

A FUNCTIONAL SYSTEM FOR A CEMENT MORTAR PANEL WITH
PRESTRESSED BIAXIAL REINFORCEMENT

DESCRIPTION

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Object of the invention

10 The present invention relates to a functional system for a cement mortar panel with prestressed biaxial reinforcement. In the invention, a system is understood to be an ensemble of items which, when related together in an ordered fashion, contribute to the general good quality of the said panel. On the other hand, functional is understood to be all that relating to the design or organization of the system which pursues the ease, utility and convenience of its use.

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20 To be precise it consists of a system of things of substance, namely, of elements contributing to the functionality of the system, to the physical, formal and functional constitution of the ensemble, allowing it to be handled and used under maximum safety and efficiency conditions, in its application to a panel of the type prefabricated with cement mortar. In building construction, the panel is for closing the openings in a building structure, both the external openings, in which case it has the visible face decorated to form the façade, and the internal openings, in which case they do not need any decoration on the visible face thereof, which delimit the
25 patios of a building. The panel is formed by a cement mortar panel which, having a thickness of from 2 to 7 cms, includes a prestressed biaxial reinforcement which is formed by two series of prestressed cables or rods, those of one same series being mutually parallel and equidistant, while the series cross each other orthogonally without being fixedly attached to one
30 another to form a reinforcement grid.

Background of the invention

5 The present applicant is the holder of international patent application PCT/ES2007/000706, published under number WO 2008/139003, relating to a prefabricated cement mortar panel with biaxial reinforcement comprising variants of elements of a functional system which are compatible with or replaceable by new elements having like functional or innovative features.

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Description of the invention

15 In the above-mentioned international patent application, there were not included in the functional system thereof certain aspects or elements which make the cement mortar panel to which they are directed have improved comfort conditions, at the same time as they enhance the stability and safety features thereof.

20 Without belittling the qualities of the said functional system, the solution has been adopted of configuring some of the elements of the previous system, such as the versatile operating means, such that they become more neutral in their effects on the outside of the panel and more resistant to climatic conditions, the suspension means to the structure of a building provided with means controlling seismic phenomena and the settling movements of the building and the means of reducing damp inside
25 the building.

30 In accordance with the foregoing solution, the functional system object of the present invention has been developed, consisting essentially in the cement mortar panel having embedded in the mass thereof versatile operating means on the panel ensemble allowing it to be handled and/or attached to suspension means to the structure of a building, to means controlling seismic phenomena and the settling movements of the building,

to means for reducing damp inside the building and to means reducing the infiltration of damp inside the panel.

5 A feature of the invention is that the versatile operating means on the panel ensemble, allowing it to be handled and/or attached to suspension means to the structure of a building, is constituted by an oblong body formed by a thick flat bar which, in omega shape, forms a central rectangular arch which is flanked by two lateral arms, which are symmetrical relative to said central rectangular arch and mutually coplanar and form the main retaining means of the body within the mortar, the
10 central portion of the central rectangular arch having a threaded through hole for the sequential insertion of the handling means and the anchoring means and a dimension of the ensemble such as to allow said lateral arms to be able to be located in the medial internal region of the panel in which
15 the biaxial reinforcement is located.

A further feature of the invention, appropriate for a metallic structure formed by vertical upright profiles and horizontal cross-member profiles, and which has the purpose of facilitating the suspension of architectural
20 panels in buildings having a reinforced concrete structure, consists of disposing a plurality of clamps provided with stable fixing means to the edges of the floor structure slabs of a reinforced concrete structure, the clamps being disposed individually in vertical alignment in said edges to form coaxially vertical guide rows for housing and retaining the upright
25 profiles which are connected together by cross members on which the suspension means provided on the backs of the architectural panels are seated and attached.

Further features related to the above, specify that, in one case, the
30 clamps are formed by a quadrangular bushing or ring having coplanar to one of the faces thereof two lugs, which configure it in a bridge-like fashion, as fixing means of the bushing to the edge of the floor structure slab, in a position appropriate for the vertical passage of the upright

profiles, with the lugs including means for anchoring the bushing to the edge of the building floor structure slab. At the same time, the front face of the bushing, which is opposite to the seating surface of the bushing on the floor structure slab edge, has a vertical elongated hole. In another case, the clamps are formed by a folded bar portion which, forming a rectangular arch, extends orthogonally at both free ends thereof in two symmetrical coplanar lugs forming the horizontal fixing means of the bushing to the edge of the building floor structure slab.

10 A further feature of the invention, applicable to the case in which the versatile operating means on the panel ensemble allowing the handling and/or fixing thereof to suspension means to the structure of a building are formed by plugs formed by short, thick bodies. Thereby, the lateral region of the short, thick body, comprised between the retaining means and the
15 anchoring means having an end region flush with the surface of the hidden face of the panel, has the side region thereof provided with irregularities increasing the surface area thereof and the distance to be covered thereover by any damp which may infiltrate in the space which may have formed between said body and the cement mortar of the panel in which it is
20 inserted as a result of thermal expansion and/or contraction.

Further features of the invention associated with the foregoing consist of:

25 1. – The short, thick body basically has a configuration in the lateral region thereof of the group formed by conical surfaces, cylindrical surfaces, oval surfaces and prismatic surfaces.

 2. – The surface irregularities in the lateral region of the short, thick
30 body of the plugs are formed by reliefs projecting from the surface of said lateral region.

3. - The surface irregularities in the lateral region of the short, thick body of the plugs are formed by recesses below the surface of said lateral region.

