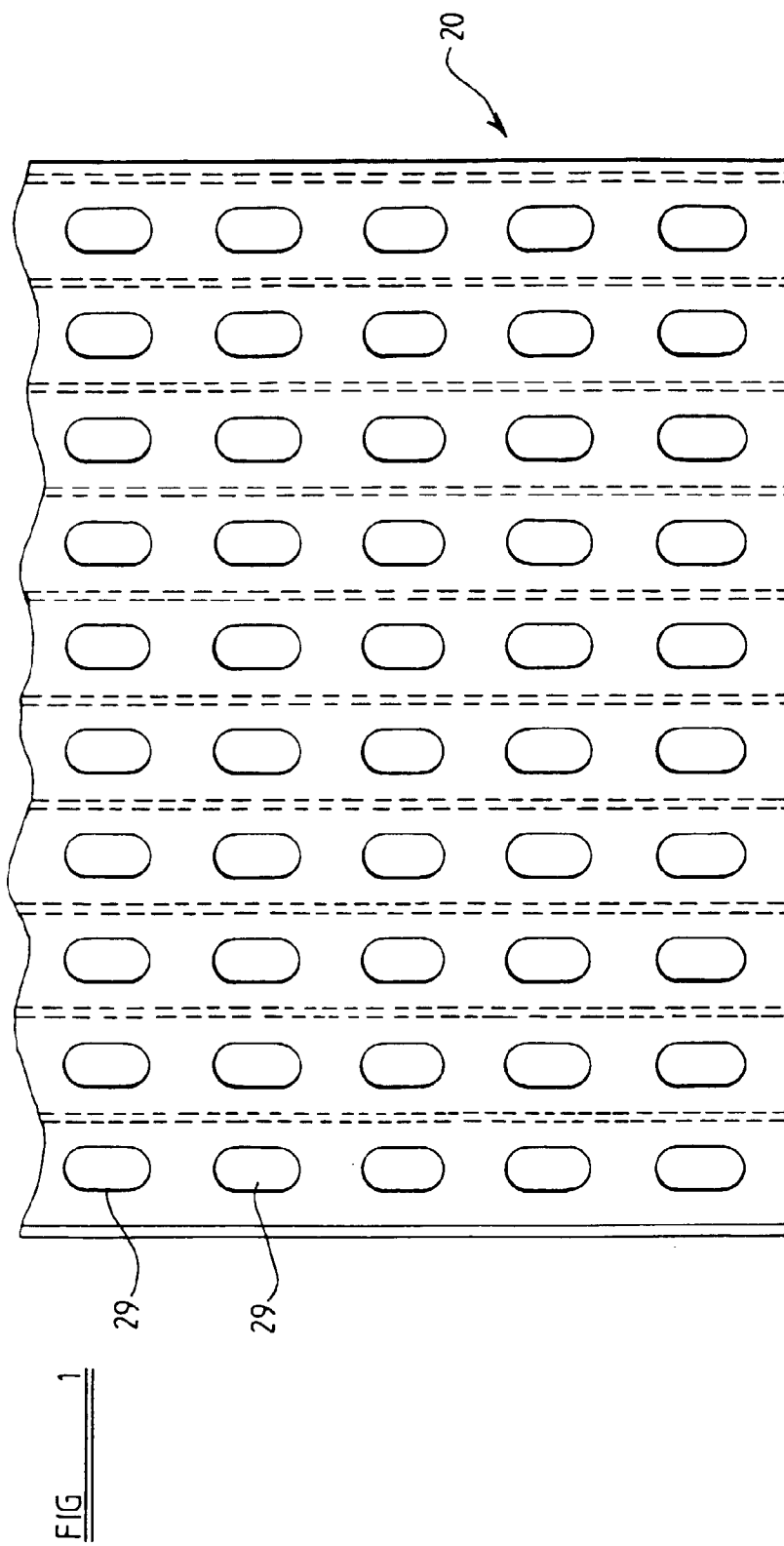


FIG 4

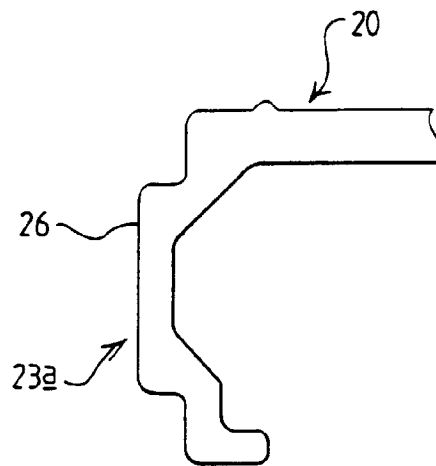
