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(54) **Title**: A MODULAR ASSEMBLY FOR THE CONSTRUCTION OF INSULATED BUILDING STRUCTURES

(57) **Abstract**: The present invention relates to a modular assembly comprising at least two different building blocks for the realization of insulated building structures.

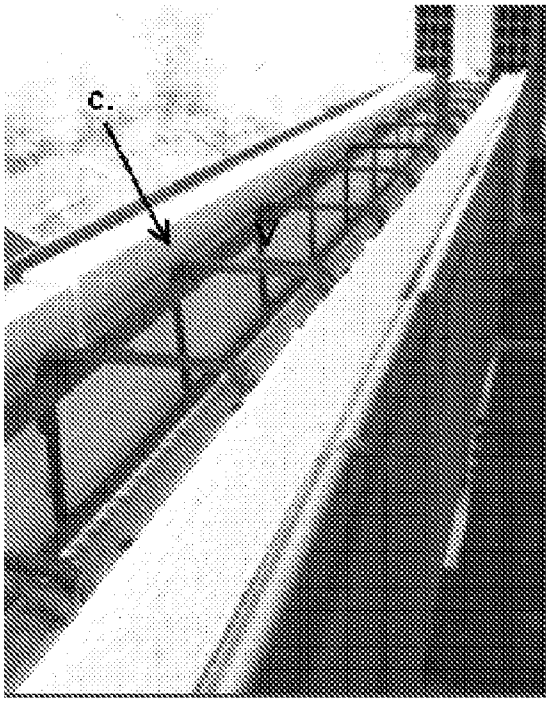


Fig. 7

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A MODULAR ASSEMBLY FOR THE CONSTRUCTION OF INSULATED BUILDING STRUCTURES

DESCRIPTION

FIELD OF THE INVENTION

The present invention relates to a modular assembly comprising at least two different building blocks for the construction of insulated building structures.

STATE OF THE PRIOR ART

Thermal, acoustic or thermoacoustic insulation of structures for dwelling, working, playing, sporting use, etc., or for storage, has always been an objective for a better life quality. In particular, in the modern age in which ever-increasing attention is devoted to energy conservation for reaching ideal temperatures in the environment of interest, and to stress-causing factors, such as noise, insulation of the above-indicated structures is increasingly in demand and sought-after by users.

Various insulation systems are known, among which also building blocks of walls, having an internal insulating body attached to brick elements on two faces, with interlocking profiles allowing a good juxtaposition of such blocks in the construction of walls.

However, walls do not consist merely in wall, but also contain casings of various type and are moreover attached to various elements, such as bearing pillars, floors and ceilings. Each junction (joint) and each fitting of frames for casings is accountable for the creation of thermal and/or acoustic bridges decreasing the insulation yield and therefore leading to energy waste in the heating or cooling of environments, and to a worse acoustic insulation thereof.

Any improvement apt to make insulation more effective is evidently of strong interest for the public; hence, continuous improvements for an ever-increasing building insulation are advisable .

SUMMARY OF THE INVENTION

The present invention relates to a modular assembly for the construction of insulated structures, comprising at least two construction elements apt to improve insulation of walls built therewith.

Such elements are selected from an insulating building block for the realization of wall, or of an external insulation for an already existing wall, an insulating building block apt to the installation of counterframes for casings, an insulating building block apt to the installation of reinforcements of lintels for casings, an insulating building block apt to the connection between walls and pillars, floorings, ceilings. Such insulating building blocks are hereinafter described and depicted in Figures 1-5.

As indicated above, the modular assembly of the present invention will comprise at least two among the following building blocks:

a. building block (1), schematically depicted in Figure 1, apt to the realization of wall, formed by an insulating element (2) fixed on one or two opposite vertical faces (3) to a structural element (4), said building block having interlocking profiles (5) on one or more of the remaining free faces;

b. building block (6), schematically depicted in Figure 3, apt to the installation of counterframes for casings, formed by a substantially U-shaped insulating element (7), fixed on two opposite vertical faces (8) to a structural element (9), said building block having interlocking profiles (10) on the remaining free faces and, optionally, longitudinal reliefs and/or grooves in the internal side of said U;

c. building block (11), schematically depicted in Figure 4, apt to the installation of reinforcements of lintels for casings, formed by a substantially U-shaped insulating element (12), fixed on two opposite vertical faces (13) to a structural element (14), said building block having interlocking profiles (15) on the remaining free faces and, optionally, longitudinal reliefs and/or grooves in the internal side of said U;

d. building block (15), schematically depicted in Figure 5, apt to the connection between walls and pillars, floorings, ceilings, formed by insulating material having interlocking profiles (16) on at least one of the opposite horizontal faces (17) and, optionally, on two opposite vertical faces.

The set of such elements provides an extremely effective means for the abatement of thermal, acoustic or thermoacoustic bridges, in fact making more effective the insulation of the structure, in particular of the walls in connection with the building structure of interest.

The term “insulation” as used herein is related to the technique for insulating two systems having different environmental conditions, so that the two systems do not exchange heat or vibrations with each other. Insulation therefore can afford acoustic, thermal or thermoacoustic insulation. Typically, insulation is carried out by interposing between the two parts specific materials not allowing heat exchange, in case of thermal insulation, or vibration exchange, in case of acoustic insulation.

The term “insulating” is used herein with regard to those materials commonly used in insulation techniques, or the so-called thermally and/or acoustically insulating materials, i.e. all those materials that are characterized by a low thermal and/or acoustic conductivity.

For thermal and/or acoustic insulation, various materials are commonly used: polyurethane foam, rock wool, glass wool, synthetic rubbers with low thermal conductivity, polystyrene foam, ceramic fibre, cork.