5 4. - The projecting reliefs of the surface irregularities on the lateral region of the short, thick body of the plugs have an annular configuration and are contained in mutually parallel planes perpendicular to the axis of the short, thick body of the plug.

10 5. - The projecting reliefs of the surface irregularities on the lateral region of the short, thick body of the plugs follow helical paths with a direction of minimum damp flow.

15 6. - The external contact line between the plug and the cement mortar may be covered and closed with a washer including a sealing joint arrangement.

A further feature of the invention, which is particularly applicable to a wall for buildings having ecological features, the façades whereof are of the type preferably formed by prefabricated cement mortar panels having a thickness of about 3 cms which are attached to a completely metallic independent structure or a metallic structure associated with a reinforced concrete structure and which form between said panels and metallic structure a ventilated chamber, are defined by the fact that the façade support structure, be it metallic or mixed, is completely covered by a breathable sheet on the front surface thereof, which is the one comprised inside the ventilated chamber and facing the back of the prefabricated façade panels forming said ventilated chamber, said sheet being breathable only with respect to the air and damp inside the building and is
20 25 30 breathable exclusively in one sole direction from the inside of the building towards the ventilated chamber.

Further features of the invention which are intimately related with each other and/or with the foregoing feature, are:

5 1. – On the rear surface of the support structure, which is the one opposite the front surface thereof containing the breathable sheet, there is abutted a water-repellent breathable board, the board being provided with a layer of foam mortar, also breathable, projected on said abutment surface towards said rear surface of the structure.

10 2. – A water-repellent board, having one of the faces thereof covered with a projected layer of foam mortar, is abutted by this covered face against the rear surface of the support structure, being the rear surface the one opposite the front surface which is covered by the breathable sheet.

15 3. – On the face of the water-repellent board not having the layer of foam mortar, there is abutted a frame which, formed by two horizontal "U"-shaped profiles and two vertical "C"-shaped profiles, houses a blanket of insulating material and which is optionally provided in the uprights thereof
20 with holes for the passage of cables and pipes.

 4. – Abutting the face of the "U" and "C"-shaped metal profile frame opposite to the face abutting the water-repellent breathable board, there is an assembly of two plasterboards abutted face-to-face of which the board
25 closer to the building interior is covered with a layer of breathable paint.

 5. – The blanket of insulating material consists of a self-supporting semi-rigid material which is disposed between the water-repellent breathable board and the assembly of plasterboards, possibly without the
30 support of the metal profile frame.

 6. – The breathable foam mortar is reinforced by materials of the group formed by cellulose fibers, rock wool, fiberglass and synthetic fibers.

A further feature of the invention is to be found in the fact that an anti-seismic device, which is specially applicable where the prefabricated panels closing the structure of a building are placed against the structure
5 by means of a plurality of fixing members formed by a threaded rod which engages, at one end, in the threaded through hole of a versatile plug embedded in the panel and is attached thereto by a nut, at the same time as, at the other end thereof, there is fixedly attached thereto by nuts and locknuts, a polygonal seating plate which engages at one edge thereof a
10 channel of a support profile fixedly attached to the building structure, consists of locking means which releasably stabilize the seating of the polygonal plate in the channel of the support profile fixedly attached to the building structure.

15 Further features of the invention forming embodiments and details thereof are described below:

1. – The locking means are formed by a retaining profile which being releasably fixedly attached in overhanging fashion to the building
20 structure, has at the free end thereof a resiliently flexible inverted channel for engaging one side of the polygonal seating plate, opposite to the side with which it is seated in the channel of the support profile, fixedly attached to the building structure to stabilize the seating of said polygonal plate.

25 2. – The polygonal plate has abutting the face thereof facing the support structure and suspended on the upper edge of the polygonal plate astride this edge, locking means formed by a metal plate piece having, in the centre thereof, a window through which there freely extends the fixing locknut of said polygonal seating plate and a lower end which is bent into a
30 perpendicular tab. The polygonal tab seats, on the one hand, on the upper face of a horizontal portion of the angular support profile fixedly attached to the structure and, on the other hand, is fixedly attached through said horizontal portion of the angular support profile to a rigidifying profile for the

latter which is snugly fitted between the channel of said angular support profile and a vertical portion thereof fixedly attached to the support structure.

5 3. – The window of the metal sheet piece has dimensions such as to allow the positional fixing locknut of the polygonal seating plate to project therethrough and the rotation of the locknut when handling it to fix the position of said polygonal seating plate.

10 4. – The rigidifying profile has a rectangular rightangled tubular configuration and has a length such that allows an indefinite length of the angular support profile of the group comprising the whole of said length or a plurality of regularly spaced apart independent portions thereof to be occupied.

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Brief description of the drawings

To facilitate the understanding of the foregoing ideas, at the same time as various details of a constructive nature are disclosed, there is
20 described hereinbelow an embodiment of the present invention, with reference to the drawings accompanying this specification. In view of their primordially illustrative nature, these drawings must be understood to be lacking in any limiting scope relative to the breadth of the legal protection requested. In the drawings:

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Figure 1 is a perspective view of an embodiment of a versatile plug according to the present invention.

30 Figure 2 is a side elevation view of an embodiment of the means allowing the panel to be handled when attached to the versatile plug.

Figure 3 is a partly section side elevation view of an anchoring point of a panel to a building support structure.

Figure 4 is a partly section side elevation view of a point of the panel where there is a plug attached to a handling means such as that of Figure 2.

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Figure 5 is a partly sectional side elevation view of the arrangement of a panel when being stripped from the mold.

Figure 6 is a cross section view of an embodiment of the structure of the invention where there is to be seen a clamp variant, an upright and a cross-member variant, all connected by the clamps to the floor structure slabs of a reinforced concrete building structure and a cement mortar panel having biaxially prestressed reinforcement suspended in said structure.