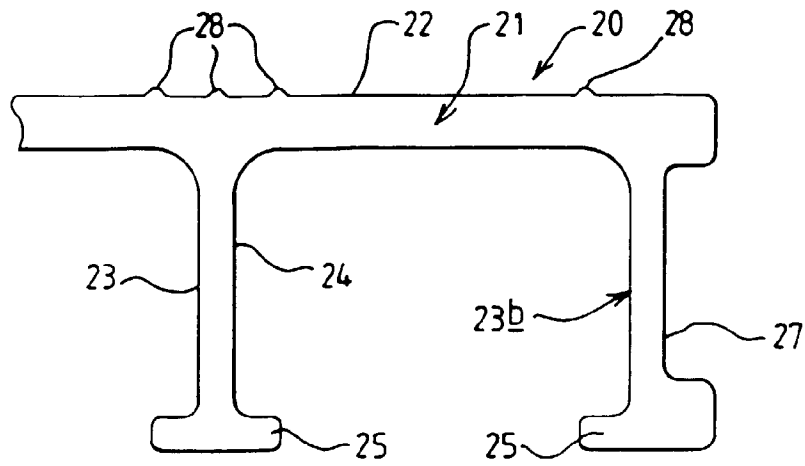
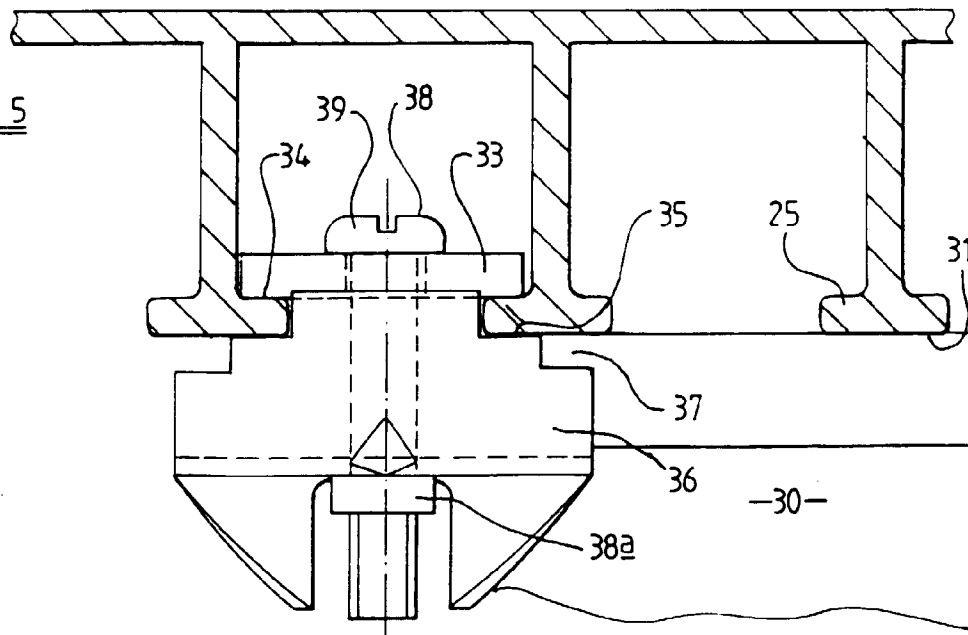