DETAILED DESCRIPTION OF THE FIGURES

The figures reported below depict possible and non-binding embodiments of the invention. For instance, where the structural element depicted is in the form of a brick element, it is evident that such form is used to provide an example of embodiment, but that any structural element commonly used in the building industry may be used in the making of the blocks of the invention. Also the interlocking profiles depicted are merely exemplary and may be made according to any one of the embodiments described herein.

Figure 1 (a and b). Figure 1 is a schematic depiction of building block a. for the realization of walls (also denoted by (1) in the description and in the claims) formed by an insulating element (2) fixed on one or two opposite vertical faces (3) to a structural element (4), said building block having interlocking profiles (5) on one or more of the remaining free faces.

Figure 1a shows a block having structural elements (4) fixed on both the opposite vertical faces (3) of the insulating element (2), whereas Figure 1b shows a block having structural elements (4) fixed on only one of the opposite vertical faces (3) of the insulating element (2). It may be seen how the opposite vertical face (3) remaining free in Figure 1b has a substantially flat surface.

Figure 2. Figure 2 shows a schematic depiction of the insulating element (2). Note how the interlocking profiles may be present on all four of the remaining free surfaces, the two vertical ones and the two horizontal ones.

Figure 3. Figure 3 (a and b) shows a schematic depiction of building block b. (also denoted by (6) in the description and in the claims) and of the component parts thereof. In particular, Figure 3a shows a schematization of the building block apt to the installation of counterframes for casings, formed by a substantially U-shaped insulating element (7), fixed on two opposite vertical faces (8) to a structural element (9), said building block having interlocking profiles (10) on the remaining free faces.

Figure 3b shows a schematic depiction of the insulating element (7), and optionally longitudinal reliefs and/or grooves in the internal side of said U, allowing greater adhesion to concrete, or to mortar or the like, after casting.

Note that, though not shown in the figure, the interlocking profiles can be present also on the free opposite vertical faces.

Figure 4. Figure 4 (a-e) shows a schematic depiction of building block c. (also denoted by (11) in the description and in the claims) and of component parts thereof. In particular, Figures 4 (d and e) show a schematic depiction of the above-mentioned building block apt to the installation of reinforcements of lintels for casings, formed by a substantially U-shaped insulating element (12), fixed on two opposite vertical faces (13) to a structural element (14), said building block having interlocking profiles (15) on the remaining free faces and, optionally, longitudinal reliefs and/or grooves in the internal side of said U in order to allow a greater adhesion to concrete, or to mortar or the like, after casting.

Figures 4 b and c show a cross section, respectively, of Figures 4 d and e. The structural element 14 is depicted in Figures 4 b and d in one embodiment in which such element is a panel of aggregating agent for plaster, whereas, in Figures 4 c and e, in one embodiment in which such element is a small hollow flat block, a medium hollow flat block or a large hollow flat block.

Figure 4a shows a schematic depiction of the substantially U-shaped insulating element (12) comprising longitudinal reliefs in the internal side of said U apt to allow a greater adhesion to concrete, or to mortar or the like, after casting.

Note that, though not shown in the figure, the interlocking profiles can also be present on the free opposite vertical surfaces.

Figure 5. Figure 5 (a-d) shows a schematic depiction of the building block d. (also denoted by (15) in the description and in the claims) apt to the connection between the walls and pillars or flooring, formed by insulating material having interlocking profiles (16) on at least one of the opposite horizontal faces (17) and, optionally, on two opposite vertical faces.

Figures 5 a and c show a block having interlocking profiles of male type on a horizontal opposite face (cross section and perspective depiction, respectively), whereas Figures 15 b and d show a block having interlocking profiles of female type on a horizontal opposite face (cross section and perspective depiction, respectively).

Note that, though not shown in the figures, the interlocking profiles can also be present on the free opposite vertical surfaces.

Figure 6 shows the realization of a wall with an opening for the casings using and joining to the bearing pillars by using the blocks according to the assembly of the invention.

Figure 7 shows a detail of the installation of reinforcement for lintel in block c. of the invention.

Figure 8 shows a section of walls realized with the assembly of the invention. It may be noted that corners are insulated as well.

Figure 9 shows an example of embodiment of element e. for the construction of insulated structures e., wherein said building block is formed by an insulating element fixed to a structural element on one vertical face, the opposite face being substantially flat, said building block optionally having interlocking profiles on at least one of the remaining free faces in which the structural element can be selected from a medium hollow flat block, a small hollow flat block, a large hollow flat block, brick elements and panels of aggregating agent for plaster.

DETAILED DESCRIPTION OF THE INVENTION

As mentioned above, the invention therefore relates to a modular assembly for the construction of insulated building structures, comprising at least two construction elements selected from:

a. building block (1) apt to the realization of wall, formed by an insulating element (2) fixed on one or two opposite vertical faces (3) to a structural element (4), said building block having interlocking profiles (5) on one or more of the remaining free faces;

b. building block (6) apt to the installation of counterframes for casings, formed by a substantially U-shaped insulating element (7), fixed on two opposite vertical faces (8) to a structural element (9), said building block having interlocking profiles (10) on the remaining free faces and, optionally, longitudinal reliefs in the internal side of said U;

c. building block (11) apt to the installation of reinforcements of lintels for casings formed by a substantially U-shaped insulating element (12), fixed on two opposite vertical faces (13) to a structural element (14), said building block having interlocking profiles (15) on the remaining free faces and, optionally, longitudinal reliefs in the internal side of said U;

d. building block (15) apt to the connection between the walls and pillars or flooring, formed by insulating material having interlocking profiles (16) on at least one of the opposite horizontal faces (17) and, optionally, on two opposite vertical faces.