15 Figure 7 is a perspective view of a detail of one of the possible embodiments of a clamp once attached to the edge of a floor structure slab of a reinforced concrete building structure and the retained position therein of an upright, drawn in dashed line to facilitate the view of the clamp.

20 Figure 8 is, like Figure 7, a detail of a second one of the possible embodiments of a clamp once attached to the edge of a floor structure slab of a reinforced concrete building structure and the retained position therein of an upright, drawn in dashed line to facilitate the view of the clamp.

25 Figure 9 is a perspective view of a floor structure slab showing the lower ends of a number of metal upright profiles anchored at the lower end thereof to a lower horizontal metal profile and a further number of metal upright profiles anchored at the upper end thereof to an upper horizontal metal profile, both horizontal metal profiles being mounted to one same floor structure slab.

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Figure 10 is a cross section view of a detail of the way of attachment, with possibility of movement, of the upper end of an upright

metal profile at a point of the upper horizontal metal profile, in a situation where no settling of the reinforced concrete structure has occurred.

5 Figure 11 is a cross section view of the way, after a settling movement of the concrete structure has occurred, in which the attachment of the upper end of an upright metal profile, shown in the previous figure, remains, where said upper end is located in the vicinity of the base wall of the upper horizontal metal profile.

10 Figure 12 is a cross-sectional elevation view of a cement mortar panel, with a plug formed by a short, thick body according to an embodiment prior to the one of the present invention.

15 Figure 13, similar to Figure 6, shows a plug formed by a short, thick body according to an embodiment of the present invention, where the irregularities project from the lateral region thereof.

20 Figure 14, similar to Figure 7, shows a plug formed by a short, thick body according to an embodiment of the present invention, where the irregularities form recesses in the lateral region thereof.

Figure 15 is a vertical section view of a part of an embodiment of a complex wall of the invention.

25 Figure 16 is a partial perspective and sequentially sectional view of a part of a complex wall like the one shown in the previous figure, seen from the outside.

30 Figure 17 is a partially sectional side elevation view of two anchoring points of a like number of adjacent panels abutting a building support structure, all provided with the antiseismic device of the invention.

Figure 18 is a partially sectional side elevation view of an anchoring point of a panel in an angular support section according to the object of the invention.

5 Figure 19 is a front elevation view of a detail of the sheet metal piece where the disposition of the window and its relation with the fixing locknut for positioning of the polygonal seating plate is to be seen.

Description of embodiments of the invention

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Figure 1 shows a preferred embodiment of a versatile plug 100 constructed according to the present invention. The versatile plug 100 is formed by a single piece made by successive die stamping and folding operations on a thick flat bar. The purpose of this is to obtain an oblong body which formed as a rectangular omega forms a central rectangular arch 111 constituting the anchoring means 107. The central rectangular arch 111 is flanked by two lateral arms 112 constituting the retaining means 106. These retaining means 106 are symmetrical relative to the central rectangular arch 111 and are mutually coplanar. The retaining means 106 form the main retaining means of the oblong body in the mass of the mortar. Likewise, the central portion 113 of said central rectangular arch 111, acting as anchoring means 107, has a central threaded through hole 114 for sequential insertion of the handling means 108 of Figure 2 and the fixing means 109 of Figure 3.

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As shown in Figure 3, between the outer plane A of the central portion 113 which is flush with the hidden face 104 of the panel 102 and the coplanar outer plane B of the two side arms 112, the versatile plug 100 has a dimension D such as to allow said side arms 112 to be located in the medial inner region of the panel 102 where the cables 105 or rods of the biaxial reinforcement are to be found.

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The figures show that the oblong body is formed by a flat bar, preferably of ferric material such as steel, without excluding other materials. The flat bar may be shaped by a series of die-stamping and pressing operations, without excluding in any case the possibility of forming it by lost-wax
5 casting or other process.

In the majority of cases, the oblong body consists of a single solid piece having the convex and concave transverse edges 115 thereof rounded.

10 Figure 2 shows an embodiment of the handling means 108 for the panel 102. After being engaged with the versatile plug 100, the handling means 108 allows the versatile plug 100 to be handled for insertion thereof in the panel 102 in the molding stage thereof. Finally, it allows the demolding and transportation of the panel 102, when in the position shown in Figure 4.

15 This handling means 108 for the panel 102 is formed by a steel rod 116 having one end 117 threaded, which may be releasably engaged in the threaded through hole 114 provided in the central portion 113 of the central rectangular arch 111 of the versatile plug 100. At the other end, the
20 handling means 108 is provided with a throat 118 which, as shown in Figure 5, is for allowing it to be held by the grippers 119A of a transporter 119. In an initial operation, the transporter 119 inserts the versatile plugs 100 in the body of the mass of fresh mortar deposited in the forming mould 120 for the panel 102 on a texture plate 120A in an environment closed by
25 a closure plate 121 for the open end of the mould 120. In subsequent operations the handling means 108 allows the panel 102 to be removed from the mould 120 and be transported to the setting facilities and, from the setting facilities, to the store and/or job site.

30 As shown in Figure 3, in the operation of seating the panel 102 in the cross-members 128 fixedly attached to uprights 110 to form a building structure, fixing members 109 are inserted in the threaded through holes 114 of the central rectangular arch 111. These fixing members 109 are

formed by a threaded rod 122 which engages, at one end, in the threaded through hole 114 of the central portion 113 of the central rectangular arch 111 and is fixed thereto by a nut 123, at the same time as there is fixed thereto at the other end by respective nuts 124 and locknuts 125 a seating
5 plate 126 which engages in a channel 127 of a support cross-member profile 128 fixedly attached to the uprights 110 of a building structure.

