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(54) **FORMWORK ELEMENT**

(57) The invention relates to a formwork element which is specially designed for the construction of walls and similar. The formwork element comprises a hollow rectangular prismatic block or body (1') which is open at the lower and upper faces thereof and which is made from expanded polystyrene foam or another similar material. The edges of the aforementioned faces are provided with numerous small rectangular prismatic projections (3) in the form of cubes which define therebetween similarly-configured housings (4), the projections on the

upper face being offset in relation to those on the lower face. In this way, when the bodies are stacked such that they are offset lengthways, a tongue-and-groove connection is created therebetween, ensuring optimum stability. Numerous bodies (1') can be stacked to produce a level chamber which is closed at the inner and outer faces thereof and which can receive a mass of reinforced concrete forming the resistant element of the wall. According to the invention, the vertical reinforcements pass through openings (6) in the smaller lateral walls (5) thereof.

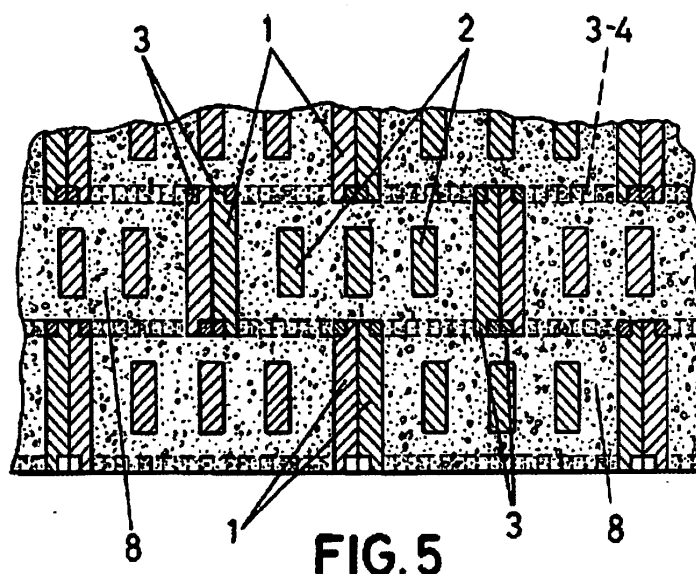


FIG. 5

Description

Purpose of the invention

[0001] This invention refers to a formwork element which is especially designed for the construction of both interior and exterior walls, and for both one-storey and multi-storey buildings.

[0002] Said element allows an easy and fast assembly, which can be cut in order to adequate its dimensions to certain practical requirements.

[0003] The formwork element is designed for the obtention of concrete walls, appropriately reinforced, wherein the pipes or ducts for various services are embedded, with the special feature that said element gives to the walls a high insulation coefficient, both thermal and acoustic.

[0004] The formwork element is useful for industrial buildings, houses, condominiums, garages, swimming pools, cold chambers, etc.

Background of the invention

[0005] As is well-known, within the wide range of possibilities that present-day technology offers for the construction of walls, one solution consists of making said walls with reinforced concrete, pouring the concrete "in situ", after shaping the appropriate formwork.

[0006] In general, these formworks consist of metal plates, appropriately rigidified, which are interconnected forming two parallel vertical planes, appropriately connected by means of spacers, in such a way that once the formwork has been duly configured, the required metal frameworks are introduced therein and it is finally concreted.

[0007] This solution makes it possible the obtention of walls with a high solidity, which nevertheless exhibit various problems. In this regard:

- In order for the building or construction in question to be solidly finished, its various walls must be linked together by means of said metal frameworks and the concrete must be poured only once, which requires the use of a large formwork surface, i.e. a large number of reinforced metal plates, which entails considerable investment costs and the handling of large amounts of very heavy material.
- In most cases the formwork plates, which have a modular structure, are not suited to the required practical measures, so that the formwork must be completed either by means of custom-made plates, with the ensuing cost increase, or else by means of fortuitous lower-cost solutions, such as, for example, custom-cut wood planks, which adversely affect the structural resistance of the entire formwork, as well as the construction's aesthetic finishing.
- Even though these formworks make it possible to incorporate all types of ducts and pipes, such as,

for example, wastewater drainage ducts, sanitary water pipes, electric conduits, etc., significant problems arise in connecting these conduits with the exterior, since the formworks' high cost does not make it possible to create orifices therein in order to access said conduits.

