HU000027723T2

(19) **HU**

(11) Lajstromszám: **E 027 723**

(13) **T2**

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SZÖVEGÉNEK FORDÍTÁSA

(21) Magyar ügyszám: **E 10 759687**
(22) A bejelentés napja: **2010. 08. 25.**

(96) Az európai bejelentés bejelentési száma:
EP 20100759687
(97) Az európai bejelentés közzétételi adatai:
EP 2578760 A1 **2013. 04. 10.**
(97) Az európai szabadalom megadásának meghirdetési adatai:
EP 2578760 B1 **2015. 12. 02.**

(51) Int. Cl.: ***E04B 13/48*** *(2006.01)*
B28B 7/22 *(2006.01)*
B28B 19/00 *(2006.01)*

(86) A nemzetközi (PCT) bejelentési szám:
PCT/ES 10/000306
(87) A nemzetközi közzétételi szám:
WO 11151475

(30) Elsőbbségi adatok:
201000706 **2010. 05. 31.** **ES**

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(54) **Eljárás kompakt modulok gyártására épülethez**

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 578 760 B1

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention of the grant of the patent:
02.12.2015 Bulletin 2015/49

(21) Application number: **10759687.6**

(22) Date of filing: **25.08.2010**

(51) Int Cl.:
E04B 1/348 *(2006.01)* ***B28B 7/22*** *(2006.01)*
B28B 19/00 *(2006.01)*

(86) International application number:
PCT/ES2010/000306

(87) International publication number:
WO 2011/151475 (08.12.2011 Gazette 2011/49)

(54) **PROCEDURE FOR MANUFACTURING OF COMPACT MODULES FOR CONSTRUCTION**
VERFAHREN ZUR HERSTELLUNG KOMPAKTER MODULE FÜR EINE KONSTRUKTION
PROCÉDÉ DE FABRICATION DE MODULES COMPACTS POUR LA CONSTRUCTION

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO SE SI SK SM TR
Designated Extension States:
BA ME RS

(30) Priority: **31.05.2010 ES 201000706**

(43) Date of publication of application:
10.04.2013 Bulletin 2013/15

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EP 2 578 760 B1

Printed by Jouve, 75001 PARIS (FR)

Description

OBJECT OF THE INVENTION

[0001] This invention relates to a new procedure for the manufacture of compact blocks, i.e. blocks formed by a cubicle to be used on their own or in combination with other similar blocks, in erecting a building of variable height.

[0002] The objective of the invention is to achieve 100% monolithic prismatic modules that do not require rigid floor fixing and that nullify any vibration or expansion, preventing the appearance of cracks and humidity; all at a surprisingly low cost and suitable for mass-production in its entirety.

[0003] Thus, the invention lies within the field of construction.

BACKGROUND OF THE INVENTION

[0004] Old, obsolete and costly construction processes for buildings based on a concrete foundation upon which stands a structure formed by columns and beams, enclosed at the top by a slab and laterally by bricks and other similar construction materials, are increasingly being replaced with pre-fabricated modules, usually made of reinforced concrete, which form prismatic-rectangular blocks with respective openings for doors, windows, etc., so that each module consists of reinforced concrete panels corresponding to each of its sides, factory-made, installable on the ground, specifically over an appropriate foundation, joined together at their edges usually with the help of mechanical means, such as screws, nuts or other things.

[0005] This multiple-part construction of the modules, as well as their attachment to the foundation, is inherently prone to expansion and vibrations, whereby cracks and humidity frequently appear on the modules.

[0006] Furthermore, this structuring does not preclude the need for subsequent coatings both internally and externally, as well as chamber formation for the passage of service ducts and for the introduction or spreading of insulation materials correspondingly to external wall surfaces.

[0007] In an attempt to overcome these problems, there are some known solutions wherein two, three, four or five sides of the prismatic block are joined together at their origin as a single piece, i.e. reducing the number of pieces forming the module and consequently the number of joints put between them, which only manages to solve the first of the above-mentioned problems in part, the second one remaining unchallenged.

[0008] The inventor is not aware of the existence of any other solutions in industry or in practice to achieve a completely monolithic state, i.e. where all six sides of the prismatic block are joined together as a single piece to provide the benefits listed above.

[0009] The Document FR 2 244 064 discloses all the features of the preamble of claim 1.

DESCRIPTION OF THE INVENTION

[0010] The manufacturing process of compact modules for use in construction proposed by the invention achieves this complete monolithic state, as mentioned above, as well as much lower manufacturing costs in comparison with any of the conventional construction systems.

[0011] More specifically, to achieve this, the process begins with a factory-made permanent formwork, which integrates all the lateral sides as well as the upper and lower slabs, corresponding to the inside of the desired prismatic cubicle space. This permanent formwork integrates both the cubicle's internal finishing materials and the appropriate hollows for doors, windows, etc., as well as orthogonal partitioning walls corresponding to these hollows, and with a width consistent with the thickness for the internal or external wall as a whole.

[0012] Once these s are hardened, the dimensions of which are restricted only by logical transportation limits, the formworks are stored within the factory itself, or where deemed most appropriate, until the time for their use.

[0013] At that time, the geometry of the module to be built is traced on the floor over a plated smooth simple platform, which may even be a properly compacted floor. This can be done in the factory or on the building-site.

[0014] The lower slab is provided on top of this platform in the appropriate position, with the assistance of supports that sufficiently separate the slab from the platform, according to the forecast total thickness of the lower slab.