Figure 6 shows a possible application to a building structure 134, wherein there is to be seen a variant of clamp 129, an upright 130 and a variant of
10 cross-member 131, all connected, through the clamps 129, to the edges 132 of the floor structure slab 133 of the reinforced concrete building structure 134 and a cement mortar panel 135 having biaxially prestressed reinforcement 136 suspended on said building structure 134.

15 The cross-members 131, for supporting the outwardly projecting suspension means 137, in one case, may adopt a double angle configuration or, in other cases, as shown in Figures 15 and 16, the configuration of a flat "C" shaped rail with openings in the upper edge for the insertion of the seating plates 138 of the suspension means 137
20 anchored to the plugs 139 embedded in the panel 135 between the biaxially prestressed reinforcements 136.

The same Figure 6 shows how the clamps 129 are fixed to the edges 132 of the floor structure slabs 133 by nails 140 or other anchoring means in
25 concrete which pass through the lugs 141 of the clamps 129. At the same time (see Figures 7 and 8), in the quadrangular bushing 142 associated with said lugs 141, there is housed the upright 130 which is fixed to said quadrangular bushing 142 by anchoring members 143 or other means passing through the front face 144 of the quadrangular bushing 142
30 through an elongated hole 145 provided in the front face 144. The elongated hole 145 allows for the limited sliding of the clamp 129 during the settling movements, without them affecting the arrangement of the façade panels.

- Figure 7 shows the case in which the clamp 129 is formed by a quadrangular bushing 142 which is fixedly attached to a flat bar 146. The free ends of the flat bar 146 form the lugs 141 provided with holes for the passage of the anchoring means to the edge 132 of the floor structure slab 133 of the reinforced concrete building structure 134, by way of the nails 140. The front face 144 of the quadrangular bushing 142 has the said elongated hole 145 for anchorage of the upright 130.
- Figure 8 shows the case in which the clamp 129A is formed by a folded flat bar portion 147 which, forming a bushing 142 open in the form of a square arch 148, extends perpendicularly at both free ends thereof in two lugs 141 which are coplanar and symmetrical. Furthermore, both lugs 141 are provided with holes for the passage of nails 140 forming the fixing means of the open bushing 142 to the edge 132 of the floor structure slab 133 of the building structure. At the same time, the bushing 142 houses the upright 130 and holds it tight by means of the anchoring means 143 through the elongated hole 145.
- Figure 9 shows a way of carrying out according to the invention the closing structure for the construction, which consists of disposing on the floor structure slab 149 a flexible impermeable sheet 150 formed, for example, of an elastomeric material such as butyl.
- This sheet 150 is mounted on the floor structure slab 149 with an upper edge region 150A overlapping the floor 149 and allowing the rest of the sheet 150 to hang, covering a central portion 150B of the edge of the floor structure slab 149, while another lower edge region 150C is left suspended. The said upper edge portion 150A serves as seat for a lower horizontal metal profile 151, which is called lower relative to the opening of an upper floor, which is installed with a slight overhang relative to the edge of the floor structure slab 149 and is fixed thereto by a screw. The lower horizontal metal profile 151 is complemented in coplanar fashion by an

upper horizontal metal profile 152, which is called upper relative to the opening of a lower floor. At the same time the lower edge region 150C of the sheet 150 covers the side of the upper horizontal metal profile 152, located on the lower face of the same floor structure slab 149.

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The lower 151 and upper 152 horizontal metal profiles, located in one same opening between two successive floor structure slabs 149, are for supporting upright metal profiles 153 and, as "U" shaped profiles, have, respectively, base walls 151A and 152A and side portions 151B and 152B.

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As shown in Figure 9, the lower horizontal metal profiles 151 are provided in the side portions 151B thereof with holes 154 for the passage of anchoring screws for the lower ends 153A of the upright metal profiles 153. At the same time, see Figures 10 and 11, the upper ends 153B of these upright metal profiles 153 are fixed to the corresponding side portions 152B of the upper horizontal metal profile 152 by an arrangement formed by two vertical elongated holes 155, provided transversely in said side portions 152B and screws 156 which pass through said vertical elongated holes 155 and are fixed at the upper end 153B of the upright metal profile 153. These screws 156 may be any type of screws, rivets, pins or any retaining means allowing for mutual movement originated by the presence of stresses caused by the settling of the reinforced concrete structured building.

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Figure 10 shows a form of fixing with possibility of movement of the upper end 153B of an upright metal profile 153 up to the base wall 152A of the upper horizontal metal profile 152. In the situation shown no settling of the reinforced concrete structure of the floor slabs 149 has taken place. In this situation the length L of the vertical elongated holes 155 provided in the side portions 152B of the upper horizontal metal profiles 152 is the same as or greater than the distance D, provided between the upper end 153B of the upright metal profile 153 and the base wall 152A of the upper horizontal metal profile 152, for the case in which settling of the reinforced concrete structure of the building takes place.

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Figure 11 shows the state, after the occurrence of a settling movement of the concrete structure, of the fixing of the upper end 153B of an upright metal profile 153 shown in the previous figure. In this situation, said upper
5 end 153B moves upwards to become located in the proximity of the base wall 152A of the upper horizontal metal profile 152.