- Even though the obtained wall offers high mechanic resistance, it has a very low insulation coefficient, both from the thermal point of view and the acoustic point of view.

Description of the invention

[0008] The formwork element proposed by the invention resolves in a fully satisfactory manner the aforementioned problems, since it constitutes a lost element designed to definitively form part of the wall obtained thereby, and, due to its own nature, it incorporates its thermal and acoustic insulation characteristics to said wall. Moreover, it is easily frangible or capable of being cut in order to suit its dimensions to the practical requirements of each case and to create orifices or windows therein in order to access the interior ducts.

[0009] To this end, and more specifically, said formwork element is materialised in a body that is essentially rectangular-prismatic, made of expanded polystyrene foam or other material with similar characteristics. It is a hollow body that is open at its faces and provided with internal rigidifying partitions, with the special feature that said body incorporates a plurality of small projections, also rectangular-prismatic, on the periphery of said faces, with a staggered distribution, which define equally-configured housings between one another, so that the projections or cubes on the upper face are opposite the housings on the lower face, which makes it possible to achieve a high solid tongue-and-groove connection between them upon superimposition of the bodies.

[0010] These rectangular-prismatic elements or bodies exhibit a length that is significantly greater than the height and width, so that walls may be constructed in rows, in a manner similar to conventional construction blocks or bricks, the bodies in each row remaining longitudinally offset with respect to the rows located immediately above and below, so that, in turn, these bodies maintain a staggered distribution on the wall which ensures a perfect relative stability for all of them, and which, moreover, allows for "keying" between the walls on the corners or "T" connections.

[0011] In any case, the union of the appropriate number of formwork elements, in a co-planar arrangement, and according to the specific requirements of each case, entails obtaining two parallel formwork surfaces, which are perfectly enclosed and continuous, and between which an interior concrete-receiving housing is created, which may be poured therein by any conventional method and which ensures that the mass of concrete extends in one piece to the entire wall or walls of the concerned building or construction, where it is also

possible, moreover, to introduce vertical metal frameworks therein which jointly emerge from the foundations.

[0012] When horizontal frameworks are also needed, the blocks in certain alignments will be provided with wide indentations on the smaller side walls through which said frameworks will pass.

[0013] The nature of the material comprising these formwork elements, which, as already mentioned, is expanded polystyrene foam, incorporates its thermal and acoustic insulation characteristics to the enclosure, as well as being easy to cut, using a simple saw or any other appropriate tool, both for the production of finish parts or elements with non-standard dimensions and for the creation of orifices or windows on the larger walls for the passage of, or access to, ducts and pipes, if necessary. To this end, these elements incorporate grooves or marks on the side walls which facilitate the cutting.

Description of the drawings

[0014] In order to complement the description being made and to contribute to a better understanding of the characteristics of the invention, according to a preferred example of practical embodiment thereof, we attach, as integral part of said description, a set of drawings which, with an illustrative and non-limiting character, represent the following:

Figure 1.- It shows, according to a schematic perspective representation, a formwork element made in accordance with the object of this invention.

Figure 2.- It shows, by means of a representation similar to that of figure 1, another formwork element especially designed to allow implementation of horizontal metal frameworks on the wall that is to be produced.

Figure 3.- It shows, by means of a representation similar to the preceding figures, another formwork element with openings on one of its ends only, which may be used as a closure element where the horizontal framework ends.

Figure 4.- It shows, also by means of a perspective view, a partial detail of a wall made with formwork elements according to the invention, in a phase prior to the concreting phase.

Figure 5.- It shows, finally, a longitudinal section detail of an entirely finished wall.