According to the invention, the building block of wall a. could be as schematically depicted in Figure 1a, and could therefore comprise a structural element (2) fixed on each of the two opposite vertical faces (3), and the interlocking profiles could be present on one, two, three or four of the remaining free faces. In one embodiment, the interlocking profiles could be on two of the remaining free faces opposite to each other, and could have a male/female or a male profile on one face and a female profile on the other one, so as to be able to form a row of such "interlocking" elements.

In another embodiment, to the hereto-described profiles, analogous male-female profiles could be added on the remaining two free faces, so as to be able to realize a wall of such elements.

The male-female profiles according to the invention could, in general, be represented by a male profile of a substantially rectangular, triangular, square, trapezoidal or semi-circular, ampulla or the like shape; in general, it will have a shape apt to be juxtaposed, with the least possible interstitial space, to the female profile. The female profile will, of course, be shaped like a mould of the male profile.

The blocks could be juxtaposed in the insulating part and joined with conventional aggregating agents in the structural part, or suitable adhesives could be used between the insulating components so as to further decrease the interstitial space between successive components.

In one embodiment, when sufficiently elastic materials are used, the interlocking profile could be a triangular or trapezoidal profile in which the male be slightly greater than the female (millimetric differences), so as to form a still greater adhesion between the overlapped structural components, facilitated by the elasticity of the insulating component and by the weight of one component onto the other one.

What described above in connection with the interlocking profiles is applicable to all components of the assembly according to the invention, and therefore is to be understood as described also for b. c. and d..

In a preferred embodiment, the interlocking profiles on the insulating element will exceed in height, of about 1-3 cm, e.g. about 1.5 cm, the structural elements, so as to insulate also the layer of material used for adhesion between blocks (for instance, mortar or the like).

In one embodiment, the block apt to the realization of wall a. will therefore be provided already assembled and will be comprised of two structural elements between which the insulating element is interposed; the insulating element could be, e.g., a layer of expanded polystyrene with male/female interlocking on all four sides, coming out in height of about 1-2 cm, e.g. about 1.5 cm, from the structural elements.

Block a. according to the invention enables to insulate also the mortar layer serving to erect walls, thereby realizing the wall as a barrier with high resistance and good thermal inertia, and without thermal bridges that could be caused, e.g., should the insulating material not exceed in height the structural elements, therefore leaving free the layer of mortar or the like.

The block as described herein serves to realize a rubble-filled infilling masonry in a single installation, instead of with the traditional method consisting in a first step of

realizing the outer wall, a second step of realizing a thickness of plaster, followed by the laying of the insulating material by gluing on said plaster, and a subsequent step of realizing the internal wall.

According to a different embodiment, the building blocks of walls a. as above described, could be as schematically depicted in Figure 1b, and have the structural element (4) on only one of the opposite vertical faces (3) so as to enable the construction of an "external insulation" on walls already existing, or of a wall with external insulation. Such external insulation could be placed on the external face of pre-existing walls, with the insulating component that could face outwards and on which an adhesion-promoting primer for plaster or other could be placed; or, for inwards, e.g. when a structure in sight is desired, in order to realize a thermal external insulation; or, it could also be realized by construction of the wall with the building blocks depicted in Figure 1b. Alternatively, the external insulation could be constructed, in the same way described above, also on the internal face of the wall, in order to realize, e.g., an acoustic or thermoacoustic external insulation.

The remaining free opposite vertical face (3) could be coated with plaster, outer coatings, paints or wallpapers, according to its intended use.

To sum up, therefore, the building block a., of wall, could be formed by an insulating element (2) fixed on two opposite vertical faces (3) to a structural element (4), said building block having interlocking profiles (5) on at least one of the remaining free faces.

Such block could also be formed by an insulating element (2) fixed to a structural element (4) on one vertical face of the two opposite vertical faces (3), the remaining opposite face being free and substantially plane, said building block having interlocking profiles (5) on at least one of the remaining free faces. To the above-mentioned free vertical face (3), aesthetic covers could be applied as desired.

As can be seen in the annexed figures, the insulating element of the invention and the structural material fixed thereto, interlocking profiles excluded, are substantially shaped as a parallelepiped with a rectangular base in which the longer sides correspond to the above-mentioned opposite vertical faces.

The thickness of the insulating material, i.e. its width between the opposite vertical faces (3) in the case of the building block (1) apt to the realization of formed wall or of the analogous faces of building block d. (15) apt to the connection between the walls and pillars or flooring, could be of between about 2 and about 15 cm, depending on the thickness of the wall that is to be realized. In case of external insulations for acoustic insulation, such thickness could also be reduced to about 2-5 cm, whereas in case of wall or external insulation where a thermal or thermoacoustic

insulation is to be realized, such a thickness will normally be of about 6; 7; 8; 9; 10; 11; 12; 13; 14; 15 cm.

In the case of the building block (6) apt to the installation of counterframes for casings or of the building block (11) apt to the installation of reinforcements of lintels for casings, the insulating element (7) or (12) will be a substantially U-shaped element, as schematically depicted in Figures 3 and 4, so as to create an opening apt to enable the installation or counterframes or lintels for casings in the wall.

Said element therefore enables to have an insulated building block even where normally insulation is absent due to the need to install counterframes for casings such as windows, French windows and doors, or to install reinforcements of lintels therefor.

The U shape enables the forming of an opening or a seat in the wall, apt to the insertion of such counterframes or reinforcements into the wall itself. In one embodiment, the internal side of the U, where the counterframes or the reinforcements will be located, will have longitudinal reliefs and/or grooves so as to realize, once the concrete or the mortar has been laid, an "adhesion-promoting" interlocking structure preventing motion of the counterframes or the reinforcements in the insulating seat.

