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(54) **Modular dowel assembly for fixing a lining element to a panel of an expanded plastic material and structural element incorporating said assembly**

Modulares Dübelsystem zur Befestigung eines Verkleidungselementes an einer Kunststoffschaumplatte und Konstruktionselement mit diesem System

Assemblage à cheville modulaire pour fixer un élément de revêtement sur un panneau en matière plastique expansée et pièce de structure comprenant ledit assemblage

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- **SOVIET PATENTS ABSTRACTS Section PQ, Week 9126, 14 August 1991 Derwent Publications Ltd., London, GB; Class Q43, AN 91-191180 & SU-A-1 583 561 (MOSC RURAL CONSTR) 7 August 1990**

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Description

BACKGROUND OF THE INVENTION

Field of the invention

[0001] In its more general aspect, the present invention relates to construction elements incorporating one or more foamed plastic slabs which find a preferred use in building construction.

[0002] The present invention relates, more specifically, to construction elements including a pair of foamed plastic slabs, such as, for example, lost formworks employed in the construction of dividing walls, ceilings or flooring.

[0003] In the following description and in the appended claims, by the term: covering element, is indicated either one or more layers incorporating any material having appropriate mechanical characteristics, such as for example plaster, plastic plaster, gypsum, concrete and the like or fire resistant characteristics such as for example combinations of non-woven fabric and bitumen, or panels or slabs of an appropriate material having decorative or structural functions, such as for example panels of plaster board, wood, marble slabs, corrugated sheet metal and the like.

[0004] As is known, in the building construction field in general and in the manufacture of so-called prefabricated products in particular, the use has steadily increased of so-called composite construction elements, i.e. including at least one foamed plastic slab, preferably foamed polystyrene, having the function of thermoacoustic insulation, and one or more covering elements in layers or panels of appropriate construction material, e.g. concrete, plaster, gypsum, wood and the like, imparting adequate mechanical and, optionally, decorative characteristics to the construction element, manufactured element or building.

[0005] If on the one hand the construction elements of the type mentioned exhibit characteristics of lightness, relative ease of installation and low cost, their acceptance in the field and their flexibility of use have until now been limited by the difficulty of associating in a sufficiently stable and durable manner the covering elements to the foamed plastic slab.

[0006] The foamed plastic employed has in itself a quite negligible ability of retaining the covering layers of plaster or concrete applied thereon, an ability totally lacking when the covering element is a wood panel or other rigid materials.

Known art

[0007] In order to associate an appropriate covering layer to the foamed plastic slab, the constant teaching of the known art has been and is basically that of fastening the selected covering layer to the foamed plastic slab by means of a metal or plastic supporting net fixed to or supported at a short distance from the slab.

[0008] If a metal net is adopted, as for example in the case of lost formworks comprising a pair of foamed plastic slabs mutually spaced and stiffened by appropriate spacing means, both the slabs are surrounded by an actual cage of electrically welded metal wires, extending parallel and transversely thereto and which fulfill the dual function of conferring to the formwork the necessary mechanical resistance to the casting and sufficient supporting capacity of the covering layer.

[0009] The results are a considerable complexity of installation, the formation of "thermal bridges" between one side and the other of the foamed plastic slab due to the presence of the wires which pass through the slab and which compromise the insulating characteristics and involve formation of condensates and rust.

[0010] In order to prevent the formation of thermal bridges and at the same time provide an adequate support to the covering element, it has been proposed, for example as disclosed in Italian patent application No. 46869-A/78, to fasten on the opposite sides of the slab a metal net equipped with parallel ribbing in relief, partially covered with a thin layer of plastic cement and then plaster.

[0011] In both cases, however, the need of incorporating the metal supporting net in the covering layer involves inevitably the use of a considerable quantity of concrete or plaster, with a corresponding increase in production and/or installation time and cost on site.

[0012] When the net is plastic, on the other hand, the ability to retain the covering layer is so limited that the latter consists essentially of a few millimeters of a plastic plaster layer.

[0013] If the covering element is a rigid panel, e.g. wood, the technology of the industry resorts constantly either to so-called sandwich structures in which the slab is enclosed between two rigid self-bearing panels, e.g. as described in US patent No. 4,443,988, or to actual beams inserted in longitudinal grooves extending for the entire height of the slab, as illustrated for example in patent application WO 93/01371.