Figures 12, 13 and 14 show examples of a plug which, made according to the art of the applicant for the present invention, constitutes the means for
10 fixing a cement mortar panel with prestressed biaxial reinforcement to a building structure. The fixing means is inserted in the mortar mass before setting thereof inside the mesh formed by the reinforcement members in such a way that the retaining means of the fixing means is housed in said mortar mass slightly below the prestressed reinforcement members and
15 short of the visible surface of the panel. In turn, the means for anchoring to the building structure has a region flush with the surface of the hidden face of the panel.

Figure 12 shows a plug 157, already disclosed by the applicant for the present invention, which is formed by a short, thick body 158 having the
20 retaining means 159 to the cement mortar mass forming the panel 160. The retaining means 159 is located on the prestressed biaxial reinforcement members 161 and distant from the visible face 162 of the panel 160. At the same time the body 158 has the anchoring means 163 with its threaded axial hole 168 in a region flush with the surface of the
25 hidden face 169 of the panel 160. It should be noted that the body 158 has a tapered side surface 170, thereby improving its retention in the panel 160.

30 Figure 13 shows a plug 171 having the same features as the plug 157 of Figure 12, except that the side surface 172 of the short, thick body 173 thereof is provided with reliefs 174 projecting from said side surface 172. In the case shown, the reliefs have an annular configuration, without

excluding that they may adopt other configurations such as, for example, a spiral one.

5 Figure 14 shows a plug 175 having the same features as the plug 157 of Figure 12, except that the side surface 176 of the short, thick body 177 thereof is provided with recesses 178 below the level of said side surface 176. In the case shown, the recesses have an annular configuration, without excluding that they may adopt other configurations such as, for example, a spiral one.

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The external line 179 of contact between the plug 157, 171 and 175 and the cement mortar of the panel 160 may be covered and closed with a resilient washer 180 forming a sealing gasket arrangement.

15 It is not excluded that some reliefs projecting from the side surface may be combined with others which do not. Likewise, it is not excluded that the short, thick body 158, 173, 177 in all cases may have basically a configuration in the side region thereof of the group comprising tapered surfaces, cylindrical surfaces, oval surfaces and prismatic surfaces.

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Figures 15 and 16 show a complex wall in which the façades thereof are of the type formed preferably by prefabricated cement mortar panels 181 having a thickness of around three centimeters. The prefabricated panels 181 are fixed to an independent completely metallic support structure or to
25 a metallic support structure 182 associated with a reinforced concrete support structure having the form of a floor structure slab 183, a ventilated chamber 184 being formed between said panels 181 and metallic support structure 182.

30 The support structure 182 of the façade, be it metallic or mixed, has the front surface thereof, which is comprised inside the ventilated chamber 184 and facing the back of the prefabricated façade panels 181 with which said ventilated chamber 184 is formed, covered by a breathable sheet 185. The

sheet 185 is breathable only with respect to the air and damp of the building interior and exclusively one way from the interior of the building to the ventilated chamber 184.

- 5 In the case of a mixed support structure 182, such as the one shown in the figures and in greater detail in Figure 16, it should be noted that the floor structure slabs 183 form the constructional part of the mixed support structure, while the other metallic part 182 of the same structure is formed by "U" shaped metal profiles 186, as cross members. These metal profiles
10 186 are fixed to the facing surfaces of two contiguous floor structure slabs 183 and disposed with their concave sides facing each other, the latter being connected by "C" shaped metal profiles 187 as uprights.

- A water-repellent breathable board 188 is abutted to the rear surface of the
15 metallic support structure 182, which is the surface opposite the one bearing the breathable sheet 185. The board 188 is provided with a layer of foam mortar 189 which is also breathable, projected on said abutment face towards the metallic support structure 182.

- 20 The water-repellent breathable board 188, which abuts the metallic support structure 182 with the face having the projected layer of foam mortar 189, also abuts with the other face thereof a support frame 190 of "C" shaped metal profiles 191. The support frame 190 holds inside, parallel to said water-repellent board 188, a blanket 192 of an insulating material which
25 being made from a self-supporting semirigid material, allows the possibility of not having the support provided by said support frame 190.

- Thereafter, abutting the face of said support frame 190 of "C" shaped metal profiles 191, opposite the one against which the water-repellent
30 breathable board 188 is placed, there is disposed an assembly of two plaster boards 193 and 194 abutting each other, among which, the board 194, which is the one closer to the interior of the building, being covered with a layer of breathable paint 195.

The breathable foam mortar 189 is reinforced with materials of the group formed by cellulose fibers, rock wool, fiberglass and synthetic fibers.

5 As shown in Figure 17, in the operation of seating the panels 196 and 196A in a building structure 197, fixing members 199 are inserted in the threaded holes of an omega-shaped versatile plug 198 or a cylindrical versatile plug 198A. These fixing members 199 are formed by a threaded rod 200 which is engaged, at one end, in the threaded hole of the central portion of the
10 central rectangular arch of the omega-shaped versatile plug 198 or the threaded axial hole of the cylindrical versatile plug 198A and is fixed thereto by a nut 201. At the same time, in both cases, there is fixed thereto at the other end thereof by corresponding nuts 202 and locknuts 203 a polygonal seating plate 209 which engages in a channel 210 of a support profile 211
15 fixedly attached to the structure 197 of a building.

Up to here there has been described the application of the object of Utility Model n° ES 1 068 863, to which there is added hereinafter the description of the object of the invention. As indicated above, the object consists of
20 disposing locking means 212 which removably resiliently and flexibly stabilizes the seating of the polygonal seating plate 209 in the channel 210 of the support profile 211 fixedly attached to the building structure 197.