According to the present invention, said insulating element in c. and/or b. will have a width between said vertical faces (8) or (13) of between about 15 and about 43 cm, and the inner section of said U will have a width of between about 6 and about 30 cm. For instance, for the realization of building blocks b. apt to the installation of counterframes for casings, the internal section of said U could be of between about 6 and about 16 cm, whereas in the realization of building blocks c. apt to the installation of reinforcements of lintels for casings, the internal section of said U could be of between about 8 to about 16 cm.

Evidently, the overall width of the building block b. or c. will be equal to that of the block a. used. This could be realized by varying both the thickness of the insulating element and of the structural ones, or, alternatively, could be realized by varying the thickness of the structural elements.

The building blocks b. and c. could be provided directly assembled (structural elements and insulating elements as above-described) or as kit of parts assemblable by the user.

The assembly according to the present description could also comprise a further block e. for the construction of insulated structures, wherein said building block is formed by an insulating element fixed to a structural element on one vertical face, the opposite face being substantially flat, said building block optionally having

interlocking profiles on at least one of the remaining free faces in which the structural element can be selected from a medium hollow flat block, a small hollow flat block, a large hollow flat block, brick elements and panels of aggregating agent for plaster. For instance, said block could be used for the insulation of thermal bridges between the walls and beams or pillars from the outside;

The insulating element according to the invention could be made of polystyrene, expanded polystyrene, polyurethane foam, rock wool, glass wool, synthetic rubbers with low thermal conductivity, polystyrene foam, ceramic fibre, cork or combinations thereof.

Such combinations could for instance be comprised of one or more parallel or overlapped layers of at least two of said materials, or of one or more of said materials embedded into one of said materials. For instance, there could be used combinations comprising the above-mentioned synthetic rubbers in which rock wool and/or glass wool or other suitable materials are embedded.

The materials indicated herein are not limiting the invention, as any suitable insulating material known to the technician in the field could be used.

As to the structural elements, these could vary depending on whether element a., b. or c. is made.

Generally, however, being building materials apt to the construction of buildings, such materials will substantially be shaped as a parallelepiped with a rectangular or squared base.

For the making of the blocks a. and/or b., said structural element will be an element commonly used for the construction of a wall, like, e.g., a solid brick, a half-full brick, a brick element, a block of tuff, a block of concrete, a block of lightweight concrete and the like.

Depending on the wall thickness to be made (bearing wall, external walls, non-bearing walls) said structural material will have a suitable width, which could be, e.g., a width of about 8; 9; 10; 11; 12; 12,5; 13,5; 14; 15; 17.5; 20 cm.

In case block a. be made as schematically described in Figure 1a, the block width determining the wall thickness will be given by the sum of the thickness of the structural element, taken twice, and of the thickness of the insulating element. There could be had, e.g. with an insulating element having a thickness of about 10 cm, building blocks (1) apt to the construction of walls having a thickness of about 26, 28, 30, 32, 33, 34, 35, 37, 38, 40, 42, 45, 50 cm.

In case block a. be made as schematically described in Figure 2b, for an analogous thickness of the insulating element there will be had building blocks (1) having a thickness of about 18; 19; 20; 21; 22; 22.5, 23.5; 24; 24.5; 25; 27.5; 30; 35; 40 cm.

For the making of block b., the thickness of the U-shaped component (7) could be as described above, and will preferably be of between 12 and 26 cm and the structural element could be, like for block a., an element commonly used for the construction of a wall, such as a solid brick, a half-full brick, a brick element, a block of tuff, of concrete, of lightweight concrete and the like; depending on the wall thickness to be made (bearing wall, external walls, non-bearing walls) said structural material will have a suitable width, which could be, e.g., a width of about 8; 9; 10; 11; 12; 12.5; 13.5; 14; 15; 17.5; 20, 25, 30, 32, 33, 35, 37, 38, 39, 40, 41, 42, 44, 45, 47, 48, 50 cm.

Instead, for the making of block c., the thickness of the U-shaped component (13) could be as described above and will preferably be of between about 16 and 43 cm. The structural element will appropriately be a medium hollow flat block, a small hollow flat block, a large hollow flat block or a panel of aggregating agent for plaster, or other element of concrete or lightweight concrete, and its thickness will therefore be between about 0.5 cm (e.g., for the panel) and between about 2 and 12 cm, e.g. about 3, 4, 5, 6, 7, 8, 10 cm, depending on whether a small hollow flat block, a medium hollow flat block or a large hollow flat block is used as a structural element. The structural element according to the invention could be of any suitable material commonly used in the building field, such as concrete, aerated concrete, autoclaved concrete, clay, porous-paste ceramic material, tuff, lightweight concrete, and the like.

Building block d. (15), sketched in Figure 5, will be a block apt to the connection between the walls and pillars or flooring, formed by insulating material having interlocking profiles (16) on at least one of the opposite horizontal faces (17) and, optionally, on two opposite vertical faces. Such element serves to ensure that there be a joint between the wall realized with the building block for walls and the one pillar, floor, or beam. The presence of a junction between pillar and wall is moreover provided for in anti-seismic regulations, and it will have a thickness of about 0.5 cm to 10 cm, according to the needs of the requesting technician.

Such block could have a substantially upturned T shape, in case the interlocking profile be a male-type profile, or it could have a substantially "bridge-like" shape in case the interlocking profile be of female type. Even on the shorter vertical faces, the block could have opposite male-female interlocking profiles.

Such a shape enables, on the one hand, to form a continuous line of elements d., and, on the other hand, to provide a male or female interlocking profile that could be used vertically on pillars or horizontally on floors and ceilings.

In one embodiment, block d. could be with a rectangular or squared base, and of height of between about 0.5 cm and about 10 cm. The present invention also relates to each one of the blocks as described herein, taken individually.