[0014] In both cases, the assembly operations of the foamed plastic slab with the covering element are laborious from the practical viewpoint, difficult to perform on site and in any case limited to a few very specific applications.

[0015] Furthermore, German patent application DE-A-1 938 065 discloses a construction element comprising a pair of light construction slabs mutually associated by means of a nog structure including a spacer rod irreversibly locked to supporting elements made of stainless material and supported externally to the light construction slabs.

[0016] US patent No. 4,040,222 discloses a wall having an outer structural component of masonry units which are provided with dovetails slots in their inner faces. A fixing device is provided which has a tongue at one end of a screw threaded rod and an adjustable cap

at the other, so that the tongue may be inserted and fixed into the dovetail slot and the cap adjusted by screwing on the rod.

[0017] Lastly, US patent No. 4,397,065 discloses a reinforcing masonry wall structure comprising a first and a second plurality of courses of masonry blocks to the opposite sides of which first and second layers of plaster-like material are applied. Third and fourth layers of plaster-like material are positioned on the first and second layers respectively. A welded wire fabric material is positioned between each of the first and third and second and fourth layers of plaster-like material. Horizontally disposed reinforcing rods may be extended through the structure to achieve additional bond strength as desired.

Summary of the invention

[0018] The technical problem underlying the present invention is therefore that of conceiving and making available a construction element comprising a sectional nog structure which may embedded into one or more foamed plastic slabs, that would be capable of i) being either assembled at the building site immediately before casting concrete, or preassembled at the works and ii) supporting any covering element of the slabs in an extremely flexible way, while allowing to substantially reduce assembling times and labor.

In conformity with the present invention, the technical problem set forth above is solved by a construction element as defined in attached claim 1.

[0019] In accordance with a first advantageous aspect of the present invention, the construction element comprises a sectional nog structure, i.e. a nog structure including elements (insert, tierod) mutually associated in a removable manner and variably combinable depending on the specifications and contingent application requirements as explained in greater detail below.

[0020] The sectional nog structure of the present invention can be installed, preferably screwed, in the foamed plastic slab either immediately downstream of the slab forming operations or during on-site installation.

[0021] In accordance with the present invention, the foamed plastic of preferred use is foamed polystyrene.

[0022] Preferably, the foamed plastic slabs have an apparent density between 20 and 25 kg/m^3 and are produced by a continuous method in a known manner.

[0023] Depending on the specific use, the continuous slabs have a predetermined height varying between 60 and 330 cm and are cut in pieces of appropriate length, so as to facilitate the subsequent operations of processing and transport.

[0024] The foamed plastic slabs have a thickness of from 3 to 15 cm, chosen on a case-by-case basis, so as to ensure appropriate mechanical strength, e.g. to the cast in the case of lost formworks, as well as the desired thermoacoustic insulation characteristics.

[0025] For the purposes of the present invention, furthermore, it is preferable to use foamed plastic slabs appropriately treated with suitable flame-retardant additives designed to increase the flame-resistant characteristics and fire resistance thereof.

[0026] In accordance with the present invention and in order to avoid the formation of thermal bridges or condensates, the inserts of the sectional nog structure are preferably made of an appropriate material which does not conduct heat and is preferably fire resistant.

[0027] Advantageously, the inserts are of plastic processable by molding and preferably thermoplastic such as for example polyethylene or polypropylene or, optionally, phenol-formaldehyde resins.

[0028] For the purposes of the present invention, each of the inserts is preferably equipped with a substantially cylindrical body, externally provided with means which ameliorate securing to the foamed plastic slab in which they are flush-insertable.

[0029] Preferably, said means comprise a thread integral with the body of the insert, which at the same time facilitates insertion of the insert by screwing the same into the foamed plastic slab.

[0030] In order to facilitate the insertion of the insert in the slab, the latter can be equipped with lead-in holes, formed in a known manner, e.g. by milling, in accordance with a predetermined arrangement depending on the final use of the slab.

[0031] In accordance with a preferred embodiment, the means for fastening one or more covering elements to the slab protrude from a base formed in each insert at an end portion opposite the tierod and accessible from outside the slab.