Figure 6.- It shows another detail of the same wall, in this case in cross-section.

Preferred embodiment of the invention

[0015] In view of the above-mentioned figures, one can see how the formwork element proposed by the invention is constituted by a rectangular prismatic body (1), for instance, with external dimensions similar to those of a classic construction block, but with the special feature that it is entirely made of hollow, expanded polystyrene foam, open at both the upper and lower faces, and preferably provided with rigidifying interior and transverse partitions (2), whose height is significantly lower than that of the body itself (1).

[0016] These elements may be interconnected by tonguing-and-grooving, as shown in figure 2, for which purpose, on the perimeter of the upper and lower faces, and as an extension of the considerably thick perimeter wall, they exhibit a plurality of small rectangular-prismatic projections (3) in the form of die, which have a staggered distribution and which create housings (4) between one another, which formally and dimensionally coincide with the housings, but there is an offset between the upper and lower faces, so that, when the bodies (1) are stacked, the projections or die (3) of one remain opposite and finally embedded in the other's housings (4), in order to achieve the desired tongue-and-groove effect, which offers high solidity in the co-planar fixing between blocks.

[0017] The block may exhibit four side walls of the same height, as shown in figure 1, or else the smaller lateral walls (5) may be affected by wide indentations (6), as is the case with block (1') shown in figure 2, so that, while in the first case it is only possible to provide vertical metal frameworks, which pass through the modules or elements (1) interior cavities, in the second case, horizontal frameworks may also be provided, specifically located on the indentations (6).

[0018] These indentations (6) define longitudinal grooves on the wall for each row obtained by means of bodies (1') of this type, which naturally must be closed at the end, for which this purpose, the existence of bodies (1'') such as the one shown in figure 3 has been anticipated, with indentations (6) on only one of the smaller side walls (5), while the other one acts as a closure element, exhibiting a height that coincides with that of the larger side walls.

[0019] In any case, after the coupling between bodies or modules (1), (1'), (1''), and as shown in figures 4, 5, and 6, the larger walls of the bodies (1) create an integral enclosure which corresponds to the internal and external faces of the wall, forming a continuous chamber, closed at the lower end by the floor (7), which is undeformable through the smaller side walls (5) and the interior rigidifying partitions (2) of the prismatic bodies (1), (1'), (1''), a chamber which will subsequently be filled with a mass of concrete (8), which, together with the metal frameworks, grants the wall the appropriate structural rigidity, said mass of concrete (8), however, remaining completely insulated from both the exterior and

the interior of the wall, so that, despite its high degree of conductivity, it does not act as a thermal bridge, the larger side walls of the various bodies or modules (1), (1'), (1'') defining, respectively, an internal and external barrier to both thermal and acoustic transmission.

[0020] Prior to the pouring of the concrete in the hollow chamber of the formwork, ducts may be provided therein, such as the downpipe (9) shown in figure 4, electric conduits (10), etc., with side accesses (11) and (12) towards the internal or the external face of the wall, which are easily implemented on the formwork due to its own nature, since the expanded polystyrene foam may be easily cut with a saw or any appropriate cutting tool.

[0021] The wall will be completed with any exterior (13) or interior (14) coating, made of any adequate material, in order to provide it with any finishing, such as, for instance, face bricks, plaster, tiles, boarding, wallpaper, etc.

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Claims

1. Formwork element which, being especially designed for the obtention of reinforced concrete walls, is **characterised in that** it has a rectangular-prismatic (1) body, made of hollow, expanded polystyrene foam or other similar material, open at the upper and lower faces, provided with multiple small projections (3) on the periphery of said faces which have the form of die and a staggered distribution and which define equally formed housings (4) between one another, the projections on the upper face being offset with respect to those of the lower face, in order to achieve a multiple tongue-and-groove coupling upon superimposition of the bodies (1).
2. Formwork element, according to claim 1, **characterised in that** said prismatic body (1) has internal rigidifying partitions (2), preferably of a height substantially smaller than that of the body itself (1).
3. Formwork element, according to the preceding claims, **characterised in that** the prismatic body (1') incorporates wide indentations (6) on the edges of its smaller side walls (5), when said body (1') is designed to become a part of rows on the wall whereon it is necessary to create horizontal metal frameworks.
4. Formwork element, according to claim 3, **characterised in that** the prismatic bodies (1'') designed to occupy the end positions on said rows which receive the horizontal metal frameworks, exhibit indentations (6) on only one of the smaller side walls, while the other, the terminal one, is closed.