FIG 3

FIG 5



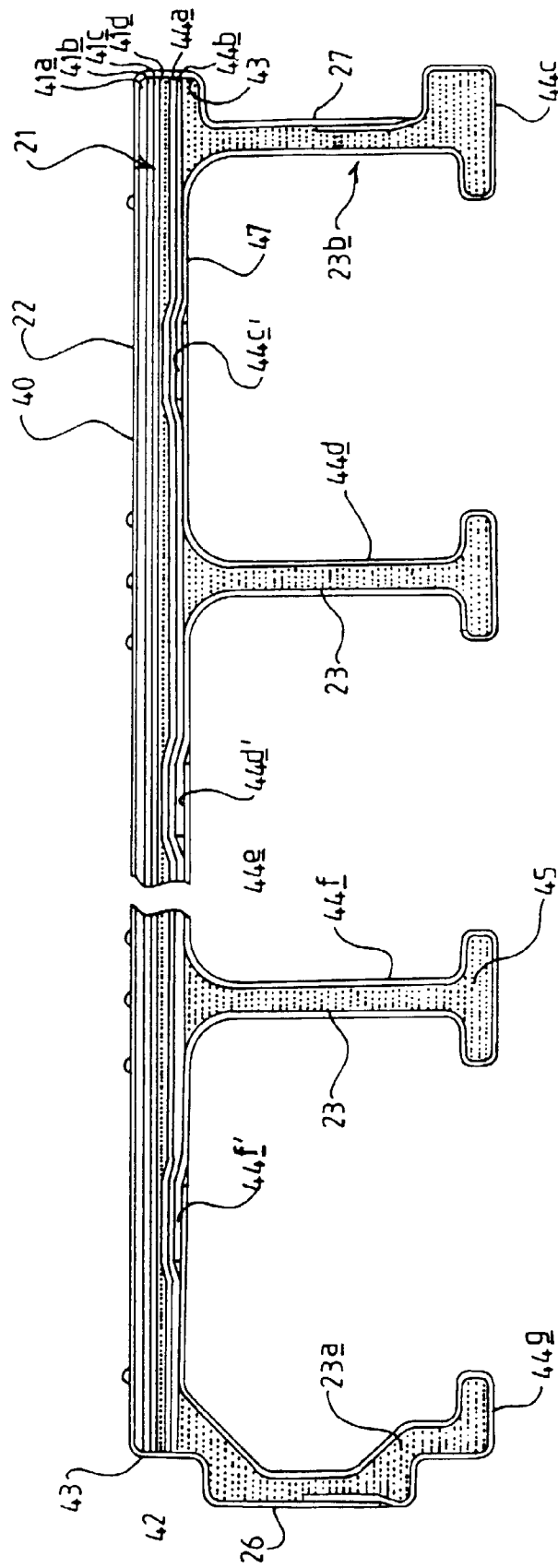


FIG 6

FIG 5a