[0032] Advantageously, said base also exerts the important function of retaining in position the foamed plastic slab in which the insert is embedded, facilitating the operations of manufacture, transportation and installation thereof.

[0033] In a first embodiment this base, preferably flattened and integral with the body of the insert, can itself constitute a support means for the covering element.

[0034] In this case, the base of the insert has an adequate thickness, preferably between 1.5 mm and 5 mm, such as to allow anchoring of the covering element, e.g. a plaster board panel, by means of screws or other similar fastening elements.

[0035] As an alternative, the means designed to allow or facilitate anchoring of the covering element to the slab may have a different structure and form, depending on the particular covering element which it is desired to employ, and can be either integral with the base of the insert or defined with the base itself by one or more metal elements associated with the insert and, optionally, with the supporting element of the foamed plastic slab as well.

[0036] These means can comprise, as better explained below, stakes, blocks, eyes extending from said base and preferably integrally formed therein.

[0037] In this first embodiment of the present inven-

tion, the sectional nog structure comprises a pair of plastic inserts engaged by screwing on opposite threaded ends of a metal tierod.

[0038] The inserts mounted on opposite sides thereof can be inserted in parallel slabs mutually spaced and stiffened by a plurality of tierods.

[0039] In accordance with another aspect of the present invention, the construction element described above is of the so-called modular type, in which one or more foamed plastic slabs of predetermined size and weight, equal to or different from one another, are assembled to form more complex composite structures.

[0040] Thus, for example, the construction element described above allows to provide modular lost formworks, of the type comprising a pair of foamed plastic slabs mutually associated at a predetermined distance by respective spacer means.

[0041] In this case, one or more metal reinforcing wires or bars can be fastened, e.g. by welding, to the metal tierods connecting the inserts, so as to reinforce adequately a layer of concrete poured between the foamed plastic slabs.

[0042] In a preferred embodiment, the construction element comprises means for facilitating installation and positioning of the metal reinforcing rods before pouring the concrete. Preferably, said means comprise one or more eyes, integral with the tierod, in which the metal rods designed for reinforcing the concrete are inserted and subsequently fastened, e.g. by welding.

[0043] The formwork thus provided is not only capable of receiving in an adequate manner a casting of concrete or other suitable construction material, but is also capable of supporting at the same time any external covering element after having completed the cast.

[0044] Thanks to its own modular characteristics and as better explained below, furthermore, the construction element of the present invention allows to associate to the tierod inserts - even of different types - having the support means better suited to support the desired covering element.

[0045] In this manner, the construction element of the present invention allows to advantageously associate on both sides of the formwork or double-slab wall, those covering elements, even of different types, which best meet the construction and/or decorative requirements of the product it is intended to manufacture.

[0046] Since the inserts are associated in a removable manner with the respective tierods, furthermore, the further advantages are achieved of a possible access to the concrete casting space, so as to arrange more easily the reinforcing rods, and a possible removal of one of the foamed plastic slabs after hardening of the casting, so as to be able to work directly on the concrete wall and apply thereto the desired covering and finishing layers.

[0047] In accordance with another advantageous feature of the present invention, particularly appreciable in the case of lost formworks, it is possible to use in the same formwork both nog structures with double insert and tierod and nog structures with a single insert to the greater benefit of flexibility of use of the formwork.

[0048] In both cases, the presence of plastic inserts, notoriously a good thermal insulating material, allows to eliminate in a substantially complete manner the development of thermal bridges between the inside and the outside of each slab, contributing to impart optimal characteristics of thermoacoustic insulation to the construction element as a whole.

[0049] In the lost formworks of the present invention, the spacer means advantageously comprise the tierods of the nog structure with double insert, used and arranged in appropriate number and positions calculated by an expert in the art depending upon the characteristics of the casting and wall it is intended to build.

[0050] In said formwork construction elements, furthermore, the nog structure ensures correct positioning of the foamed plastic slab either in the presence of tensile stress (e.g. during concrete pouring), or in the presence of compressive stress (e.g. during operations of manufacture, transport, cutting and installation) of the formwork.

[0051] The construction element of the present invention, therefore, fulfills the dual advantageous function of tierod or strut.depending upon the type of stress, tractive or compressive, the foamed plastic slabs are subjected to.