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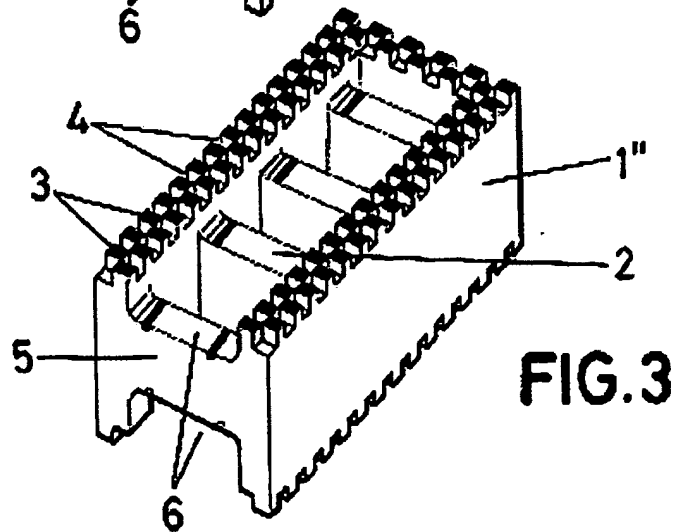
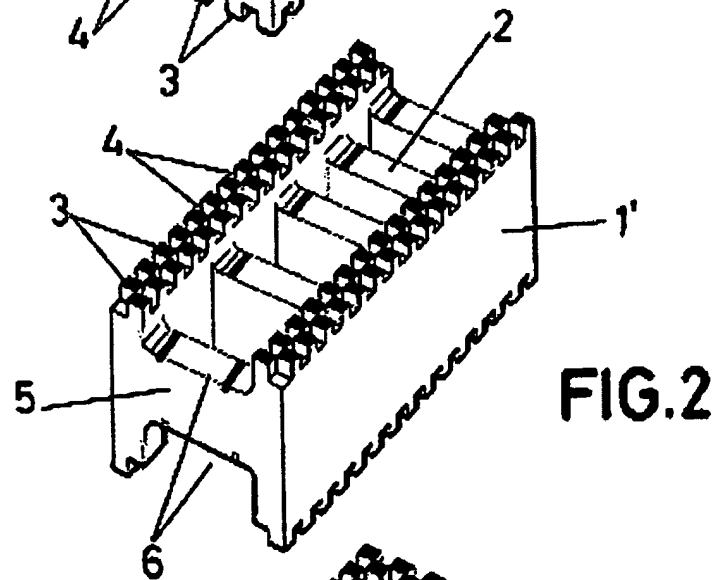
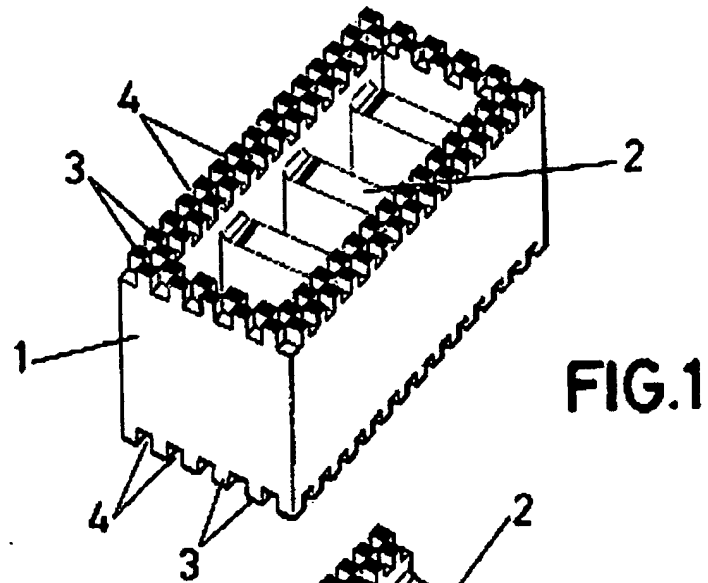
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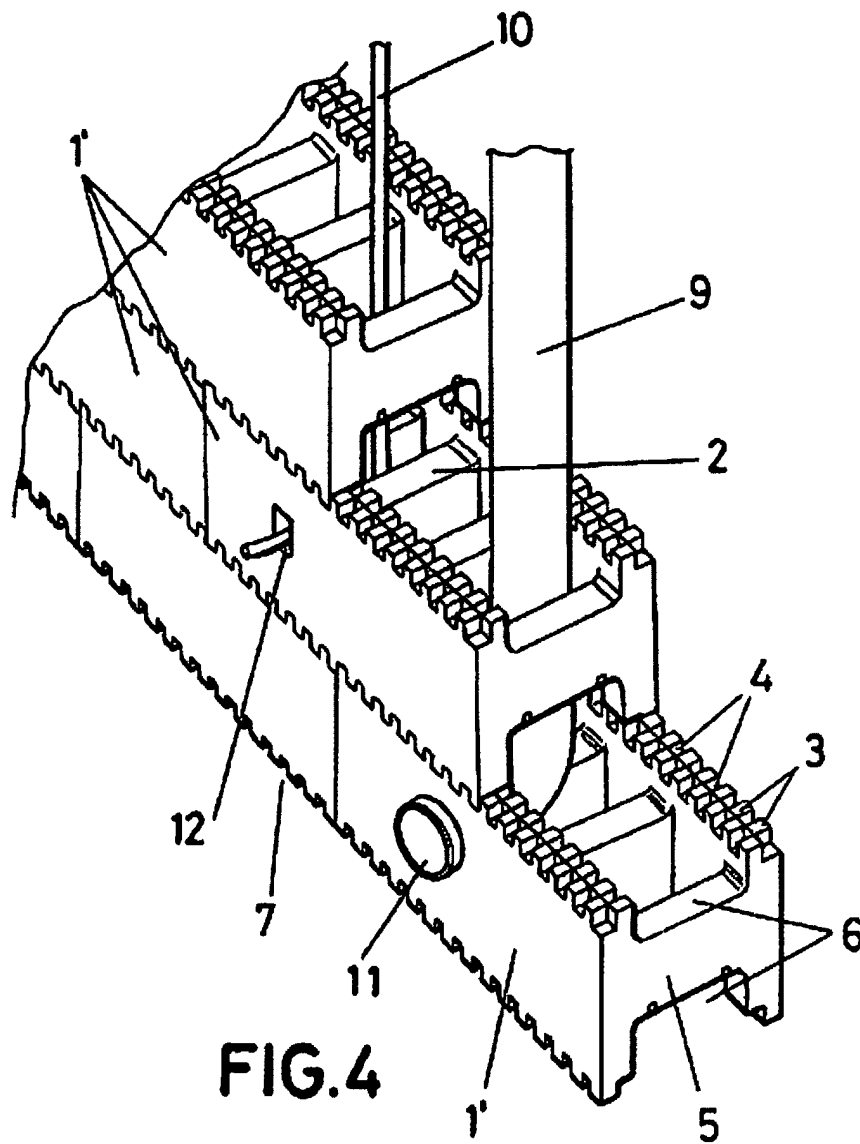
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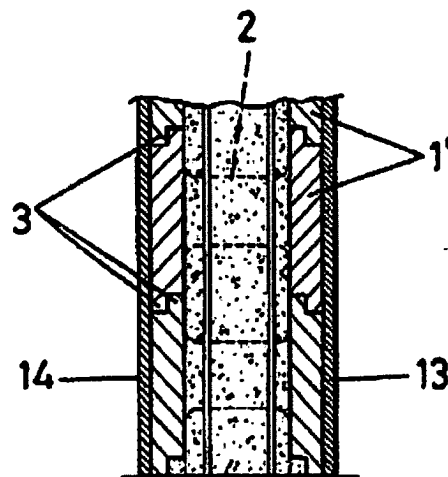
