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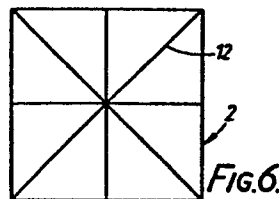
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64 Building panel.

57 A building panel comprising a pair of encasement members adapted to fit together to form a shell which encloses a core, the core comprising a reinforcing insert structure of strip material which is arranged within the shell so that the plane of the strip is normal to the major surfaces of the shell, and a settable filler material which is initially in a fluent form, so that it may be poured into the insert structure and can subsequently be set into a solid form.



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"Building Panel"

10 This invention relates to building panels and particularly to panels which are suitable for use in floors of the raised platform type which are supported a short distance above a sub-floor, usually on pedestals, so as to enable wiring and other services to be run beneath the floor.

15 Such floors have recently found increasing acceptance in office buildings, for example, where there is a requirement for electrical power supply and communication systems, for example associated with computers, and where the routing of services such as cable may need to be changed quite frequently. In an office where
20 there is no raised floor, this requirement can cause considerable problems.

 A typical raised platform floor generally comprises a series of square panels, common sizes being 600mm square or 750mm square, supported on an array of pedestals, each pedestal having a
25 cruciform support member at its upper end, which is adapted to receive the adjacent corners of four floor panels. The floor panels are so constructed, that they are preferably sufficiently rigid to take the required loads without the necessity for any grid of bridging support members or stringers between the pedestals, so that
30 an entire floor can be constructed using only the pedestals and the floor panels themselves.

 One common type of floor panel which is used in flooring systems of this kind consists of a core of high density material such as chipboard about 30-35mm thick, encased within a galvanised
35 steel outer shell, the thickness of the steel usually being 1 mm or

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more. The corners of the panel each rest on the support surface of one of the pedestals and abut against the cruciform structure which serves to locate the corner of each panel relative to those of the other three adjacent panels. The shell may for example be formed of

5 a base tray with upstanding side walls, and a top plate with downwardly depending side walls which fit closely around the upper edges of the side walls of the base tray. A panel of this kind is shown in published British patent application serial no. 2130615.

The use of chipboard as a core material has, however, been

10 found to entail certain disadvantages in use, particularly in respect of the load bearing capability of the panels, since chipboard is relatively weak in shear, and is also inhomogeneous so that a number of small panels cut from the same larger sheet may have totally different strength characteristics.

15 Accordingly, the present invention seeks to provide a building panel of the general type described above, having a core with considerably improved strength characteristics by comparison with traditional core materials.

Accordingly, the present invention provides a building

20 panel comprising a pair of encasement members adapted to fit together to form a shell which encloses a core, the core comprising a reinforcing insert structure of strip material which is arranged within the shell so that the plane of the strip is normal to the major surfaces of the shell, and a settable filler material which is

25 initially in a fluent form, so that it may be poured into the insert structure and can subsequently be set into a solid form.

The fluid or pourable material can consist depending on the purpose for which the structural panel is employed, for example, of concrete, mineral substances with a cement binder (including

30 aerated cement), plaster of Paris, or plaster-bound mineral substances, synthetic resin compositions, organic fibrous materials with synthetic resin binders, synthetic resin compositions with fillers embedded therein, such as, for example, bloated concrete or purlite, wood concrete or wood fibres and cement, asbestos cement or

35 the like.

Additional solid additives may also be included, such as woodchips in the case of plaster of paris, or polystyrene or vermiculite granules in the case of epoxy.

Preferably, the shell is assembled from two tray-like members made of sheet steel, which may be galvanised or aluzinc coated, and the insert is made of steel strip whose width is equal to the internal depth of the finished panel. The insert structure may take the form of a loosely wound spiral, a honeycomb, cruciform and/or diagonal or other structure which is such as to provide reinforcement of the panel at regular intervals. The insert may be spot welded or bonded into one of the trays, before the filler is poured into the interstices of the structure.

According to a further aspect of the invention there is provided a building panel comprising a pair of encasement members adapted to fit together to form a shell which encloses a core, the core comprising a foam formed from a mixture of filler including synthetic resin and a catalyst which is placed in one of the encasement members before the two members are fitted together, so that the core is formed by subsequent foaming and setting of the filler "in situ".

Preferably, the panel also includes an internal reinforcement structure comprising an insert of strip material arranged within the shell with the plane of the strip normal to the major surfaces of the shell, the strip material being positioned in on of the encasement members before the addition of the filler. In a preferred arrangement, the reinforcement comprises a first pair of mutually perpendicular reinforcing strip members each of which extends diagonally from one corner of the shell to the opposite corner, and a second pair of mutually perpendicular strip members each of which extends between the mid points of opposite sides of the shell, so that the whole reinforcement forms a "Union Flag" formation.

In an alternative arrangement, one of the encasement members may include integral reinforcing formations such as embossed ridges or other patterns.

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

Figure 1 is a partially broken away vertical cross-section through an assembled floor panel according to the invention; and

Figures 2, 3, 4, 5 and 6 are top plan views of semi-assembled floor panels, showing various embodiments of the internal structure.

Referring to Figure 1, the assembled panel comprises a base tray 2 having upstanding side walls 4, and a top plate 6 having downwardly depending side walls 8 which are arranged to fit over the side walls 4 of the base tray, the general construction of the two members being similar to that shown in published British patent application no. 2130615. The panels are preferably of sheet steel of 0.5 - 1.0mm thickness. Internally, however, the illustrated panel differs from that of the prior specification in that the core consists of a solidified filler material which is reinforced by steel strips 12 which are arranged in a regular pattern in the base tray. As can be seen from the drawings, the width of these strips is equal to the internal thickness of the panel so as to provide a structural reinforcement and their thickness is preferably 1mm to 2.0mm.