[0052] In any case, in all the construction elements of the present invention the covering element can comprise both a layer of appropriate construction material such as for example plaster or cement, or of a material having fire-retarding or fire-resistant properties, such as for example combinations of non-woven fabric and bitumen, and another panel of wood, plaster board, rigid plastic, etc. having a decorative and/or a structural function.

[0053] Depending upon the covering element selected, whether having structural characteristics or not, the construction elements may advantageous have bearing characteristics, i.e. be able to support independently possible static loads applied thereon.

Brief description of the drawings

[0054] The characteristics and advantages of the invention will be more readily apparent from the description of some embodiments thereof, given below by way of non-limiting example with reference to the annexed drawings, wherein:

- Figure 1 shows a perspective and partially cross sectioned view of a construction element, in particular a lost formwork in accordance with the present invention;

- Figures 2 to 8 show perspective views in enlarged scale of alternative embodiments of some details of

the sectional nog structure of FIG. 1;

- Figures 9 and 10 show side views in enlarged scale and partial cross section of alternative embodiments of the sectional nog structure of FIG. 1;

- Figure 11 shows a perspective and partially cross sectioned view of an additional embodiment of the lost formwork in accordance with the present invention.

Detailed description of the preferred embodiments

[0055] With reference to the figures, reference number 1 indicates as a whole a sectional nog structure making part of a construction element in accordance with the present invention.

[0056] According to a first embodiment thereof, illustrated in figure 1, the sectional nog structure 1 is inserted in a lost formwork indicated as a whole by 7 and comprises a pair of opposed inserts 2, 3 mutually connected at a predetermined distance by a metal tierod 4.

[0057] The metal tierod 4 has in turn a predetermined length, determinable in advance during design depending upon the wall thickness it is desired to manufacture by means of the formwork 7.

[0058] The inserts 2 and 3 are obtained in a known manner by molding and are of thermoplastic material, e.g. and preferably polyethylene.

[0059] Said inserts comprise respective bodies 8, 9, substantially cylindrical, having at one end flattened bases 10, 11 an at the opposite free end a truncated cone tapering, designed to aid their insertion in the foamed plastic slabs 5 and 6.

[0060] Blind holes 12, 13 are also axially formed in said bodies 8, 9 in which opposite threaded ends 4a, 4b of the metal tierod 4 are engaged by screwing.

[0061] In order to fasten stably the inserts 2, 3 to the slabs 5, 6 of foamed plastic in which they are flush-insertable, the inserts are advantageously provided with threads 14, 15 integral with their bodies 8, 9 and which aid at the same time their insertion by screwing into the foamed plastic slab.

[0062] Preferably, a substantially cross-shaped recess 16 is formed in the bases 10, 11 to receive a tool, not shown, for screwing the inserts 2, 3 into the respective slabs 5, 6 of foamed plastic and on the respective opposed ends 4a, 4b of the metal tierod 4.

[0063] The bases 10, 11 are also equipped - as better illustrated in figure 3 - with a plurality of stakes, all indicated by 17, integral with the inserts 2, 3 and extending perpendicularly therefrom.

[0064] The stakes 17 constitute respective means designed to allow anchoring of a covering layer to the slabs 5 and 6 of foamed plastic.

[0065] In the lost formwork 7 of figure 1, the stakes 17 support a plastic net 18, e.g. of polyethylene or fiber glass, fixed thereto in a known manner e.g. by heat welding.

[0066] In accordance with the present invention, the lost formwork 7 also comprises a plurality of horizontal and vertical metal reinforcing rods 19, 20, fixed in a known manner to the metal tierod 4 of the nog structure 1 and designed to reinforce a concrete casting poured in a hollow space 21 defined between the two foamed plastic slabs 5, 6.

[0067] In an alternative embodiment illustrated in figure 10, the nog structure 1 is equipped with means which facilitate installation and positioning of the horizontal metal rods 19 before the concrete cast.

[0068] Preferably, the above means comprise one or more eyes 43, integral with and spaced apart along the metal tierod 4, in which the horizontal metal rods 19 are inserted and subsequently fixed, e.g. welded.

[0069] Advantageously, the lost formwork 7 allows to provide bearing walls of the so-called "continuous" type, quake-proof, having a thickness determined during design and provided on-site by prearranging tierods 4 of appropriate length.