[0015] We then proceed to provide the necessary walls comprising each module, which could simply consist of the perimetral walls, or one or several of the internal compartment partition walls, thus also holding on to the lower slab by means of high strength putty, and finally proceeding to place the upper slab.

[0016] Furthermore, all necessary installations are placed on the external side of this internal integral formwork, such as electricity, telephone, sanitation, drinking water, etc.

[0017] Subsequently and above these installations, i.e. externally to them, insulation is either placed or spread over those wall surfaces that require it.

[0018] Next, a surrounding reinforcement is provided, which affects all six sides of the formwork and is calculated according to the required strength.

[0019] Next, an external formwork is put in place. This is made of four lateral pieces, each substantially protruding over the adjacent piece at one of its edges, so that this external formwork can allow for slabs and walls of any size, by simply joining together the four overlapping lateral sides.

[0020] At the next operational phase, we proceed to fill the space between internal permanent formwork and the external recoverable formwork, with highly-fluid self-compacting concrete of high initial and final strengths, to

prevent segregation at the pouring stage and thereby obtaining a 100% monolithic state, the concrete pouring achieving the highest forecast level for the upper slab, i.e. a hollow rectangular prismatic block is obtained, made of reinforced concrete and a single-piece structure, whereby the module does not require rigid floor fixing and prevents any risk of vibration or expansion that could cause the appearance of cracks and humidity within the module.

[0021] After stripping the module, i.e. after removal of the external and recoverable formwork, the structural behaviour of the module is identical to that of a beam, providing sufficient stability and strength for use at one level, or for piling in stacks of ten, twelve, or even more, depending on the thickness of its walls, by joining together the modules with the corresponding anchors for both vertical and horizontal handling.

[0022] All of this, in unison, achieves not only excellent quality, but also a much lower manufacturing cost than previously conceived, owing to the system's simplicity, while providing very high versatility for any industry, whether through automation or simply by mechanisation, being affordable for all investors, regardless of their location or financial ability, and with the consequent development of industrial production of decent, safe and affordable housing for any given situation, besides remaining open to a plethora of possibilities with respect to quality, given its adaptation to different finishes of and installations to the internal and permanent formwork.

DESCRIPTION OF THE DRAWINGS

[0023] In order to supplement the description provided and with the purpose of better explaining the characteristics of the invention, the following preferred embodiment of the invention is given as an example only, without being limitative in any way, by reference to the accompanying drawings, in which:

Figure 1 shows a disassembled representation in the factory of the result obtained in the first phase of the procedure, i.e. the six integral parts of the internal permanent formwork;

Figures 2 and 3 show the respective disassembled representation in the perspective of the structure presented in the preceding drawing but with the different parts exploded in their definitive position in relation to the assembly;

Figure 4 shows the structure of the preceding figures duly assembled, i.e. the completely finished internal permanent formwork

Figure 5 shows a representation similar to that of the preceding figure, but where the service installations have been added to the internal permanent formwork;

Figure 6 shows the next operative phase of the procedure when the insulation material has been deposited on the structure shown in Figure 5;

Figure 7 shows the result of the next operative phase of the procedure in which the structure from Figure 6 appears covered with a mesh framework;

Figure 8 shows the structure of the preceding figure in the intermediate phase of installation of the exterior recyclable formwork;

Figure 9 shows the result after the complete implantation of the external formwork;

Figure 10 shows the structure of Figure 9 at the end of the phase of filling up with concrete of the space between the two formworks - external and internal.

Figure 11 shows, finally, the end result of the procedure after the removal of the external recoverable formwork.

PREFERRED EMBODIMENT OF THE INVENTION

[0024] After observing the reviewed figures, and in particular figures 1, 2 and 3, it can be seen how in the first phase of the procedure, at a factory level, the constituent parts of the internal permanent formwork are obtained, namely a base element (1) corresponding to the floor structure, a similar element (2) for the ceiling structure, and in this case four elements (3, 4, 5 and 6) corresponding to the lateral walls of the module, which optionally can be complemented with internal compartment elements not represented in the drawings.

[0025] These elements, in particular the lateral elements (3, 4, 5 and 6), incorporate openings (7) corresponding formally and dimensionally to doors and windows having external perimetric extensions, with dimensions coinciding with the planned thickness of the walls.

[0026] As was mentioned before, this permanent formwork (1, 3, 4, 5 and 6) is structured in such a way so that its internal face constitutes the final internal face as seen in the structure of the module.

[0027] In the next operative phase, the fixing of these elements is proceeded with and, in order to implement the rectangular prismatic block of six faces shown in Figure 4, as was pointed out above, high-resistance putty can be used for this purpose, to support the final concrete structure.

[0028] Going back again to the bottom platform (1), it must be pointed out that it incorporates in its bottom face buffers (9) depending on the distancing elements at the level of the permanent formwork in its entirety with respect to the floor and with respect to a platform that had been previously established in it. For its part, the element (2) corresponding to the ceiling structure can be provided, for example, with a rectangular window (10) for the

exit of smoke or for some other purpose, extended into an ascending collar with the same height as the one planned for the said ceiling structure.

[0029] After obtaining the internal permanent formwork, fixing externally to the same of the service installations of the module is proceeded with, such as, for example, in the present case and as shown in Figure 5, the electrical installation (11).

[0030] In a next operative phase, as shown in Figure 6 and also externally, depositing the insulating material (12) on those faces of the formwork follows next, insofar as is necessary, namely that corresponding to the exterior of the dwelling.