The said locking means 212 consists of a retaining profile 213 which is
25 removalby fixedly attached in cantilever fashion to the building structure 197. In conditions of resilience and flexibility the retaining profile 213 has, at the free end thereof, an inverted channel 214 for engaging one side of the polygonal seating plate 209. This side is opposite the side with which it is seated in the channel 210 of the support profile 211 fixedly attached to
30 the building structure 197.

Under these assembly conditions of the panels 196 and 196A, the arrangement of the support 211 and retaining 213 profiles in cantilever

fashion confers on the installation thereof adequate resilience and flexibility to allow slight movements of the panels 196 and 196A without harming the stability of the panels 196 and 196A in the building structure 197.

5 Obviously, the fixing of the support 211 and retaining 213 profiles to the structure 197 by screws 215 allows the installation to be readily recomposed in case of deterioration of any of the panels or remodeled for needs of space or appearance, without excluding, thereby, that such profiles may be replaced by other members of like functionality.

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Likewise, the polygonal seating plate 209, which will preferably have a rectangular or square shape, may adopt other configurations, without excluding in an extreme case the circular configuration understood as polygonal of an infinite number of sides.

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Also, the versatile plugs may be of a configuration other than the one described, provided always that they have a threaded hole for the insertion of the threaded rod 200 or have an equivalent member.

20 As shown in Figure 18, in one example of the operation of seating the panels 216 in a building structure 197, there are inserted in the threaded holes of a short, thick bodied versatile plug 217, of an omega-shaped versatile plug or other similar type, fixing members 218 formed by a threaded rod 219 which engages, at one end, in the threaded axial hole of
25 the versatile plug 217 and is fixed to the plug 217 by a nut 220. Likewise, in both cases, there is fixed thereto at the other end thereof by respective nuts 221 and locknuts 222 a polygonal seating plate 223 which engages in a channel 224 of an angular support profile 225 fixedly attached to the building structure 197.

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Also up to here there has been described the way in which a fixing point of a panel 216 was installed in the building 197 up to date. Hereinafter there will be described the object of the invention consisting of disposing locking

means 226 which, removably, rigidly stabilizes the seating of the polygonal seating plate 223 in the channel 224 of the angular support profile 225 fixedly attached to the building structure 197.

- 5 According to the device of the invention, the polygonal seating plate 223 is provided with locking means 226 abutting the face A thereof, which is the surface facing the support structure of the building 197, and suspended from the upper edge B of the polygonal seating plate 223, riding thereon. The locking means 226 consists of a metal sheet piece 227 provided in the
10 centre thereof with a window 228 through which there freely projects the locknut 222 for fixing said polygonal seating plate 223 and with a lower end which is bent perpendicularly to form a tab 229. The tab 229, on the one hand, seats on the upper surface of a horizontal portion 230 of the angular support profile 225 fixedly attached to the building structure 197 and, on
15 the other hand, is fixedly attached by a screw 231 or other means, through said horizontal portion 230 of the angular support profile 225 to a rigidifying profile 232 for the latter. The rigidifying profile 232 is located in fitted fashion between the channel 224 of said angular support profile 225 and a vertical portion 233 thereof fixedly attached to the building structure.

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- As shown in Figure 19 and gathered from Figure 18, the window 228 of the metal sheet piece 227 has dimensions allowing the locknut 222 for positional fixing of the polygonal seating plate 224 to project therethrough and the rotation of said locknut 222 at the time of manipulating it to fix the
25 position of said polygonal seating plate 223.

- It should be pointed out that the rigidifying profile 232 is of right rectangular tubular configuration and of an indefinite length such as to allow a length of the angular support profile 225 of the group formed by the whole of said
30 length or a plurality of independent portions thereof which are regularly spaced apart to be occupied. Likewise, another type of profile could be used, and even tabs die punched out from the angular support profile 225

itself which were disposed perpendicularly just below the horizontal portion 230 inciding on the wall of the channel 224.

CLAIMS

1. – A functional system for a cement mortar panel with prestressed biaxial reinforcement, suitable for closing the openings in a building structure, which delimit the patios of said building and which is formed by a cement mortar panel, said panel, having a thickness of from 2 to 7 cms, includes a prestressed biaxial reinforcement (136, 161) which is formed by two series of prestressed cables (105) or rods, which are mutually parallel and equidistant within one same series and said series cross each other orthogonally without being fixedly attached to one another to form a grid, **characterized in that** the cement mortar panel has embedded in the mass thereof versatile operating means (100, 157, 171, 175) on the panel ensemble (102, 135, 160, 181, 196, 216) allowing the handling and/or attachment of said panel (102, 135, 160, 181, 196, 216) to suspension means (127, 137, 210, 224) to the structure of a building, to means controlling seismic phenomena and the settling movements of the building, to means for reducing damp inside the building and to means reducing the infiltration of damp inside the panel.
2. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of the previous claim, **characterized in that** the versatile operating means on the panel ensemble (102), is constituted by an oblong body formed by a thick flat bar which, in omega shape, forms a central rectangular arch (111) which is flanked by two lateral arms (112), which are symmetrical relative to said central rectangular arch (111) and mutually coplanar and form the main retaining means (106) of said body within the mortar, the central portion of said central rectangular arch (111) having a threaded through hole (114) for the sequential insertion of the handling means (108) and the anchoring means (107) and a dimension of the ensemble such as to allow said lateral arms (112) to be able to be located in the medial internal region of said panel (102) in which said biaxial reinforcement (136, 161) is located.

3. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 2, in which having a metallic structure formed by vertical upright profiles (130) and horizontal cross-member profiles (128), which, having the purpose of facilitating the suspension of architectural panels in buildings having a reinforced concrete structure, is **characterized in that** it comprises a plurality of clamps (129) which, provided with stable fixing means (140) to the edges (132) of the floor structure slabs (133) of a reinforced concrete structure, are disposed individually, in vertical alignment in said edges (132) to form coaxially vertical guide rows for housing and retaining the upright profiles (130) which are connected together by cross-members (128) on which said suspension means (137) provided on the backs of the architectural panels are seated and attached.

4. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 3, **characterized in that** said clamps (129) are formed by a quadrangular bushing (142) or ring having coplanar to one of the faces thereof two lugs (141), which configure it in a bridge-like fashion, as fixing means of said bushing (142) to said edge (132) of the floor structure slab (133) in a position appropriate for the vertical passage of the upright profiles (130), said clamps (129) including means for anchoring the bushing (142) to said edge (132) of the building floor structure slab (133), at the same time as the front face of said bushing (142), being the one found in position opposite to the seating surface of said bushing (142) on said edge (132) of the floor structure slab (133), has a vertical elongated hole (145)

5. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 4, **characterized in that** the clamps (129) are formed by a folded flat bar portion which, forming a rectangular arch, extends orthogonally at both free ends thereof in two coplanar symmetrical

lugs (141) forming the horizontal fixing means of the bushing (142) to the edge of the building floor structure slab.

6. – The functional system for a cement mortar panel with prestressed
5 biaxial reinforcement of claim 1, applied to prefabricated bidirectionally
prestressed cement mortar façade panels in concrete structures, in which
the closing structure comprises a first horizontal metal profile (151) fixed
longitudinally with a slight overhang on the free façade edge of the floor
structure slab (149) with the insertion of a flexible impermeable sheet (150)
10 covering the thickness of the floor structure slab (149) and a second metal
profile (152) being the same as said first horizontal metal profile,
longitudinally fixed with a slight overhang under said free façade edge of
the floor structure slab (149) as a mirror image of said first horizontal metal
profile (151), said first and second metal profiles (151, 152) of two adjacent
15 floor structure slabs (133) being connected together by upright metal
profiles (153), regularly spaced apart and anchored to said profiles (151,
152), **characterized in that** said upright metal profiles (153) are rigidly
fixed at the bottom ends thereof to said first horizontal metal profile (151)
mounted on the floor structure slab by screws, while the attachment of said
20 upright metal profiles (153) to said upper horizontal metal profile (152) is
effected, in a limited loose-fitting fashion, in such a way that it is
horizontally and vertically slidable and is made by way of a fastening
member (156) of the group formed by self-tapping screws, rivets and nut
and bolt systems, fixed to the upper end of said upright metal profile (153)
25 through vertical elongated holes (155) formed in said upper horizontal
metal profile (152) and press fitted by the head of said fastening member
(156) in said upper horizontal metal profile (152), said holes being of a
greater width than the diameter of the fastening member and of a length
equal to the safety margin contemplated for the settling of the floor
30 structure slabs of the concrete structure of the building.

7. – The functional system for a cement mortar panel with prestressed
biaxial reinforcement of claim 6, **characterized in that** the length L of said

vertical elongated holes (155) provided in the side portions (152B) of said upper horizontal metal profiles (152) is the same as or greater than the distance D provided between the upper ends of the upright metal profiles (153) and the base wall of said upper horizontal metal profile (152).

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8. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 1, which is applicable to the case in which the versatile operating means on the panel ensemble (160) is formed by plugs (157, 171, 175) formed by a short, thick body (158, 173, 177),
10 **characterized in that** the lateral region of said short, thick body (158, 173, 177) is provided with irregularities (174, 178) increasing the extent of the side surface (172, 176) of said lateral region and the distance to be covered over said side surface (172, 176) by any damp which may infiltrate in the space which may have formed between said body (158, 173, 177)
15 and the cement mortar of said panel (160) in which it is inserted as a result of thermal expansion and/or contraction.

9. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 8, **characterized in that** the short, thick body
20 (158, 173, 177) basically has a configuration in the lateral region thereof of the group formed by conical surfaces, cylindrical surfaces, oval surfaces and prismatic surfaces.

10. – The functional system for a cement mortar panel with prestressed
25 biaxial reinforcement of claim 8, **characterized in that** said surface irregularities in the lateral region of the short, thick body (173) of said plugs (171) are formed by reliefs (174) projecting from said side surface (172).

11. – The functional system for a cement mortar panel with prestressed
30 biaxial reinforcement of claim 8, **characterized in that** the surface irregularities in the lateral region of the short, thick body (177) of said plugs (175) are formed by recesses (178) below said side surface (172).

12 - The functional system for a cement mortar panel with prestressed biaxial reinforcement of claims 10 and 11, **characterized in that** the reliefs of said surface irregularities (174, 178) on the lateral region of the short, thick body (173, 177) of the plugs have an annular configuration and are
5 contained in mutually parallel planes perpendicular to the axis of the short, thick body (173, 177) of said plug (171, 175).

13 - The functional system for a cement mortar panel with prestressed biaxial reinforcement of claims 10 and 11, **characterized in that** reliefs of
10 said surface irregularities (174, 178) on the lateral region of the short, thick body (158, 173, 177) of said plugs (171, 175) follow helical paths with a direction of minimum damp flow.

14. - The functional system for a cement mortar panel with prestressed
15 biaxial reinforcement of claim 8, **characterized in that** the external contact line between said plug (157, 171, 175) and the cement mortar may be covered and closed with a washer (180) constituting a sealing joint arrangement.