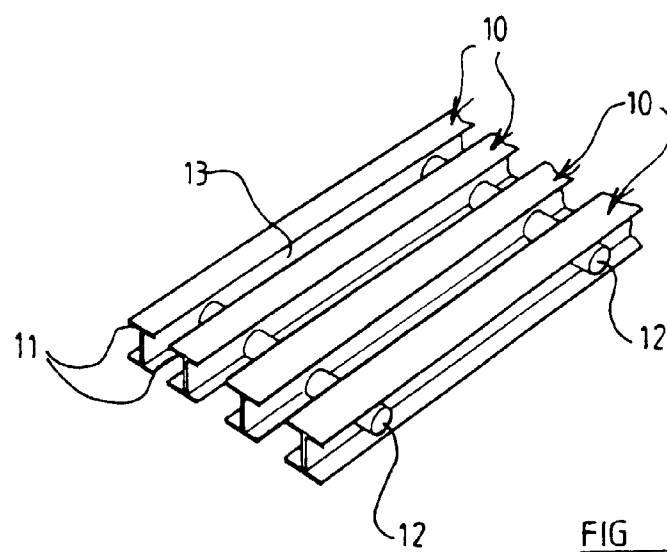
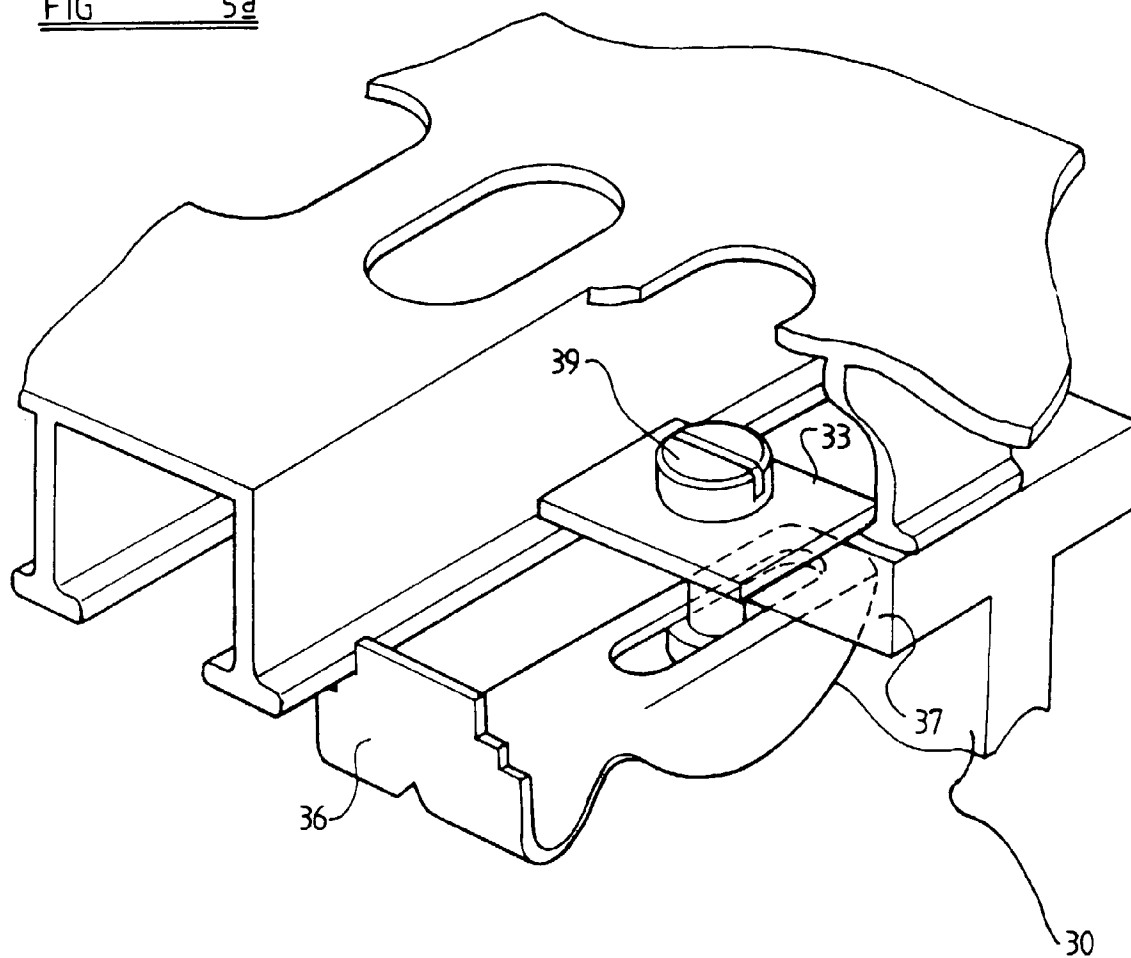


FIG 7