[0031] Next establishing a framework over the entire perimeter of the structure shown in Figure 6 is proceeded with, a framework (13) adequately calculated, based on a steel rack with not a very large cross section but sufficient to achieve the normally required objectives with a diameter for the same of eight millimetres.

[0032] Next and as shown in figures 8 and 9, an external recyclable formwork is mounted over the structure from the preceding figure, consisting of four vertical elements (14), each one of which is overlapping one of the vertical edges of the adjacent one, i.e. each of the elements of the formwork (14) is sticking out substantially with one of its ends with respect to the one it overlaps, which permits a change in the relative position between these four elements of the formwork (14) permitting in turn to vary as desired the distance between the exterior recyclable formwork and the internal permanent formwork, or - which is the same - the possibility to adjust as desired the thickness of the walls of the dwelling, whereas the height of the elements of the external formwork is considerably larger than the height of the internal formwork, including the buffers (9) of the latter in order to attain the desired width without anything more than filling with concrete up to the appropriate level.

[0033] After mounting the external formwork (14), it defines, along with the internal formwork and its accessories, a perimetric chamber (15) communicating directly with the one defined by the buffers (9) between them and the girder, which is filled with liquid concrete, as was pointed out above, and which exceeds with respect to the lower face of the formwork by an amount that is adequate to forming - also with the character of a single element - the ceiling structure of the module.

[0034] The module concludes with the removal of the recyclable external formwork (14), with the module receiving the configuration represented in Figure 11 or any other that is considered convenient as regards the number, the configuration and the location of the openings for doors and windows.

Claims

1. Procedure for the manufacture of compact modules for the construction of rectangular prismatic modules of reinforced concrete with openings corresponding to doors and windows the following operative phases being established in it:

   - Construction in the factory of an internal formwork based on at least six constituent elements consisting of a bottom base (1), a top base (2) and four lateral walls (3, 4, 5 and 6).
   - Mounting the integral elements of the said internal formwork, configuring a rectangular prismatic block in which the different elements are fixed between each other.
   - Mounting an external structured formwork consisting of four elements (14), each one of them overlapping with one of its ends the adjacent element, so that its distance from the internal formwork is adjustable as desired, supporting these elements of the recoverable external formwork on the floor, or on the horizontal platform established on it and sticking out, substantially with respect to the said internal permanent formwork with its top edge.
   - Filling the perimetrical space defined between the two formworks with liquid concrete.
   - After the concrete hardens, the recyclable external formwork is removed.

   The procedure being **characterised in that**:

   a) The internal formwork is a permanent formwork.
   b) The elements of the internal permanent formwork are fixed between each other by means of high-resistance putty supporting the said prismatic block directly on the ground or on a horizontal platform, by means of the distancing elements in the bottom face of the also bottom element.
   c) Collocation on the outside face of the internal permanent formwork of the necessary electrical, telephone, drainage, plumbing and other installations.
   d) Collocation or depositing of the insulation material on the outside of the preceding structure on the external walls that require it.
   e) Collocation also on the outside of the internal permanent formwork of a duly calculated protective framework.
   f) The liquid concrete fills up also the space defined between the internal formwork and the ground, as well as the area above the said internal formwork to configure a superior structure.

2. Procedure for manufacturing compact modules for the construction, according to Claim 1, **characterised by** being in the operative phase of the preparation of the internal permanent formwork materials

which determine the internal permanent structure of the dwelling module are used.

3. Procedure for manufacturing compact modules for the construction, according to the preceding claims, **characterised in that** the internal permanent formwork incorporates, in correspondence with the openings (7) for doors, windows and other similar elements, external partition walls (8) with a thickness coinciding with the thickness forecast for the walls of the module.

Patentansprüche

1. Verfahren zur Herstellung kompakter quaderförmiger Gebäudemodule aus Stahlbeton mit Öffnungen für Türen und Fenster basierend auf einer verlorenen Innenschalung mit mindestens sechs Komponenten, Bodenplatte (1), Deckenplalle (2) und vier Seitenwände (3, 4, 5, 6), welche im Rahmen einer Konstruklionsphase im Werk montiert wird; Phase zur Montage der integralen Bestandteile der verlorenen Innenschalung zu einem quaderförmigen Modul, das direkt auf dem Boden bzw. einer horizontalen Fläche aufgesetzt wird, Phase zur Anbringung einer Außenschalung über der erwähnten Innenschalung, Phase zum Verfüllen des umlaufenden Freiraums zwischen den beiden Schalungen mit sehr fließfähigem, selbstverdichtendem Beton, abschließende Phase zur Entfernung der abnehmbaren Außenschalung nach abgeschlossener Aushärtung des Belons. Das Verfahren ist **dadurch gekennzeichnet**, dase die Montage der verlorenen Innenschalung Im Werk erfolgt, wobei die verschiedenen Elemente untereinander mittels haftstarker Spachtelmasse so verbunden werden, dass das fertige quaderförmige Modul mit den an den Rändern der Unterseite der Bodenplatte (1) befindlichen Fußelementen (9) direkt auf dem Boden bzw. einer horizontalen Fläche aufgesetzt werden kann, wonach an der Außenseite der montierten Innenschalung alle erforderlichen Installationen, z. B. elektrische Leitungen, Telefonleitungen. Wasser- und Abwasserleitungen sowie andere Rohrleitungen und Installationen, angebracht und dann die zu dämmenden Außenwände mit dem entsprechenden Dämmmaterial versehen werden können. Danach wird eine Außenschalung bestehend aus vier Seitenteilen (14) angebracht, wobei an den Ecken jeweils das eine Seitenteil Ober das andere Seitenteil hinausragt, um eine Nachregulierung des Abstands zwischen Außen- und Innenschalung zu ermöglichen. Die wiederverwendbare Außenschalung wird direkt auf dem Boden bzw. der horizontalen Fläche aufgesetzt und daran befestigt und muss mit der Oberkante soweit über die Innenschalung hinausragen, dass beim Verfüllen des umlaufenden Freiraums zwischen den beiden Schalungen mit flüssigem Beton auch der Raum zwischen der Innenschalung und dem Boden sowie der Bereich über der Innenschalung gut verfüllt werden und ein qualitativ hochwerliger Baukörper entsteht.