[0070] To this end, the width of the hollow space 21 of the lost formwork 7 may vary from 6 to 180 cm.

[0071] In the lost formwork 7, furthermore, the slabs 5, 6 fulfill the dual function of containing the concrete casting and, once the covering elements have been applied, acting as thermoacoustic insulation elements.

[0072] Additionally, in order to provide an adequate endurance to the casting, the nog structures 1 are arranged in checkerboard design at predetermined distances, variable between 15 cm and 60 cm for the entire length and width of the lost formwork 7.

[0073] Preferably, the so-called "external" slab of the formwork, i.e. that supporting a covering element which covers the external part of a building, has a thickness from 5 to 15 cm, while the "internal" slab has a thickness of from 3 to 5 cm.

[0074] In accordance with another advantageous feature of the present invention, the lost formwork 7 can be either assembled at the building site immediately before pouring the concrete, or preassembled at the works with or without the plastic net 18 before the installation operations.

[0075] In both cases, the lost formwork 7 can be assembled by forming in advance a cage comprising the rods 19, 20 and the metal tierods 4 mutually welded together and then associating to the cage the foamed plastic slabs 5, 6 by screwing the inserts 2 and 3 onto the threaded ends 4a, 4b of the tierods 4.

[0076] Advantageously, moreover, the modular characteristics of the nog structure 1 allow to disassemble and re-use, after hardening of the concrete casting, one of the foamed plastic slabs 5, 6 by merely unscrewing the inserts mounted in the slab which it is desired to recover.

[0077] Additional embodiments of inserts particularly suited for use in a double-wall construction element such as e.g. the lost formwork 7 illustrated above, are

shown in figures 2, 6, 7 and 8 in which reference is made for convenience of discussion only to the nog 2.

[0078] Figure 2 shows in particular an insert having a flattened base 10 equipped with lightening holes 22 designed to aid penetration and fastening of a plaster covering layer.

[0079] In this embodiment, the thickness of the base 10 is chosen in such a way as to receive and adequately retain self-threading screws, not shown, for supporting a rigid covering element, e.g. a plaster board, also not shown.

[0080] The insert 2 shown in figure 6 comprises a pair of parallel eyes 23, 24 forming respective bridge elements protruding from the base 10, which constitute respective fastening means for the net 18.

[0081] This embodiment of the insert is particularly useful in cases where the net 18 of the covering layers comprises stretched metal or electrically welded metal wires.

[0082] In the insert 2 shown in figure 7, a supporting element 25, substantially U-shaped, is provided, including opposed parallel arms 26, 27 extending longitudinally in the insert 2 and a base portion 28 defining an eye extending and projecting from the base 10.

[0083] Said arms 26, 27 are in turn equipped with respective ends projecting from the insert body 8 on the side opposite the base 10 and designed to be embedded in the concrete casting poured in the hollow space 21 of the lost formwork 7.

[0084] The nog structure 1 incorporating such an insert is advantageously capable of supporting a stony slab, such as marble or granite, or a slab of some other material of considerable weight.

[0085] In the nog structure incorporating at least one insert 2 of the type shown in figure 8 in which the hole 12 is a passing hole, the metal tierod 4 may project from the base 10 for a predetermined portion of its own threaded end 4a.

[0086] In this case, the means for fixing an appropriate covering element to the foamed plastic slab advantageously consist of the projecting end of the metal tierod 4.

[0087] Thus, for example, it is possible to fix to said end a metal net which is subsequently embedded in a layer of plaster.

[0088] In another embodiment, shown in figure 11, a nog structure 1 incorporating inserts of the type shown in figure 8 allows to provide a lost formwork 7 in which another foamed plastic slab 57 is placed between the slabs 5 and 6.

[0089] In this embodiment, the intermediate slab 57 is supported in a plane of symmetry of the lost formwork 7, so as to divide the hollow space 21 in two adjacent equal and symmetrical portions 21a, 21b.

[0090] The lost formwork 7 thus structured finds a preferred use in the construction of peripheral walls for row houses, where it allows an exact apportionment of the dividing wall of adjacent houses.

