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(73) Proprietor: **Cristofaro, Rocco**
Piazza della Rotonda 16
I-96011 Augusta (IT)

(72) Inventor: **Cristofaro, Rocco**
Piazza della Rotonda 16
I-96011 Augusta (IT)

(74) Representative: **Fiammenghi, Carlo et al,**
c/o Fiammenghi-Fiammenghi Via Quattro
Fontane, No. 31
I-00184 Roma (IT)

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Prefabricated modular panels for the construction of walls
of cottages or of buildings in general

The present invention relates to prefabricated modular panels designed to be used in juxtaposed relationship for the construction of walls of cottages or thermoinsulating, soundproofing walls of buildings in general as well as to the walls formed from these modular panels. The panels each comprise a box-like tubular body designed to constitute a form to be left in place for the casting therein of a mix, for instance, concrete, or reinforced concrete or other mixes have thermo-insulating or soundproofing characteristics, while the outer surfaces constitute the faces in sight of the panels so that it will be substantially unnecessary to perform other finish operations thereon.

Many prefabricated panels made of plastics are known in the building industry, the insulating property of which is only due to the presence of an inner hollow space provided between the two main outer parallel plate walls forming each panel. Said known panels have considerable size so that the main outer walls of each panel have a low resistance owing to the elasticity of the plastics, which does not allow to construct hollow panels, having substantially rigid outer plate walls.

In addition said known plastic panels have side shaped joint edges including female and male elements respectively, which allow to connect the panels to each other only in an aligned relationship and which do not ensure any seal joining, unless auxiliary seal means are inserted between the joint surfaces.

Prefabricated modular panels are also known which permit to construct walls of heights which are of a multiple value of the panel height, but which have no carrying structure and which do not incorporate carrying pillars, as is provided in German Patent Application DE—A—1 784 143 which relates to panels which however serve to construct only straight partitions and not also curved partitions or walls. The panels are constructed in molded plastics of very thin thickness in order to form in the joint zones elastically deformable female and male connection members. German Patent Application DE—A—1 759 377 concerns modular panels which permit to construct straight walls and also angled walls with the use of modified panels, but not curved walls. Further these panels consist of closed bodies which cannot embody interconnecting pillars of reinforced concrete. German Utility Model DE—U—1 814 826 concerns also solid panels all the sides of which form connection elements to ensure a shield against the propagation of the Roentgen-gamma and neutronic rays, but which do not permit to construct soundproof and thermally insulating walls, even if they do permit to obtain either straight and curved walls.

The prefabricated modular panels according

to the present invention and the wall formed therefrom are defined in the appended claims. The box-like body of the modular panels of this invention made of plastic is obtained by a moulding process. Each box-like body is designed to constitute the form to be left in place for the casting of a concrete mix or a mix of other suitable substances into the cavities provided therein. Said panels are designed to be used in juxtaposed relationship for the construction of all the walls and partitions of a cottage or of soundproofing and thermo-insulating curtain walls and partition walls of buildings in general, in which columns, made of reinforced concrete, may be included, while the outer faces of said panels can remain also in sight, since they have also a pleasing appearance, in particular, when coloured plastic materials will be employed. In addition the outer faces of said walls substantially do not generally require any auxiliary finishing operation.

Second prefabricated structural elements in the form of modular panels having the same outline as that of the panels of the invention may be included in the wall, but they are prefabricated in reinforced concrete according to the conventional technique. The panels of this invention can be also connected to each other in a very close seal contact and under a very small friction effect so that by the use of said panels walls can be also constructed which extend according to a substantially curved line, or more exactly the wall will have a prismatic surface, each face thereof being defined by one panel. In this case the adjacent panels are mounted in mutual slightly angled relationship, owing to the cylindrical shape of the cylindrical complementary joint surfaces of the joint members forming each joint connection.