20 15. - The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 1, which is particularly applicable to a wall for buildings having ecological features, in which the façades of said buildings are of the type preferably formed by prefabricated cement mortar panels (181) having a thickness of about 3 cms which are fixed to a completely
25 metallic independent structure (182) or a metallic structure (182) associated with a reinforced concrete structure (183) and which form between said panels (181) and metallic structure (182, 183) a ventilated chamber (184), **characterized in that** said façade support structure (182, 183), being it metallic or mixed, has the front surface thereof, which is the
30 one comprised inside said ventilated chamber and facing the back of the prefabricated façade panels (181) forming said ventilated chamber (184), completely covered by a breathable sheet (185), said sheet (185) being breathable only with respect to the air and damp inside the building and

exclusively in one sole direction from the inside of the building towards said ventilated chamber (184).

16. - The functional system for a cement mortar panel with prestressed
5 biaxial reinforcement of claim 15, **characterized in that** on the rear surface
of the support structure (182, 183), which is the one opposite the front
surface of said structure (182, 183) containing said breathable sheet, there
is abutted a water-repellent breathable board (188), which is provided with
a layer of foam mortar (189), also breathable, projected on said abutment
10 surface towards said rear surface of the structure.

17. - The functional system for a cement mortar panel with prestressed
biaxial reinforcement of claim 15, **characterized in that** a water-repellent
board (188), having one of the faces thereof covered with a projected layer
15 of foam mortar (189), is abutted by said covered face against the rear
surface of said support structure (182), said rear surface being the one
opposite the front face which is covered by said breathable sheet (185).

18. -The functional system for a cement mortar panel with prestressed
20 biaxial reinforcement of claim 15, **characterized in that** on the face of said
water-repellent board (188) not having the projected layer of foam mortar
(189), there is abutted a support frame (190) which, formed by two
horizontal "U"-shaped profiles and two vertical "C"-shaped profiles, houses
a blanket (192) of insulating material and which is optionally provided in the
25 uprights thereof with holes for the passage of cables and pipes.

19. -The functional system for a cement mortar panel with prestressed
biaxial reinforcement of claim 18, **characterized in that** abutting the face
of the "U" and "C"-shaped profile frame (189) opposite to the face to which
30 there is abutted the water-repellant breathable board (188), there is an
assembly of two plasterboards (193, 194) abutted face-to-face, of which
the board (194) closer to the building interior is covered with a layer of
breathable paint (195).

20. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 18, **characterized in that** said blanket (192) of insulating material consists of a self-supporting semi-rigid material and is
5 disposed between the water-repellant breathable board (188) and the assembly of plasterboards (193, 194), possibly without the support of said metal profile frame (189).

21. – The functional system for a cement mortar panel with prestressed
10 biaxial reinforcement of claim 16, **characterized in that** said layer of breathable foam mortar (189) is configured by materials of the group formed by cellulose fibers, rock wool, fiberglass and synthetic fibers.

22. – The functional system for a cement mortar panel with prestressed
15 biaxial reinforcement of claim 1, concretely an anti-seismic device, which is specially applicable in the case in which the prefabricated panels closing the structure (197) of a building are placed against said structure (197) by means of a plurality of fixing members formed by a threaded rod (200) which engages, at one end, in the threaded through hole (114) of a
20 versatile plug (198, 198A, 217) embedded in said panel (196, 216) and is fixed to said panel (196, 216) by a nut (201, 220), at the same time as, at the other end, there is fixed thereto by corresponding nuts (202, 221) and locknuts (203, 222) a polygonal seating plate (209, 223) which fits at one of the edges thereof in a channel (210, 224) of a support profile (211, 225)
25 fixedly attached to said building structure (197), **characterized in that** it consists of locking means (212, 226) which removably stabilizes the seating of said polygonal seating plate (209, 223) in the channel (210, 224) of said support profile (211, 225) fixedly attached to said building structure (197).

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23. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 22, **characterized in that** said locking means (212) is formed by a retaining profile (213) which being fixedly and

removably attached in cantilever fashion to the building structure, has at the free end thereof a resiliently flexible inverted channel (214) for engaging one side of said polygonal seating plate (209) opposite to the side with which it is engaged in said channel (210) of the support profile
5 fixedly attached to said building structure (197) to stabilize the seating of said polygonal seating plate (209).

24. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 22, **characterized in that** said polygonal
10 seating plate (209) has abutting the face thereof facing the support structure (197) and suspended on the upper edge thereof astride said upper edge, locking means (226) formed by a metal plate piece (227) having, in the centre thereof, a window (228) through which there freely extends the fixing locknut (222) of said polygonal seating plate (209) and a
15 lower end which is bent into a perpendicular tab (229) which, on the one hand, seats on the upper face of a horizontal portion of the angular support profile (225) fixedly attached to said structure (197) and, on the other hand, is fixedly attached through said horizontal portion of the angular support profile (225) to a rigidifying profile (232) for said profile (225) which is
20 snugly fitted between the channel of said angular support profile (225) and a vertical portion of said profile (225) fixedly attached to the support structure (197).

25. – The functional system for a cement mortar panel with prestressed
25 biaxial reinforcement of claim 24, **characterized in that** the window (228) of said metal sheet piece (227) has dimensions such allowing said positional fixing locknut (222) of said polygonal seating plate (223) to project therethrough and the rotation of the locknut (222) when handling it to fix the position of said polygonal seating plate (223).

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26. – The functional system for a cement mortar panel with prestressed biaxial reinforcement of claim 24, **characterized in that** the rigidifying profile (232) has a rectangular rightangled tubular configuration and has a

length such that allows an indefinite length of the angular support profile (225) of the group formed by the whole of said length or a plurality of regularly spaced apart independent portions thereof to be occupied.