[0091] In this embodiment of the nog structure, an annular shoulder 58 is preferably formed in a median position on the metal tierod 4, so as to form opposite stop means for a pair of inserts 59, 60 positioned on opposite sides of the intermediate slab 57.

[0092] Thanks to the presence of a passing hole, said inserts can be screwed into the intermediate slab 57 and at the same time run on the metal tierod 4 until abutting against the annular shoulder 58.

[0093] In the lost formwork described above, the sectional nog structure 1 also exerts the further advantageous function of holding in position the intermediate slab 57 both during transport and installation, as well as during the concrete casting into the adjacent hollow spaces 21a, 21b.

[0094] In another embodiment of the present invention, not shown, the sectional nog structure 1 described above may be advantageously used, thanks to its own modular characteristics, in the manufacture of double-wall construction elements in which the bearing structural element - placed between the foamed plastic slabs 5, 6 - is not a concrete casting but a different supporting element such as e.g. one or more H-beams.

[0095] Construction elements of this type are represented e.g. by the composite walls for industrial sheds, comprising a pair of foamed plastic slabs mutually spaced and stiffened by a plurality of H-beams conferring to the walls the necessary mechanical strength.

[0096] The nog structure making part of the construction element of the present invention provides in this case inserts equipped with means capable of supporting a covering layer or a panel (e.g. the inserts shown in figures 2, 3 or 8) on the internal slab and inserts equipped with means capable of supporting a suitably shaped section or plate on the external slab.

[0097] An insert 2 particularly suited to this end is shown in figure 4.

[0098] It comprises a block or riser 29, integral with the base 10 and having transversely passing holes 30, 31 for receiving self-threading screws, not shown, for fastening a shaped plate.

[0099] Advantageously, it is also possible to form - with an appropriate arrangement of said passing holes - an airspace between the plate and the external foamed plastic slab, with a further increase in the thermoacoustic insulation characteristics of the construction element ("self-ventilated" wall).

[0100] The insert 2 shown in figure 5, comprising a plurality of blocks or risers 32a - 32d forming a cross and having respective transverse passing holes 33a - 33d, allows to fasten appropriate covering panels and covering elements used for building the so-called "floating floors".

[0101] From the foregoing description and discussion the advantages of the present invention are evident.

[0102] In accordance with a first advantageous feature, the construction element according to the present invention allows to combine the inserts and tierod ver-

sions best suited to manufacture the desired construction element.

[0103] The combinableness of the nog structure also allows to associate a number of foamed plastic slabs, equal to or different from one another, so as to form construction elements having the desired characteristics.

[0104] In all its embodiments, moreover, the construction elements of the present invention are of the modular type and can be dimensioned so as to facilitate as much as possible the operations of assembly, transportation and final installation on site.

[0105] Thanks to the presence of the bases accessible from the outside of the slabs and, optionally, of appropriate fastening means, the nog structure of the present invention advantageously allows to support any covering element for the foamed plastic slab or slabs, whether in the form of a panel or of a layer of appropriate material.

[0106] In all its embodiments, moreover, the construction element of the present invention exhibits optimal characteristics of tensile and compressive strength, as well as high thermoacoustic insulation characteristics.

[0107] Thanks to its extreme structural simplicity and large use of plastic, the construction elements of the present invention can be mass produced and assembled at low cost with techniques widely known and used in the art.

Claims

1. Construction element (7), in particular for manufacturing walls for buildings in general, comprising:

- a pair of foamed plastic slabs (5, 6), mutually associated at a predetermined distance by respective spacer means,
- at least one sectional nog structure (1) for fastening a covering element to said foamed plastic slabs (5, 6), said sectional nog structure (1) comprising at least a pair of opposite inserts (2, 3), mutually connected at a predetermined distance by a tierod (4) and flush-insertable in said slabs (5, 6,), at least one of said inserts (2, 3) being equipped with respective means accessible from the outside of the slabs (5, 6) for fastening said covering element to the slabs, and
- a plurality of metal reinforcing wires supported by said sectional nog structure (1) between said foamed plastic slabs (5, 6)

characterized in that in use the reinforcing wires (19, 20) are vertical and horizontal and **in that** the inserts (2, 3) are removably or adjustably associated to one end of said tiered (4) by screwing means after hardening of concrete poured between the foamed plastic slabs (5, 6).