EXAMPLES

To validate the claimed assembly, a wall with openings for the casings and reinforcements for lintels was experimentally made on a private property using the assembly of the invention.

Figure 6 shows, in particular, the presence of blocks a. b. d., visible, in the section of the window (a. and b.) and in the portion joined to the pillars (d.).

Figure 7 instead shows the installation of the reinforcement for lintel using elements c., whereas in Figure 8 a section of walls is shown where realization of insulation also in the corners is evident.

CLAIMS

1. A modular assembly for the construction of insulated structures, comprising at least two construction elements selected from:

a. building block (1) apt to the realization of wall, formed by an insulating element (2) fixed on one or two opposite vertical faces (3) to a structural element (4), said building block having interlocking profiles (5) on one or more of the remaining free faces;

b. building block (6) apt to the installation of counterframes for casings, formed by a substantially U-shaped insulating element (7), fixed on two opposite vertical faces (8) to a structural element (9), said building block having interlocking profiles (10) on the remaining free faces;

c. building block (11) apt to the installation of reinforcements of lintels for casings, formed by a substantially U-shaped insulating element (12), fixed on two opposite vertical faces (13) to a structural element (14), said building block having interlocking profiles (15) on the remaining free faces and, optionally, longitudinal reliefs or grooves in the internal side of said U;

d. building block (15) apt to the connection between the walls and pillars or flooring, formed by insulating material having interlocking profiles (16) on at least one of the opposite horizontal faces (17) and, optionally, on two opposite vertical faces.

2. The modular assembly according to claim 1, wherein said building block of wall apt to realization of wall in a. is formed by an insulating element (2) fixed on two opposite vertical faces (3) to a structural element (4), said building block having interlocking profiles (5) on at least one of the remaining free faces; or wherein said building block a. apt to the realization of wall is formed by an insulating element (2) fixed to a structural element (4) on one vertical face, the opposite face (3) being substantially flat, said building block having interlocking profiles (5) on at least one of the remaining free faces.

3. The modular assembly according to any one of claims 1 or 2, further comprising a building block e. for the construction of insulated structures, wherein said building block is formed by an insulating element fixed to a structural element on one vertical face, the opposite face being substantially flat, said building block optionally having interlocking profiles on at least one of the remaining free faces in which the structural element can be selected from a medium hollow flat block, a

small hollow flat block, a large hollow flat block, brick elements or a panel of aggregating agent for plaster.

4. The modular assembly according to any one of claims 1 to 3, wherein said insulating element excluding said interlocking profiles and said structural material are substantially shaped as a parallelepiped with a rectangular base in which the longer sides correspond to said opposite vertical faces.

5. The modular assembly according to any one of claims 1 to 4, wherein said insulating element in a. and/or d. has a width between said opposite vertical faces of between about 2 and about 15 cm, preferably about 6; 7; 8; 9; 10; 11; 12; 13; 14; 15 cm.

6. The modular assembly according to any one of claims 1 to 5, wherein said insulating element in c. and/or b. has a width between said vertical faces of between about 15 and about 43 cm and the inner section of said U has a width of between about 6 and about 30 cm.

7. The modular assembly according to any one of claims 1 to 6, wherein said insulating element is made of polystyrene, expanded polystyrene, cork, rock wool polyurethane foam, glass wool, synthetic rubbers with low thermal conductivity, polystyrene foam, ceramic fibre, or combinations thereof.

8. The modular assembly according to any one of claims 1 to 7, wherein said structural element is substantially shaped as a parallelepiped with a rectangular or squared base.

9. The modular assembly according to any one of claims 1 to 8, wherein said structural element in a. and/or b. is a solid brick, a half-full brick, a brick element, a block of tuff, a block of concrete, a block of lightweight concrete.

10. The modular assembly according to claim 9, wherein said structural material has a width of about 8; 9; 10; 11; 12; 12.5; 13.5; 14; 15; 17.5; 20, 25, 30, 32, 33, 35, 37, 38, 39, 40, 41, 42, 44, 45, 47, 48, 50 cm.

11. The modular assembly according to any one of claims 1 to 7, wherein said structural element in c. is a medium hollow flat block, a small hollow flat block, a large hollow flat block or a panel of aggregating agent for plaster.

12. The modular assembly according to claim 11, wherein said structural element has a thickness of between about 0.5 and about 12 cm.

13. The modular assembly according to any one of claims 1 to 12, wherein said structural material is concrete, aerated concrete, autoclaved concrete, clay, porous-paste ceramic material, tuff.

14. The modular assembly according to any one of claims 1 to 13, wherein said building block d. has a rectangular or squared base and a height between 0.5 and 10 cm.

15. The modular assembly according to any one of claims 1 to 14, wherein said interlocking profiles (5) are male and female profiles on opposite parallel faces.

16. The modular assembly according to claim 15, wherein said male profile has a substantially rectangular, triangular, square, trapezoidal or semi-circular shape.