Further each panel of the invention includes inner longitudinal and transverse partitions, these latter acting as stiffening members for the outer main plate surfaces of these panels and at the same time define inner spaces inside each panel and which can be used for different intended purposes, as, for instance, for the casting of a reinforced concrete column embedded into the panel or to constitute forms to receive different mixes so as to construct soundproofing or thermo-insulating or antifire walls. When one of said inner cavities of each panel is used for the casting of a column, reinforcing rods will be inserted therein which pass through said vertical cavity. In the case of the structural element panels the reinforcing rods can extend out of the upper and lower ends of each panel and can be connected or welded to the reinforcing rods extending out of the adjacent upper or lower beams of the ceiling or floor respectively of an inner room defined by the panel walls. Modified modular panels are also provided to connect walls set at right angles.

These and other features, objects and advantages of the present invention will be better understood from the following specification when read in conjunction with the accompanying drawings, in which:

Fig. 1 is a top view of a panel of the first type and a fragmentary top view of the adjacent one, in an enlarged scale; Fig. 2 is a top view of a series of the panels which are juxtaposed and interconnected to each other so as to form a straight wall portion; Fig. 3 is a top view of a metal plate for the locking of the interengaged joint elements of two adjacent panels; Fig. 4 is a top view of a variant of the panel, shown in Fig. 1; Fig. 5 is a top view of a structural element made of reinforced concrete; Fig. 6 shows a fragmentary front view of a wall formed by the juxtaposition of panels of the invention and structural elements; Fig. 7 is a detail of the cross section of the wall shown in Fig. 6, taken along the line A—A, the upper edge of said wall being provided with locking means adapted to lock, at the same time, a plurality of the panels forming a wall; Fig. 8 shows the top view of two panels connected to one another with a slight angular displacement so as to form a substantially curved wall; Fig. 9 is a fragmentary top view showing the connection of two walls set at right angles, by means of a corner L-shaped panel; and Fig. 10 is a top view of the detail of the connection of three walls by means of a connection panel.

With reference now to Figs. 1 and 2 at 1 is generally indicated a modular prefabricated panel comprising a box-like tubular body which is constructed by a moulding process in any suitable plastic material and which comprises two main parallel plate walls 2 which are connected to one another at their ends by cylindrical surfaces having the shape of female and male complementary edge joint elements 6 and 7.

Said cylindrical concave and convex surfaces 6 and 7 are so shaped as to allow to connect a series of panels 1, either in a straight direction (Fig. 2) or according to a broken line (Fig. 8) so as to obtain a prismatic or substantially curved wall in the building.

The inner space inside the main plate walls 2 and the walls 6 and 7 forming the female and male elements for joining the panels 1 to each other, is separated by longitudinal and transverse partition walls 3 and 4, so as to define tubular cavities inside the panel 1 open at their both ends and designed to receive a mix. The transverse partitions 4 serve also as inner elements to support and stiffen the main peripheral plate walls 2 and, in combination with the longitudinal wall 3, they define at least a cavity designed to form the mould for the casting of a reinforced column 5, by means of reinforced rods 10. The remaining cavities of the panel 1 designed to form curtain walls of the building will receive a mix consisting of a mixture of cement and soundproofing and/or thermo-

insulating and/or antifire materials. In particular conventional concrete can be used for obtaining the column 5 or also cellular concrete having big grains and obtained by means of the use of a mixture of foamed clay, sand and cement.

Concrete may be also used having fine grains and obtained by means of chemical additives; this concrete is not only lightweight but also has very thermo-insulating and soundproofing properties.

Along the central portion of each female joint member 6 a longitudinal groove 8 is provided which houses a strip or band 9 of an elastically deformable seal material, in particular, soft rubber, or other suitable material, and which partially extends beyond the entrance passage of the groove 8 so as to obtain a seal joint as the female and male joint elements 6 and 7 of two adjacent panels 1 are assembled in close contact one with another. The variant 1a of the panel 1, shown in Fig. 4, is substantially similar to the panel 1, except that no longitudinal inner wall is provided. This type of panel 1a is adapted for the construction of thermo-insulating and soundproofing walls of no carrying character. On the contrary the structural element 11, shown in Fig. 5, which is prefabricated with conventional means and method, has an outline equal to that of the panels 1 and 1a, but it consists of a panel made of reinforced concrete, which can substitute a panel 1 or 1a in order to include at least a carrying element in a wall 17 constituted of juxtaposed panels 1 and 1a. For such a purpose the reinforcing rods 10 could extend beyond the upper and lower ends of the element 11 so as to be able to be connected, for instance, by welding, to the reinforcing rods of the carrying skeleton of the building. The panels 1 and 1a of the embodiment of Figs. 1 and 4 and optionally one or more elements 11 can be used for composing peripheral walls, partition walls and main inside walls of cottages, as well as for composing insulating peripheral walls or partition walls of buildings, in general, and are also adapted to be easily connected to any other conventional structures made of reinforced concrete, constituting the carrying framework of a building.