2. Verfahren zur Herstellung kompakter Gebäudemodule gemäß Anspruch 1, **dadurch gekennzeichnet, dass** bei der Vorbereilung der verlorenen Innenschalung Materialien verwendet werden, die bereits der dauerhaften Innenstruktur des zukünftigen Wohnraums enisprechen.

3. Verfahren zur Herstellung kompakler Gebäudemodule gemäß den vorausgehenden Ansprüchen, **dadurch gekennzeichnet, dass** die verlorene Innenschalung an den Öffnungen (7) für Türen, Fenster und ähnliche Elemente mit Abschlussplatten (8) versehen ist, die in ihrer Breite der vorgesehenen Wandstärke des Moduls entsprechen.

Revendications

1. Procédure de fabrication de modules compacts pour la construction, en particulier, des modules rectangulaires parallélépipédiques de béton armé avec des ouvertures correspondantes à portes et fenêtres, étant du type de ceux qui comprennent une phase de construction à l'usine d'un coffrage interne permanent sur la base d'au moins six éléments constitutifs une base inférieure (1), une base supérieure (2) et quatre parols latérales (3, 4, 5 et 6), une phase de fixation des éléments solidaires dudit coffrage permanent, la configuration d'un bloc prismatique rectangulaire, supportant ledit bloc prismatique directement sur le sol ou sur une plateforme horizontale, une phase dans laquelle un coffrage externe est ajouté au coffrage décrit ci-dessus, une phase de remplissage de l'espace périphérique existant entre les deux coffrages par du béton auto-compactant hautement fluide, et une phase finale, dans laquelle, après le durcissement du béton, le coffrage externe et récupérable est éliminé. Ce coffrage est **caractérisé en ce que** dans la phase de la construction du coffrage permanent en usine, par les différents éléments sont fixés entre eux au moyen de mastic à haute résistance, de sorte qu'une fois le bloc prismatique est obtenu, celui-ci est supporté directement sur le sol ou sur une plateforme horizontale au moyen des éléments de support d'écartement (9) situés dans la face Inférieure de la base inférieure (1), tandis que sur la face extérieure de ce coffrage interne permanent, les Installations électriques, téléphoniques, de drainage, et d'autres installations de plomberie nécessaires sont installées, en mettant en place ensuite ou en déposant le matériau d'isolation à l'extérieur de la structure précédente

sur les parois extérieures qui le nécessitent. Par la suite, un coffrage externe, dont la structure est quatre pièces latérales (14), chacune sensiblement en saillie au-dessus de la pièce adjacente à une de ses bords, de sorte que leur distance par rapport au coffrage interne peut être régulée à volonté, ces éléments de support du coffrage externe et recyclable sur le sol ou sur une plateforme horizontale montée sur le même et faisant saillie sensiblement à son bord supérieur par rapport à l'intérieur dudit coffrage permanent, de sorte que dans la phase de remplissage de l'espace périmétrique existant entre les deux coffrages avec béton liquide, l'espace existant entre le coffrage interne et le sol est aussi rempli, ainsi que la zone au-dessus dudit coffrage interne, configurant ainsi une structure supérieure.

2. Procédure pour la fabrication de modules compacts pour la construction, selon la revendication 1, caractérisée en étant dans la phase opératoire de la préparation des matériaux de coffrage internes permanents, qui déterminent la structure interne permanente de l'habitation, sont utilisés.

3. Procédure pour la fabrication de modules compacts pour la construction, selon les revendication précédentes, **caractérisée en ce que** le coffrage interne permanent comporte, en correspondance avec les ouvertures (7) pour portes, fenêtres et autres éléments similaires, de cloisons externes (8) avec une épaisseur qui coïncide avec l'épaisseur de prévision pour les parois du module.