17. Modular element a. b. c. d. or e., as defined in any one of the preceding claims.

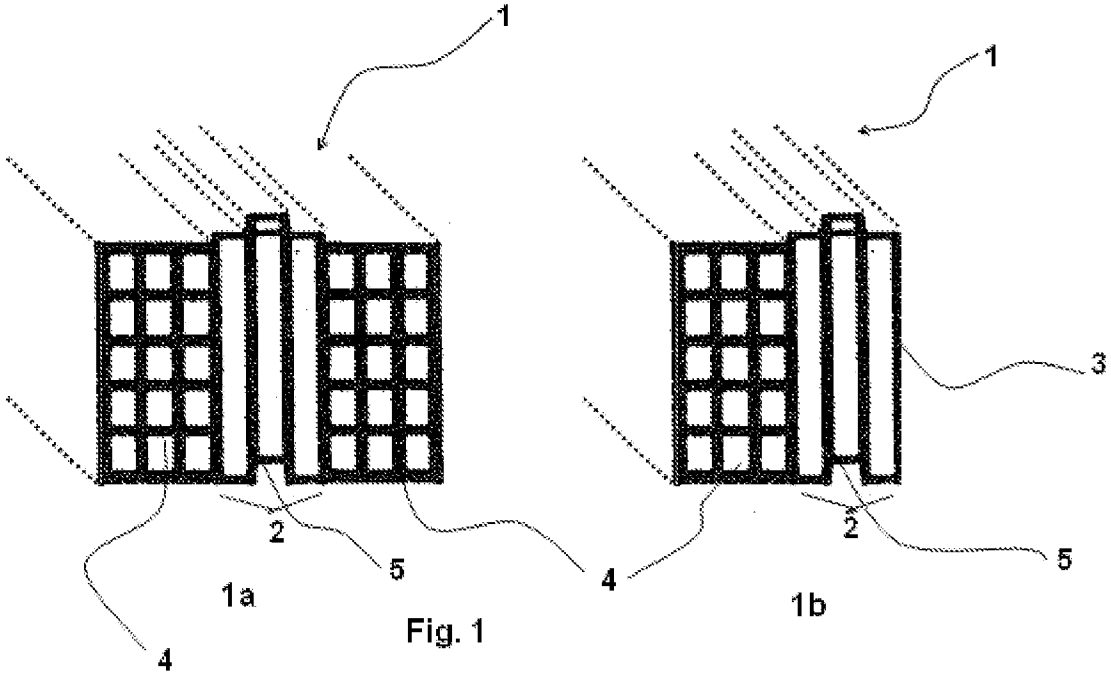


Fig. 1

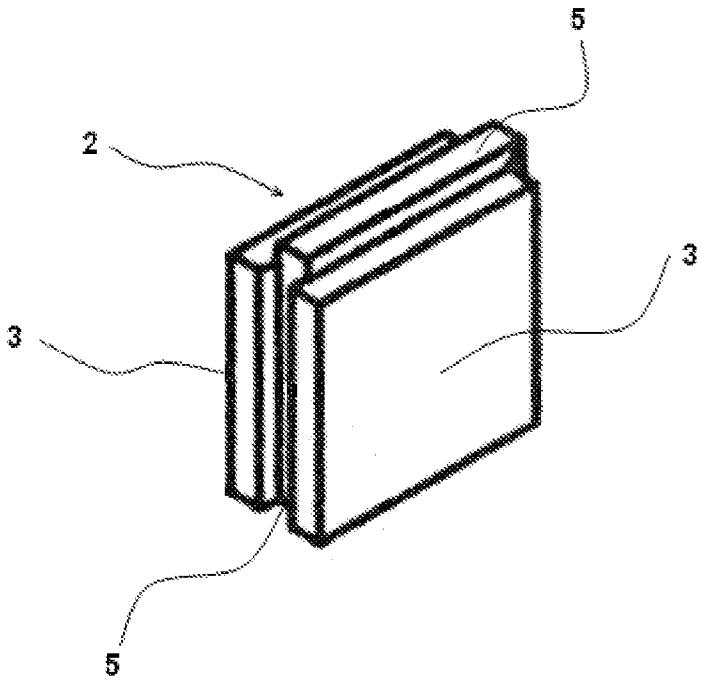


Fig. 2

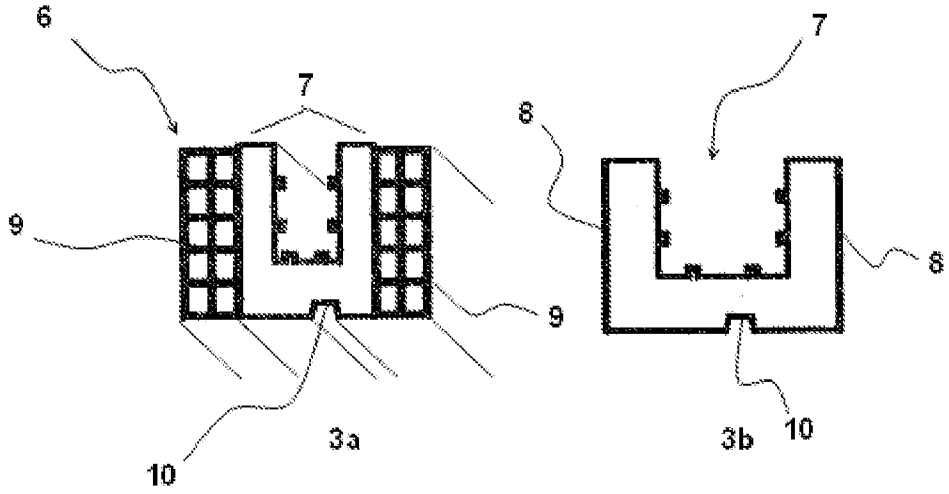


Fig. 3

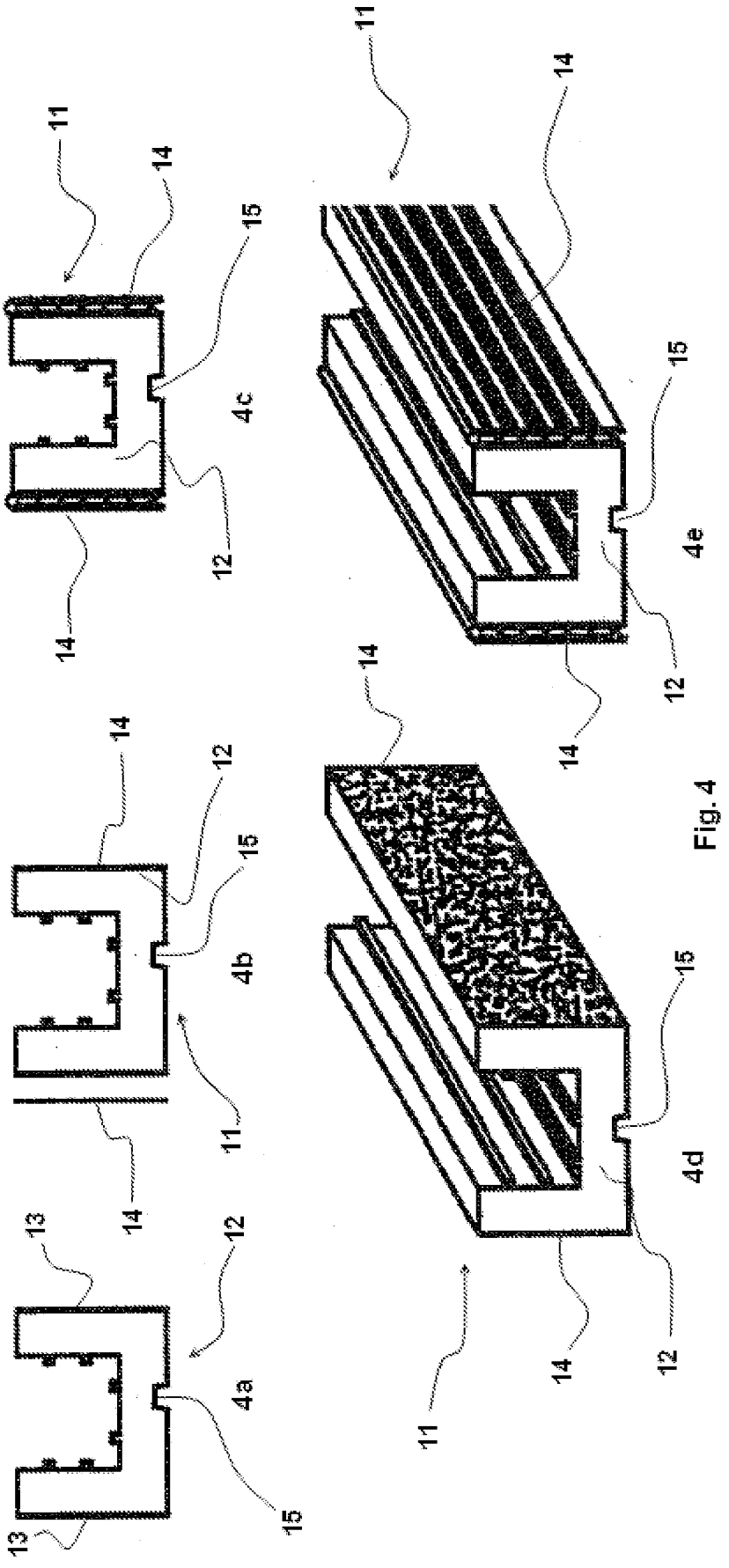

11
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4c
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4b
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4a
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4d
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15
4e
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Fig. 4