According to the different intended purposes and to the loads, the modular panels 1 and 1a and the elements 11 have different size and insulating degree. Their length will be equal to the height of the rooms of the cottages or buildings to be constructed.

The connection between each panel 1, 1a or the element 11 can be improved by means of metal plates 12 (Fig. 3) mounted according to a bridge arrangement between the two adjacent end portions of the upper sides of the two panels 1, 1a or 11 connected to one another by means of the vertical joints elements 6 and 7, after a wall has been erected.

On said plates 12 short longitudinal duly spaced apart slots 13 are provided through

which bolts 14 are caused to pass, designed to be screwed into screw nuts 15, previously embedded into the concrete or the like poured into the inner cavities of two adjacent panels 1, 1a or 11, and positioned at predetermined distances on each upper end of panels 1, 1a, or 11 (Fig. 2).

Figures 6 and 7 show another locking system, provided to lock to each other at their upper ends a plurality of panels 1, 1a or 11 forming a wall, after the assembly of said panels. For such a purpose lengths of structural shaped metal elements 16 are provided, the cross section of which has an inverted U-shape and which are made of a metal sheet material of elastically deformable type; the free ends of the sides of the U-elements 16 are spaced apart from one another of a distance slightly lesser than the thickness of the wall generally indicated 17 so that said elements 16 can be forced so as to be mounted about the upper edge of the wall 17. The elements 16 are prefabricated in modular lengths so that for the locking of the panels 1, 1a or 11, forming a wall 17 two or more lengths of elements 16 have to be used. At the joint section of two adjacent elements 16 this joint section will be protected by an inverted U joint strap 18 which is mounted on and fixed to the elements 16 and to the upper edges of the panel placed therein by means of through bolts 19 or the like.

Fig. 2 shows the position of the panels 1, 1a or 11 for the construction of a straight wall 17, while Fig. 8 shows the disposition of two adjacent panels 1a, for instance, in order to form a substantially curved wall 17a. In this disposition the joint elements 6 and 7 are slightly rotated one with respect to the other, owing to the cylindrical shape of outer surfaces of said joint elements 6 and 7.

In this assembly condition the gap, created between the two interengaged female and male joint elements 6 and 7 will be filled by a band of a packing material 19, previously stuck along the bottom portion of each concave female joint surface 6.

For the corner solutions, i.e. when two walls 17 substantially set at right angles have to be connected, L-shaped corner panels 20 are provided (Fig. 9). Said panels 20 could include a corner pillar or column made of reinforced concrete.

Figure 10 shows a panel 21 adapted for the connection of three walls 17, 17a so as to form a substantially T connection of said walls.

Of course, modified panels 1, 1a, 11 and 20 could be also provided in which the main outer planar plate surfaces 2 will be substituted by cylindrical coaxial main surfaces, if perfectly cylindrical walls have to be constructed.

Claims

1. Prefabricated modular box-like panels (1, 1a, 20, 21) for the casting of walls of cottages

or buildings in general made of concrete, reinforced concrete and the like, each panel comprising a box-like tubular body, made of plastics and so shaped as to act as a form element of a casting form to be left in place and to be embodied in the wall, said tubular body including two parallel main outer walls (2) and inner vertical longitudinal and/or transverse partitions (4, 3) for supporting and stiffening the main walls (2) and for separating the inner space of each panel (1 or 1a) into vertical cavities, open at their upper and lower ends, at least one of which may be used to form a reinforced concrete column (5) formed in said panel, while other cavities may be used to receive mixes of thermo-insulating and/or soundproofing materials, the other two vertical side edges of the panel (1, 1a, 20, 21) being shaped so as to form female and male joint elements (6, 7) having complementary cylindrical outer surfaces of a curved cross-section, each cylindrical outer surface comprising convex and concave curved portions so as to allow the connection of adjacent panels, either in vertical straight or angled relationship, each female joint element (6) comprising at its central portion a vertical groove (8) partially housing a strip (9) of a packing material, adapted to obtain a sealed connection between the interengaged female and male joint elements (6, 7) of the adjacent panels, and means (12, 15, 16) to lock together pairs of adjacent panels (1, 1a), at their upper portions.