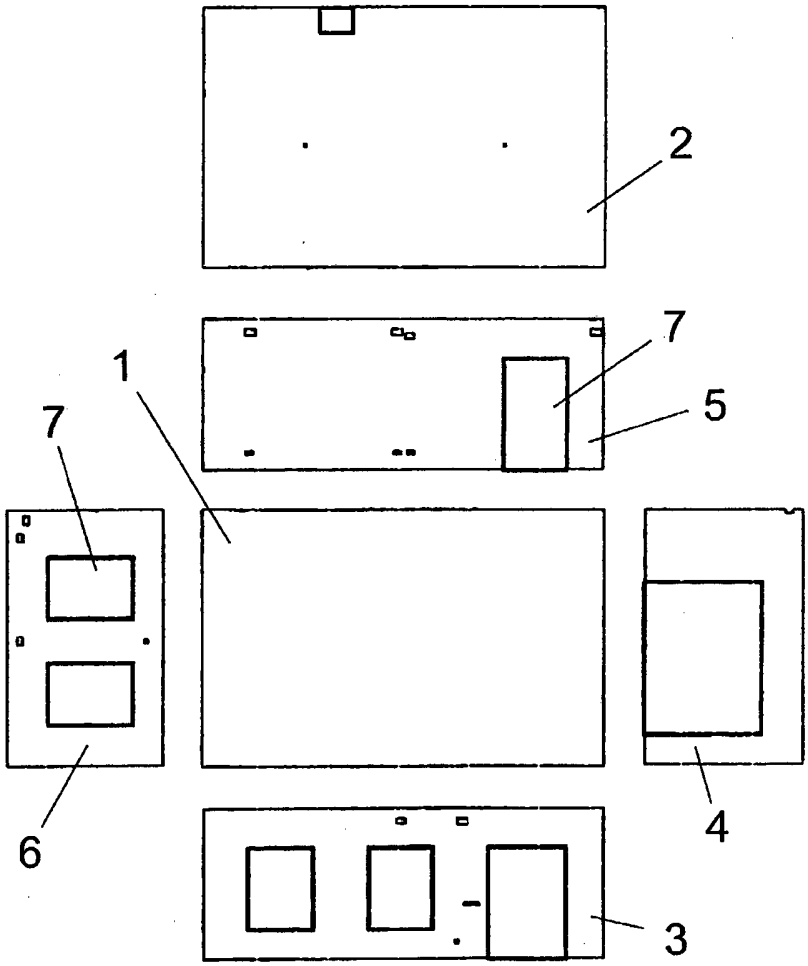

FIG. 1

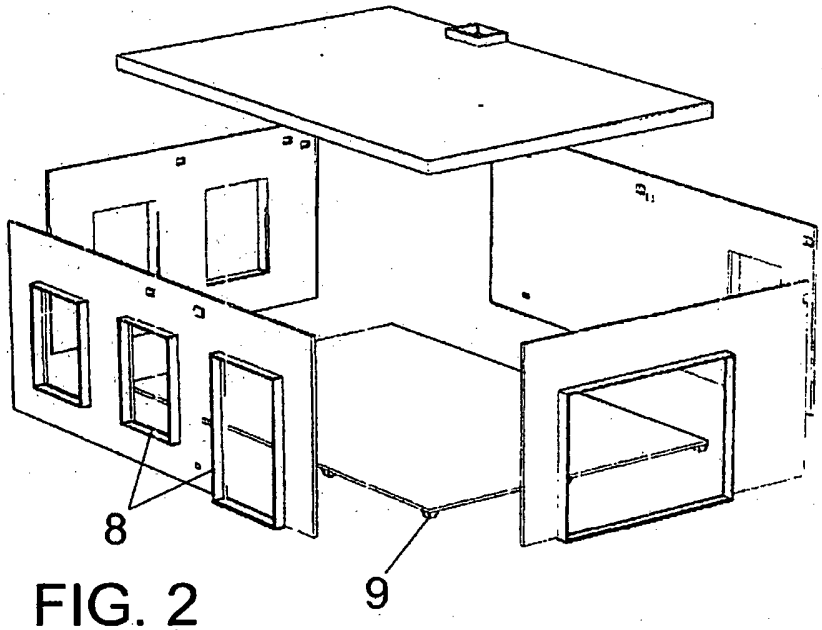

FIG. 2

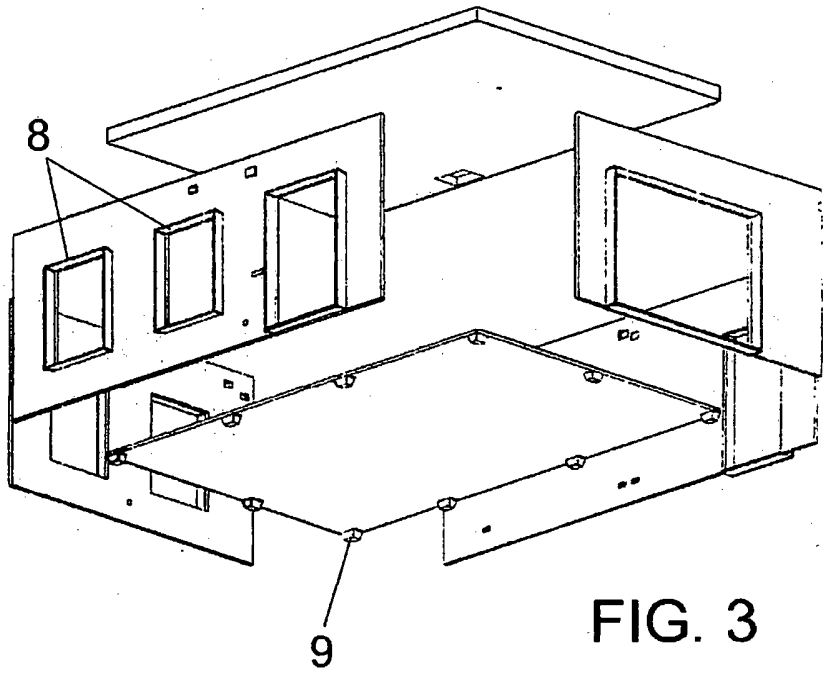

FIG. 3

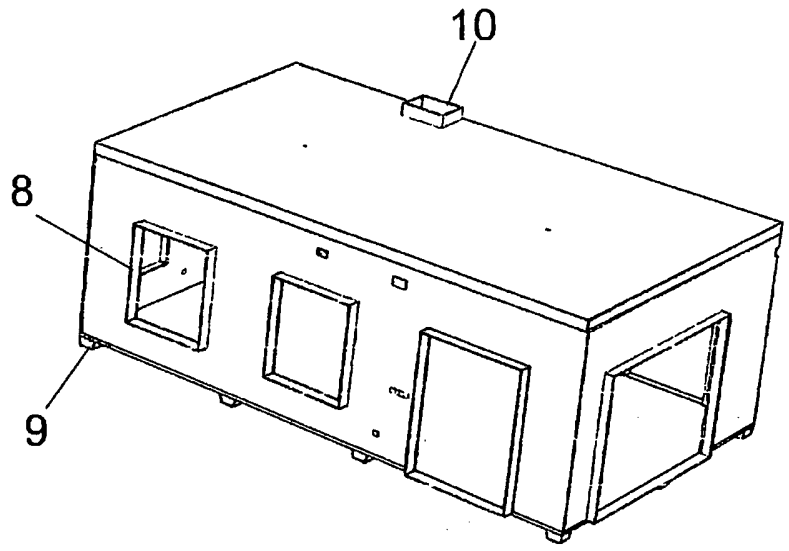

FIG. 4

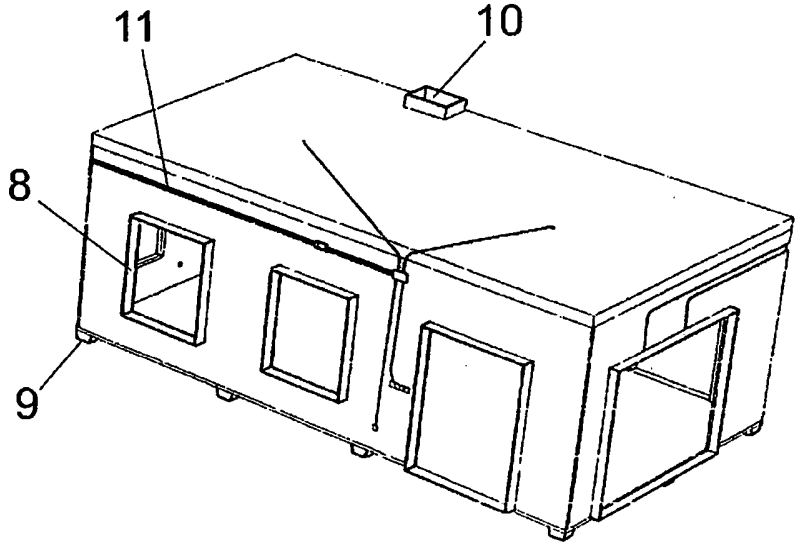

FIG. 5

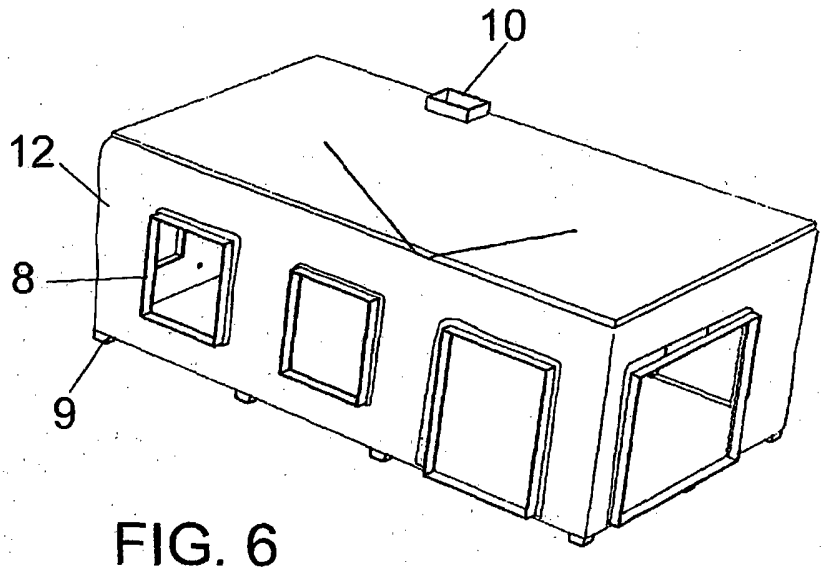

FIG. 6

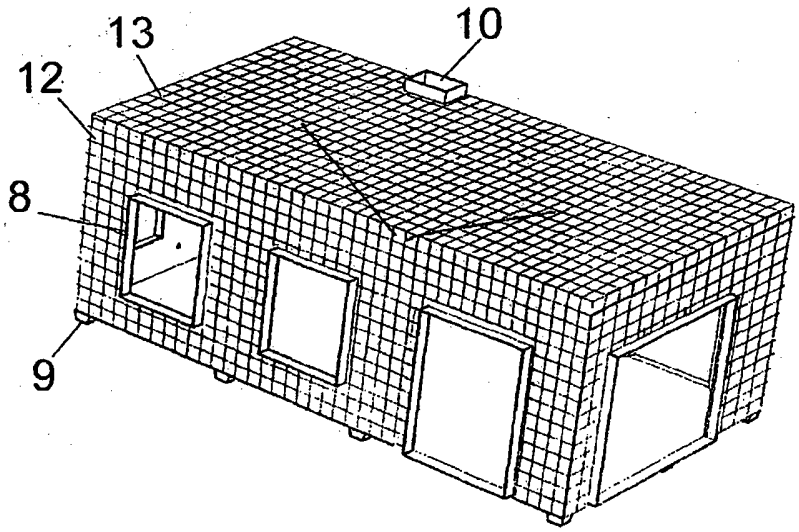

FIG. 7

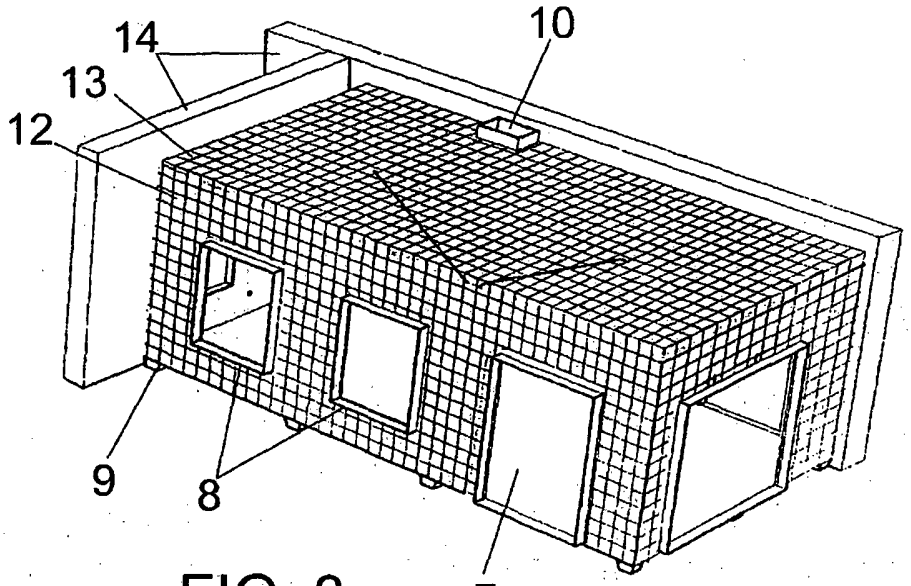

FIG. 8

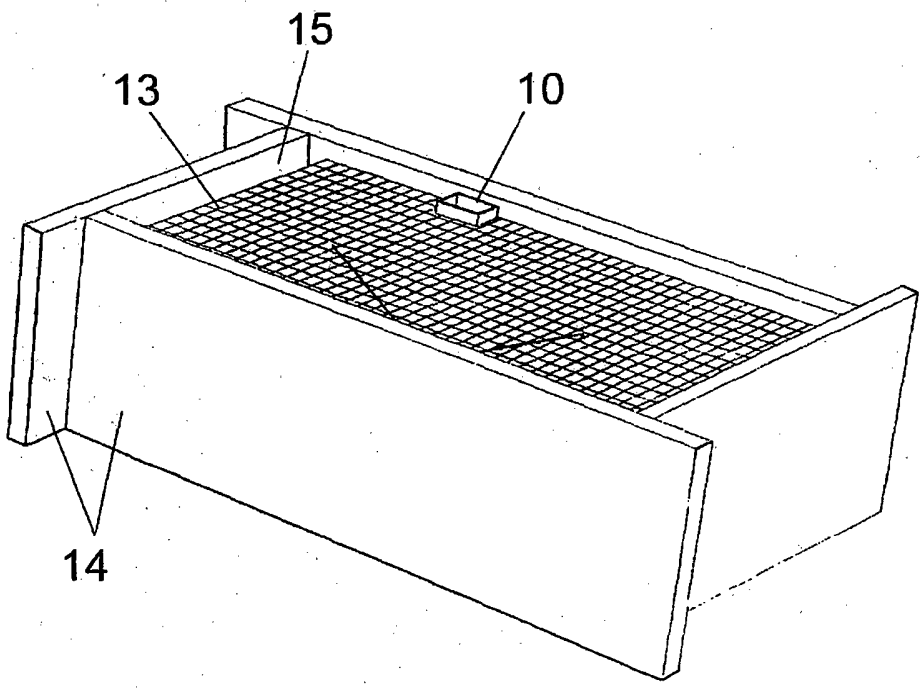

FIG. 9

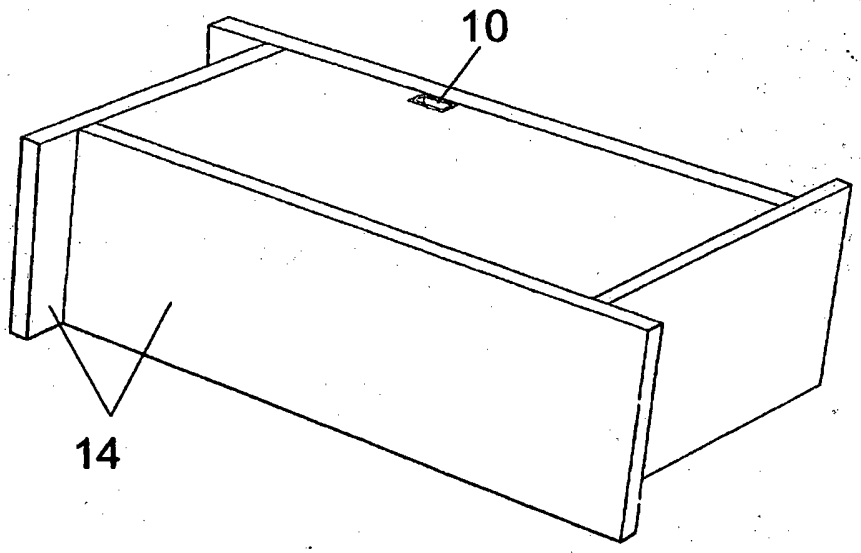

FIG. 10

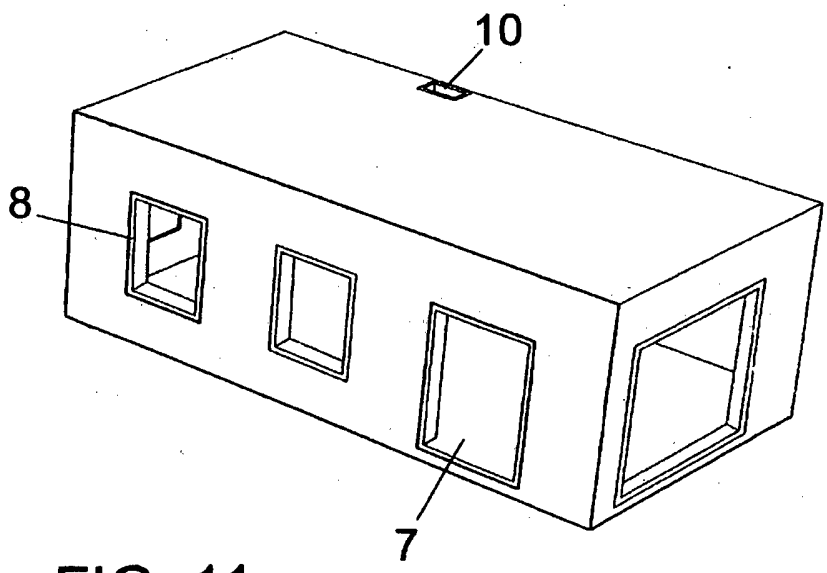

FIG. 11

REFERENCES CITED IN THE DESCRIPTION

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EP 2 578 760

16-48-HU

Eljárás kompakt modulok gyártására épülethez

Szabadalmi igénypontok

1. Eljárás kompakt modulok gyártására derékszögű hasáb-alakú, ajtó és ablaknyílásokat tartalmazó vasbeton épületmodulok előállításához, amely a következő műveleti lépéseket tartalmazza:

- legalább hat komponenst, nevezetesen padlólemezt (1), födémlemezt (2), valamint négy oldalfalat (3,4,5és 6) tartalmazó elvesző belső zsaluzat összeállítása a gyártóüzemben;
- az elvesző belső zsaluzat lényeges elemeinek összeszerelése egy derékszögű hasáb alakú modullá, illetve blokká, amely művelet során a különféle elemek egymáshoz vannak rögzítve;
- egy négy elemet (14) tartalmazó külső zsaluzat szerelése, amely elemek mindegyike az egyik végével átfedi a szomszédos elemet, úgyhogy a távolsága az elvesző zsaluzattól kívánság szerint állítható, alátámasztva illetve megtartva a visszanyerhető külső zsaluzat elemeit a padlón, vagy az azon létrehozott vagy lényegében az elvesző belső zsaluzathoz viszonyítva a felső peremével abból kiálló vízszintes felületen,
- a két zsaluzat közötti kerület menti tér kitöltése folyékony betonnal;
- a beton megszilárdulását követően az újrafelhasználható külső zsaluzat eltávolítása.

Az eljárásra jellemző, hogy

a) a belső zsaluzat elvesző illetve bentmaradó zsaluzat;

b) a belső elvesző zsaluzat elemei nagy ellenállóképességű, masszával vannak egymáshoz rögzítve, megtámasztva illetve megtartva a derékszögű hasáb-alakú blokkokat közvetlenül az aljzaton vagy egy vízszintes padozaton, a padlóelem alsó felületében levő távtartó elemek segítségével;

c) a szükséges elektromos-, telefon-, víz- és szennyvíz-, kábel- és más installációs vezetékek elhelyezése a belső elvesző zsaluzat külső felületén;

d) a szigetelő anyag elhelyezése vagy rétegként történő felhordása az előző szerkezet külső oldalán, azokon a külső falakon ahol erre szükség van;
e) egy megfelelően kiszámított protektív keretszerkezet elhelyezése a belső elvesző zsaluzat külső oldalán;
f) a folyékony beton kitölti a belső elvesző zsaluzat és az aljzat közötti teret, valamint a belső elvesző zsaluzat feletti teret, miáltal egy kiváló szerkezet jön létre.

2. Az 1. igénypont szerinti eljárás kompakt modulok előállítására a konstrukcióhoz, illetve épitményhez, azzal jellemezve, hogy a belső elvesző zsaluzat elkészitésének az operatív fázisában olyan anyagokat használunk, amelyek a térelem modul belső elvesző struktúráját meghatározzák.

3. Az előbbi igénypontok bármelyike szerinti eljárás kompakt modulok előállítására a konstrukcióhoz, illetve épitményhez azzal jellemezve, hogy a belső elvesző zsaluzat az ajtók, ablakok és hasonló elemek számára előirányzott nyilásokhoz (7) előirányzott külső választófalakkal (8) van ellátva, amelyek vastagsága egybeesik a modul falvastagságával.