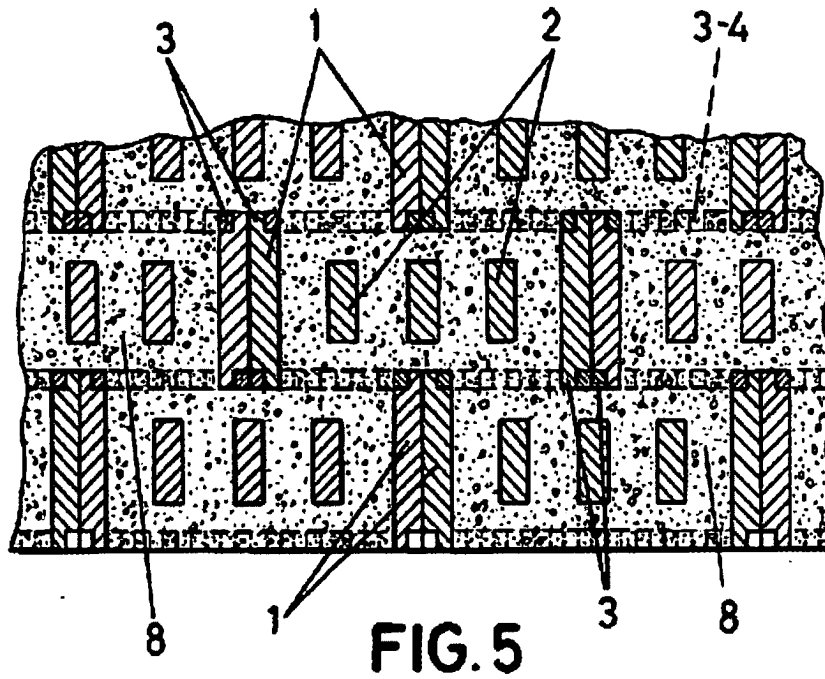
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5. Formwork element, according to the preceding claims, **characterised by** the fact that it constitutes a lost element, designed to indefinitely become a part of the corresponding wall, to which it confers the thermal and acoustic insulation characteristics derived from its own nature.