2. Prefabricated modular panels according to claim 1 formed as corner panels (20) or as connecting panels (21) for the connection of two walls (17, 17a) at right angles.

3. Prefabricated modular panels, according to claim 1, filled with a mix of foamed clay, cement, and other soundproofing and thermo-insulating materials.

4. A wall formed from prefabricated modular panels according to claim 1, wherein the panels (1, 1a, 20, 21) have a length equal to the height of the rooms of the cottage or building, the wall (17) being provided at its upper edge with locking inverted U-metal sheet elements (16) connected to each other and to the upper edge of the wall (17) by bolts (19), with the superposition of an inverted U-joint strap (18) mounted in the joint points of said elements (16).

5. A wall formed from prefabricated modular panels according to claim 1, comprising in addition at least one prefabricated structural element (11) made of reinforced concrete and having the same outline as said panels (1 or 1a).

Revendications

1. Panneaux modulaires préfabriqués modulaire (1, 1a, 20, 21) pour la construction de murs de maisons et bâtiments généralement faits en béton, en béton armé et équivalent, chaque panneau comprenant un corps tubu-

laire en forme de boîte ou caisse, fait en plastique et conformé de façon à se comporter en élément de mise en forme d'un moulé de coulée à laisser en place et incorporer dans le mur, ledit corps tubulaire comprenant deux parois principales parallèles extérieures (2) et de séparations (4, 3) intérieures verticales longitudinales et/ou transversales pour supporter et renforcer les parois principales (2) et pour séparer l'espace intérieur de chaque panneau (1 ou 1a) en cavités verticales, ouvertes à leurs extrémités supérieures et inférieures, au moins l'une d'entre elles pouvant être utilisée pour conformer une coulonne (5) de béton armé moulée dans ledit panneau, tandis que les autres cavités peuvent être utilisées pour recevoir des mélanges de matériaux isolants thermiques et/ou phoniques, les deux autres côtes verticales du panneaux (1, 1a, 20, 21) étant conformée de façon à constituer des éléments de joints femelles et mâles (6, 7) ayant des surfaces extérieures cylindriques complémentaires, à section transversale incurvée, chaque surface extérieure cylindrique comprenant des parties courbes convexes et concaves, de façon à permettre la connexion de panneaux adjacents soit en alignement vertical, soit en relation angulaire, chaque élément de joint femelle (6) comprenant en sa partie centrale une rainure verticale (8) enfermant partiellement une bande d'un matériau d'étanchéité, adéquat pour l'obtention d'une connexion étanche entre les éléments engagés entre eux de joints mâles et femelles (6, 7) des panneaux adjacents, des moyens (12, 15, 17) pour verrouiller ensemble des paires de panneaux adjacents (1, 1a) étant prévus à leurs parties supérieures.

2. Panneaux modulaires préfabriqués selon la revendication 1, en forme de panneaux d'angle (20) ou de panneaux de raccordement (21) pour la connexion entre deux murs (17, 17a) à angles droits.

3. Panneaux modulaires préfabriqués selon la revendication 1, remplis d'un mélange d'argile, de ciment et autres matériaux isolants phoniques et/ou thermiques.

4. Mur formé de panneaux modulaires préfabriqués selon la revendication 1, dans lequel les panneaux (1, 1a, 20, 21) ont une longueur égale à la hauteur des pièces de la maison ou ville, le mur 17 étant pourvu à son bord supérieur d'éléments de verrouillage en feuilles de metal en U renversé (16) reliés entre eux et au bord supérieur du mur (17) par des boulons (19) avec superposition d'une bande de joint en U inverse (18) montée aux points de jointoiement des dits éléments (16).