The arrangement of the steel strip 12 within the panel may take various forms, as illustrated in Figures 2 to 6. One form of reinforcing structure is shown in Figure 2, in which the steel strip is in the form of a continuous coil 14 which fills the whole of the base tray except for the extreme corners. The spaces between the successive coils may be of the order of 1 to 3 inches. Suitably shaped pieces of strip 16 may be positioned in the corners to reinforce these regions, as shown in the drawing. This particular type of reinforcement has the advantage that almost the whole of the reinforcing structure can be made from one piece of strip material.

Other suitable types of reinforcing structure can be formed from variously shaped "honeycombs" of strip material, that of Figure 3, for example, comprising a plurality of straight strips

which are notched so that they can be fitted together to form a square matrix, and of course it will be appreciated that the same kind of construction may be used with the strips oriented at 45° to the side walls of the base tray, so as to provide a "diamond shaped" reinforcing structure.

The structure of Figure 4 comprises a series of hexagonal cells which are formed from strips which each have a series of 120° bends in them. These may have their facing "flats" spot-welded together, or may be suitably interlocked by notching them in a similar fashion to the strips of Figure 3. Figure 5 shows an insert structure which is formed from serpentine strips, and again the abutting surfaces of these may be spot welded together, before they are placed in the base tray.

Figure 6 shows a reinforcing structure having a "Union Flag" configuration, consisting of one pair of strips which extend across the diagonals of the panel, and another pair which extend across the panel at right-angles to each other, so as to join the mid-points of opposite sides. The strips may be suitably interlocked by slotting or other known methods, at the centre. This arrangement has been found to possess excellent strength characteristics, particularly in combination with a polyester or other synthetic resin type of filler (see below).

In order to form the panel, the insert is first positioned in the base tray, and bonded in place, and then the filler material is poured into the interstices of the insert. The filler may for example be plaster of paris mixed with woodchips, epoxy resin with polystyrene granules, or airated concrete or polyester resin with a filler.

Examples of some suitable materials are as follows:

(1) A cementitious filler using lightweight screed compounds, i.e. cement and purlite: for example the "Tilcon" cement screeding sold under the trademark "Limelite", mixed to a density of 400-800 kg/m³.

(2) Gypsum with vermiculite consisting of 70-80% gypsum plaster and 20-30% vermiculite with water. Vermiculite is added or

extracted to obtain the required density (up to 1100 kg/m³), with a rust preventative additive and a waterproofing additive.

(3) A proprietary gypsum product such as Ceramblue or Olafdur (trademarks) with water and vermiculite added to give the
5 required density.

In the case of these three types of materials, they must be allowed to solidify before the top plate is bonded onto the whole assembly, for example using epoxy resin or polyurethane adhesive, and with suitable sealants around the edges so as to ensure that the
10 construction is waterproof. Alternatively, the core may be formed first in a separate mould by placing the inserts into the mould, and pouring in the filler, and then removing the core from the mould when it has solidified and bonding the base tray and top plate around it.

(4) A further alternative material, which has the
15 advantage that the top plate can be added before it has solidified, is a casting resin such as polyester resin. A suitable mixture comprises about 50-70% by weight of polyester resin, 5-10% of styrene as a "diluent" and 15-40% of vermiculite (e.g. "Micafil"),
20 with a small amount of proprietary catalyst.

A panel including a core of this type is particularly simple and quick to manufacture. The insides of the base tray and top plate are first sprayed with a polyurethane adhesive which is allowed to dry until it is just tacky, and the reinforcing strips
25 (preferably as shown in Figure 6) are placed in the base tray and also lightly sprayed with adhesive.

The resin mixture is then poured into the base tray and spread evenly overfilling the base tray by approx 10%, the top plate is immediately added and the whole assembly placed in a hydraulic
30 press at approx 200 psi for about 30 minutes, which is the expected reaction time for the resin. The press may also be heated to speed up the reaction. This results in a particularly light, rigid panel.

CLAIMS:

1. A building panel comprising a pair of encasement members
5 adapted to fit together to form a shell which encloses a core, the
core comprising a foam formed from a mixture of filler including
synthetic resin and a catalyst which is placed in one of the
encasement members before the two members are fitted together, so
that the core is formed by subsequent foaming and setting of the
10 filler "in situ".
2. A panel according to claim 1 further comprising an
internal reinforcement structure comprising an insert of strip
material arranged within the shell with the plane of the strip
15 normal to the major surfaces of the shell, the strip material being
placed in the base tray before the addition of the filler.
3. A building panel comprising a pair of encasement members
adapted to fit together to form a shell, and a core, the core
20 comprising a reinforcing insert structure of strip material which is
arranged within the shell so that the plane of the strip is normal
to the major surfaces of the shell, and a settable filler material
which is initially in a fluent form, so that it may be poured into
the insert structure and can subsequently be set into a solid form.
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4. A building panel according to claim 2 or claim 3 in which
the reinforcement comprises a spiral, a honeycomb, or a cruciform
structure.
5. A building panel according to claim 2 or claim 3 in which
30 the reinforcement comprises a first pair of mutually perpendicular
reinforcing strip members each of which extends diagonally from one
corner of the shell to the opposite corner, and a second pair of
mutually perpendicular strip members each of which extends between
35 the mid points of opposite sides of the shell.

6. A building panel according to claim 1 in which one of the encasement members includes integral reinforcing formations.

5 7. A building panel according to any preceding claim in which the encasement members comprise a base tray with upstanding side walls, and a top plate adapted to fit onto the base tray.

8. A building panel substantially as herein described with
10 reference to the accompanying drawings.

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