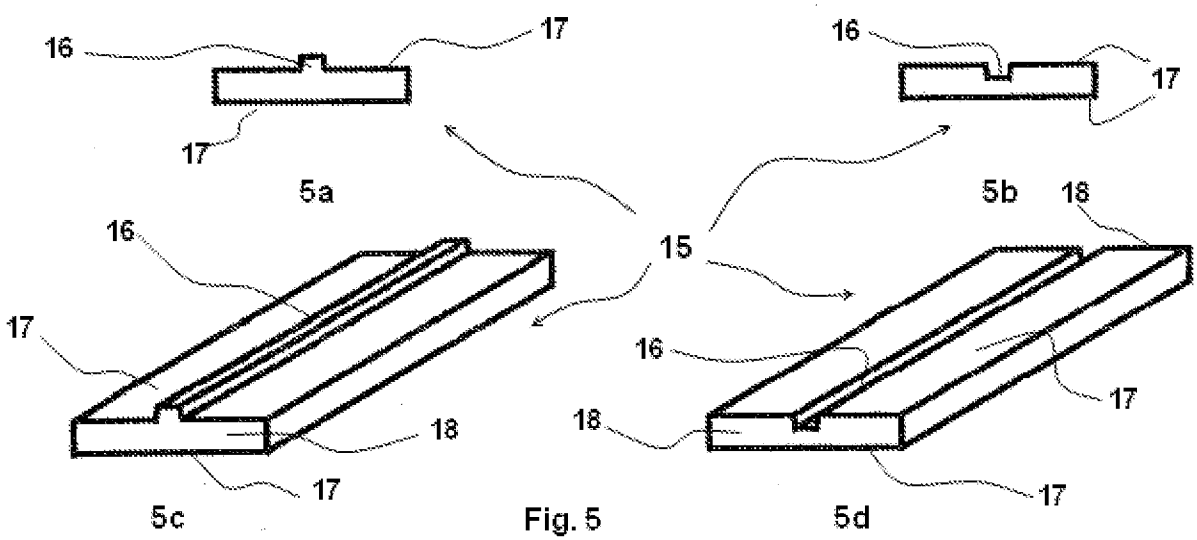


Fig. 5



Fig. 6

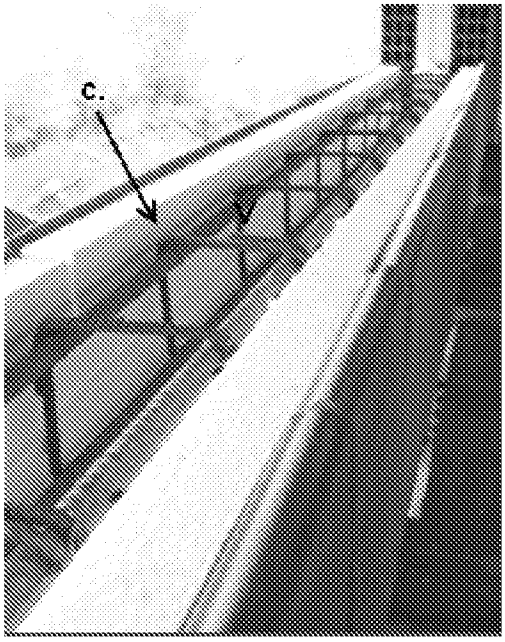


Fig. 7

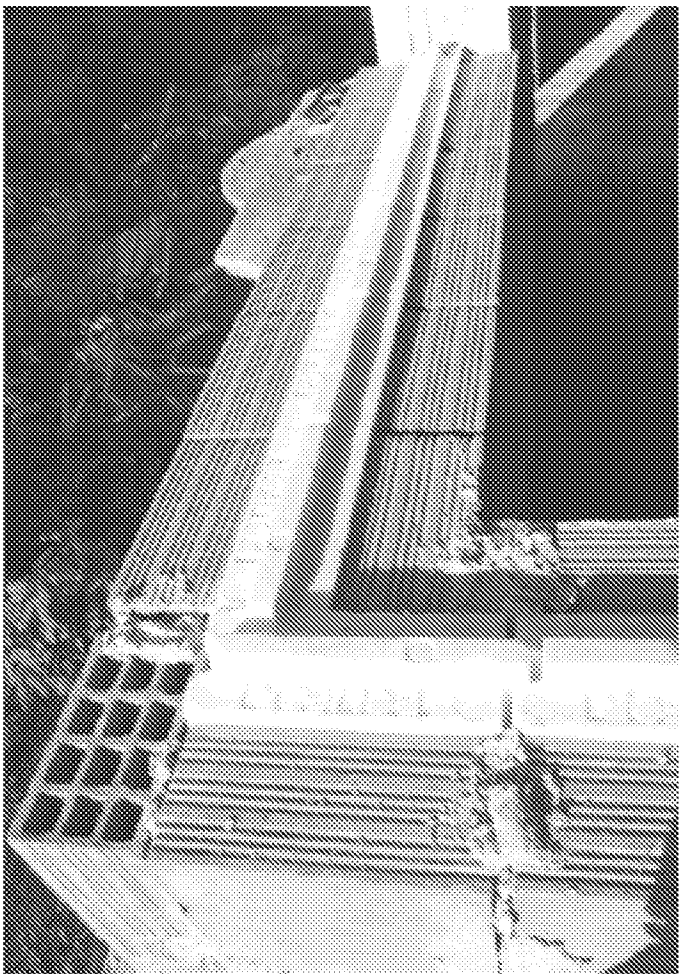


Fig. 8

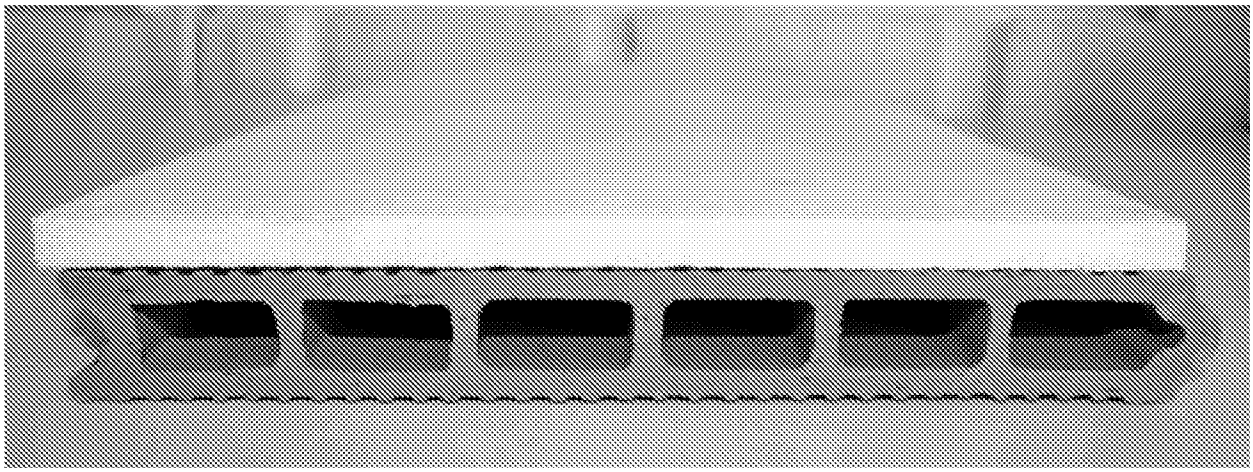


Fig. 9

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2013/056729

A. CLASSIFICATION OF SUBJECT MATTER
INV. E04C1/41
ADD.

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)
E04C E04B

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)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6 205 726 B1 (HOADLEY THEODORE A [US]) 27 March 2001 (2001-03-27) column 3, line 40 - column 4, line 57; figures 1,2,7	1-17
A	DE 199 40 324 A1 (EBERWEISER INGRID [DE]) 1 March 2001 (2001-03-01) figure 1	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

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"E" earlier application or patent but published on or after the international filing date

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
11 December 2013	18/12/2013

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Mysliwetz, Wolfgang

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/IB2013/056729

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6205726 B1	27-03-2001	NONE	
DE 19940324 A1	01-03-2001	NONE	