5. Mur formé de panneaux modulaires préfabriqués selon la revendication 1, comprenant de plus au moins un élément structurel préfabriqué (11) fait en béton armé, et ayant le même contour que lesdits panneaux (1 ou 1a).

Patentansprüche

1. Vorgefertigte, modulare, kastenförmige Bauelemente (1, 1a, 20, 21) für die Herstellung von Wänden für Landhäuser oder im allgemeinen mit Beton, Eisenbeton oder ähnlichen gebaute Gebäude, gekennzeichnet durch einen röhrenförmigen Kasten aus Plastik, der als ein Element einer Gussform ausgebildet ist das in seinem Standort einzulassen und in die Wand einzubauen ist, wobei der röhrenförmige Kasten aus zwei parallelen Hauptausenwänden (2) und Scheidewänden (4, 3) besteht, die vertikal, longitudinal und oder quer sein können und zur Abstützung und die Versteifung der Hauptausenwände (2) und für die Verteilung des Innenraums jedes Bauelementes (1 oder 1a) in vertikalen an ihren oberen und unteren Enden offenen Hohlräumen dienen, deren wenigstens eine zur Herstellung einer in dem genannten Bauelement gebildeten Säule (5) aus Eisenbeton und die anderen Hohlräumen zur Aufnahme von Mischungen von Wärmedämmstoffen und/oder schallisolierenden Materialien verwendet werden können, wobei die zwei seitlichen und vertikalen Ausenwände des Bauelementes (1, 1a, 20, 21) als Kerbenfügungsglieder (6, 7) ausgebildet sind, die zylindrische, komplementäre Ausenflächen mit gekrümmten Querschnitt aufweisen, wobei jede zylindrische Ausenfläche aus konvexen und konkaven, gekrümmten Teilen besteht sodass die anliegende Bauelemente entweder gemäss einem geradlinigen, vertikalen oder einen winkligen Verhältnis in Verbindung gesetzt werden können, wobei jeder Hohlraum (6) der Kerbenfügung in seinem Zentralabschnitt eine vertikale Nut (8) aufweist in der eine Feder (9) aus Verpackungsmaterial teilweise eingesteckt ist, die eine dichte Verbindung zwischen den eingreifenden Kerbenfügungsgliedern (6, 7) der anliegenden Bauelemente verwirklicht, und durch Mittel (12, 15, 16) zur Befestigung von den Oberteilen anliegender Bauelemente (1, 1a).

2. Vorgefertigte, modulare Bauelemente nach Patentanspruch 1 dadurch gekennzeichnet, dass sie als Winkelbauelemente (20) oder als Verbindungsbauelement (21) zur rechtwinkligen Verbindung zweier Wänden (17, 17a) ausgebildet sind.

3. Vorgefertigte, modulare Bauelemente, nach Patentanspruch 1, dadurch gekennzeichnet, dass sie mit einer Mischung von Ton, Zement und anderen Wärmedämmstoffen und schallisolierenden Materialien eingefüllt sind.

4. Wand bestehend aus vorgefertigten, modularen Bauelementen nach Patentanspruch 1 dadurch gekennzeichnet, dass die Bauelemente (1, 1a, 20, 21) eine Länge aufweisen, die der Höhe der Zimmer des Landhauses oder des Gebäudes gleich ist, wobei die obere Kante der

Wand (17) mit U-förmigen Befestigungsmitteln (16) aus Blech versehen ist, die zueinander mit der oberen Kante der Wand (17) durch Bolzen (19) verbunden sind, und eine U-förmige Verbindungsplatte (18) über den Verbindungspunkten der genannten Befestigungsmittel (16) gelegt ist.

5. Wand bestehend aus vorgefertigten, modularen Bauelemente nach Patentanspruch 1 weiterhin gekennzeichnet durch wenigstens ein vorgefertigtes Bauelement (11) aus Eisenbeton, das die gleiche Gestalt der Bauelemente (1 oder 1a) hat.