6. Formwork element, according to the preceding claims, **characterised by** the fact that it is capable of housing therein, in addition to the said vertical and horizontal frameworks, pipes and conduits for auxiliary services such as water, electricity, or other, which are laterally accessible by cutting the corresponding prismatic body's wall.







INTERNATIONAL SEARCH REPORT

International application No.

PCT/ES 03/00295

A. CLASSIFICATION OF SUBJECT MATTER		
IPC 7 E04B 2/26 , 2/86 , E04C1/40		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols)		
IPC 7 E04B , E04C		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)		
WPI , EPODOC, MISTRAL, PAJ		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5086600 A (HOLLAND et al.) 11.02.1992 , the whole document	1-6
Y	US 5428933 A (PHILIPPE) 04.07.1995, column 4, line s 38-67; figures 1-5.	1-6
A	US 5724782 A (RICE et al.) 10.03.1998, the whole document	1-6
A	US 5123222 A (GUARRIELLO et al.) 23.06.1992 , the whole document	1-5
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
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Date of the actual completion of the international search		Date of mailing of the international search report
29 July 2003 (29.07.03)		08 September 2003 (08.09.03)
Name and mailing address of the ISA/ S.P.T.O		Authorized officer
Facsimile No.		Telephone No.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/ES 03/00295

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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