2. Construction element according to claim 1, **characterized in that** said screwing means comprises a hole (12, 13) formed in a substantially cylindrical body (8, 9) of said at least one insert (2, 3) removably or adjustably engaged on a threaded end (4a, 4b) of said tierod (4).

3. Construction element according to claim 1, **characterized in that** said spacer means comprise said sectional nog structure (1).

4. Construction element according to claim 1, further comprising a plastic net (18) for supporting at least one covering layer associated with at least one of said foamed plastic slabs (5, 6).

5. Construction element according to anyone of claims 1-4, further comprising a layer of plaster, cement or non-woven fabric and bitumen, on at least one of said foamed plastic slabs (5, 6).

6. Construction element according to claim 1, further comprising a plaster board, wood or marble covering panel on at least one of said foamed plastic slabs (5, 6).

7. Construction element according to anyone of claims 1-6, further comprising a foamed plastic slab (57) supported between said pair of foamed plastic slabs (5, 6) by means of said sectional nog structure (1).

8. Construction element according to claim 7, further comprising a second pair of inserts (59, 60), flush-insertable in the foamed plastic slab (57) supported between said pair of foamed plastic slabs (5, 6), said second pair of inserts (59, 60) being supported by said tierod (4) at median portion thereof.

9. Construction element according to anyone of the preceding claims, **characterized in that** at least one of said inserts (2, 3) comprises a substantially cylindrical portion (8, 9) externally provided with slab fastening means for fastening said at least one insert (2, 3) to said foamed plastic slabs (5, 6).

10. Construction element according to claim 9, **characterized in that** said slab fastening means comprises a thread (14, 15) integral with said substantially cylindrical portion (8, 9).

11. Construction element according to anyone of the preceding claims, **characterized in that** the means for fastening the covering element to the slabs (5, 6) extend from a base (10), formed at one end of said at least one insert (2, 3), accessible from the

outside of the slabs (5, 6).

12. Construction element according to claim 11, **characterized in that** said fastening means comprise a supporting element (25), substantially U-shaped, including opposite arms (26, 27) removably engaged in said insert (2, 3) and a base portion (28) defining an eye-shaped supporting element projecting from said base (10) .

13. Construction element according to claim 11, **characterized in that** said means for fastening the covering element to the foamed plastic slabs (5, 6) comprises a plurality of stakes (17) integral with and extending from said base (10).

14. Construction element according to claim 11, **characterized in that** said means for fastening the covering element to the foamed plastic slabs (5, 6) comprises at least one block (29, 32a-32d) integral with said base (10).

15. Construction element according to claim 11, **characterized in that** said means for fastening the covering element to the foamed plastic slabs (5, 6) comprises at least one eye (23, 24) forming a bridge element extending in a projecting manner from said base (10).

16. Construction element according to claim 11, **characterized in that** said means for fastening the covering element to the foamed plastic slabs (5, 6) comprises an end portion of said tierod (4).

17. Construction element according to anyone of the preceding claims, further comprising means (43) for associating said horizontal metal reinforcing wires (19) to said tierod (4).

Patentansprüche

1. Konstruktionselement (7), insbesondere zum Errichten von Gebäudemauem im allgemeinen, mit:

- einem Paar Kunststoffschaumplatten (5, 6), miteinander verbunden in einem vorbestimmten Abstand durch entsprechende Abstandshaltermittel,

- mindestens einer zerlegbaren Struktur (1) zur Befestigung eines Verkleidungselements an besagten Kunststoffschaumplatten (5, 6), wobei besagte zerlegbaren Struktur (1) mindestens ein Paar gegenüberliegende Einsatzelemente (2, 3) aufweist, die in einem vorbestimmten Abstand durch eine Verbindungsstange (4) miteinander verbunden und in besagte Platten (5. 6) bündig einsetzbar sind, wobei mindestens eines der besagten Einsatzelemente (2, 3) ein entsprechendes von der Außenseite der Platten (5, 6) zugängliches Mittel zur Befestigung des besagten Verkleidungselements an den Platten aufweist, und

- einer Vielzahl von metallenen Verstärkungsdrähten, die von der zerlegbaren Struktur (1) zwischen besagten Kunststoffschaumplatten (5, 6) getragen werden,

dadurch gekennzeichnet, daß
die Verstärkungsdrähte (19, 20) bei Verwendung senkrecht und waagerecht sind und daß die Einsatzelemente (2, 3) nach dem Aushärten des Betons, der zwischen die Kunststoffschaumplatten (5, 6) gegossen wird, abnehmbar oder verstellbar über ein Schraubelement mit einem Ende der besagten Verbindungsstange (4) verbunden sind.