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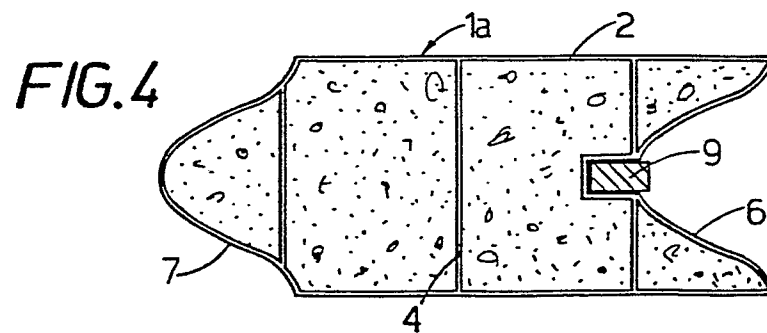
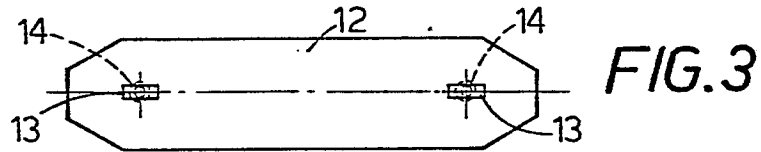
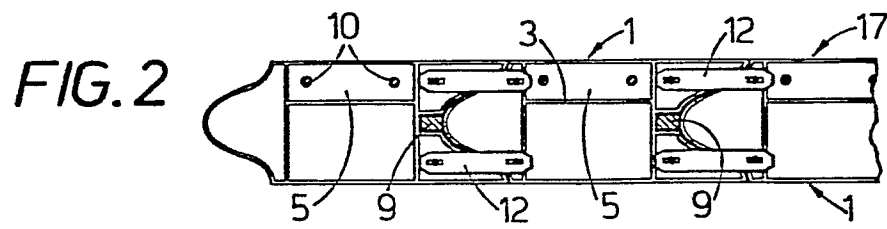
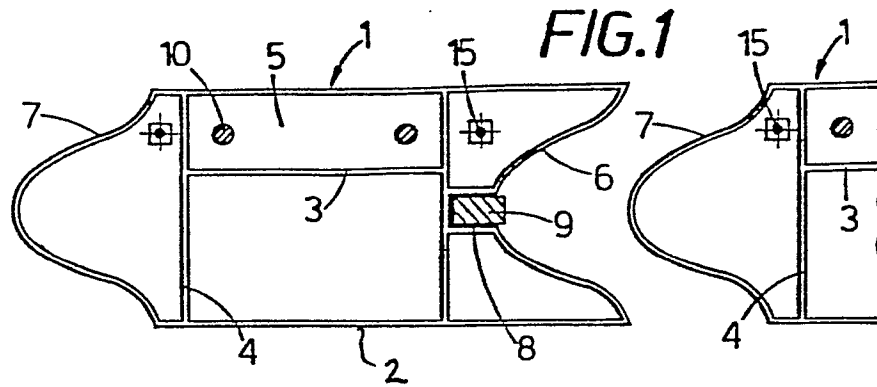


FIG. 5

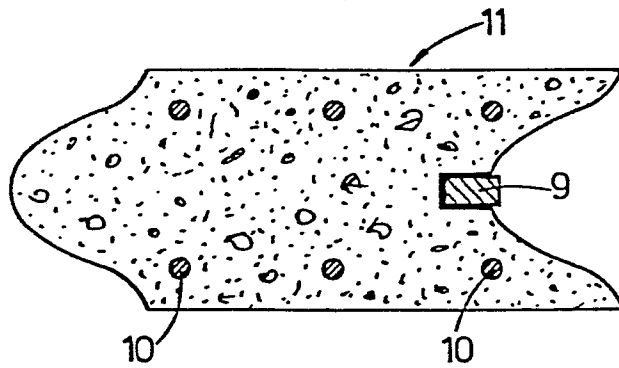


FIG. 7

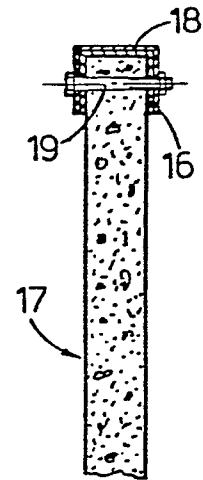


FIG. 6