2. Konstruktionselement nach Anspruch 1, **dadurch gekennzeichnet, daß** besagtes Schraubelement eine Öffnung (12, 13) aufweist, die in einem im wesentlichen zylinderförmigen Körper (8, 9) des besagten mindestens einen Einsatzelements (2, 3) ausgebildet ist, das abnehmbar oder verstellbar mit einem mit einem Gewinde versehenen Ende (4a, 4b) der Verbindungsstange (4) verbunden ist,.

3. Konstruktionselement nach Anspruch 1, **dadurch gekennzeichnet, daß** besagte Abstandshaltermittel besagte zerlegbare Struktur (1) aufweisen.

4. Konstruktionselement nach Anspruch 1, das weiterhin ein Kunststoffnetz (18) aufweist zur Stützung mindestens einer Verkleidungsschicht, die mit mindestens einer der besagten Kunststoffschaumplatten (5, 6) verbunden ist.

5. Konstruktionselement nach einem der Ansprüche 1 bis 4, das weiterhin eine , Schicht Putz, Zement oder ungewebten Stoff mit Bitumen auf mindestens einer der besagten Kunststoffschaumplatten (5, 6) aufweist.

6. Konstruktionselement nach Anspruch 1, das weiterhin ein Verputzbrett oder ein Verkleidungselement aus Holz oder Marmor auf mindestens einer der besagten Kunststoffschaumplatten (5, 6) aufweist.

7. Konstruktionselement nach einem der Ansprüche 1 bis 6, das weiterhin eine Kunststoffschaumplatte (57) aufweist, die zwischen dem besagten Paar Kunststoffschaumplatten (5, 6) durch die besagte zerlegbare Struktur (1) gestützt wird.

8. Konstruktionselement nach Anspruch 7, das weiterhin ein zweites Paar Einsatzelemente (59, 60) aufweist, das bündig einsetzbar in der Kunststoffschaumplatte (57) ist, die zwischen besagtem Paar Kunststoffschaumplatten (5, 6) gestützt wird, wobei besagtes zweites Paar Einsatzelemente (59, 60) von besagter Verbindungsstange (4) in deren Mitte gestützt wird.

9. Konstruktionselement nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** mindestens eines der besagten Einsatzelemente (2, 3) einen im wesentlichen zylinderförmigen Abschnitt (8, 9) aufweist, der außen mit einem Mittel zur Befestigung von Platten ausgestattet ist, um das besagte mindestens eine Einsatzelement (2, 3) an besagten Kunststoffschaumplatten (5, 6) zu befestigen.

10. Konstruktionselement nach Anspruch 9, **dadurch gekennzeichnet, daß** besagtes Mittel zur Befestigung von Platten ein Gewinde (14, 15) aufweist, das Bestandteil des besagten im wesentlichen zylinderförmigen Abschnitts (8, 9) ist.

11. Konstruktionselement nach einem der vorangehenden Ansprüche, **dadurch gekennzeichnet, daß** das Mittel zur Befestigung des Verkleidungselements an den Platten (5, 6) sich von einer Grundfläche (10) aus erstreckt, die an einem Ende des besagten mindestens einen Einsatzelements (2, 3) ausgebildet ist, und die von der Außenseite der Platten (5, 6) zugänglich ist.

12. Konstruktionselement nach Anspruch 11, **dadurch gekennzeichnet, daß** das besagte Mittel zur Befestigung ein im wesentlichen U-förmiges Stützelement (25) mit sich gegenüberliegenden Armen (26, 27) aufweist, die abnehmbar mit besagtem Einsatzelement (2, 3) verbunden sind, wobei das Stützelement einen Fußabschnitt (28) aufweist, der ein ösenförmiges Stützelement definiert, das aus besagter Grundfläche (10) herausragt.

13. Konstruktionselement nach Anspruch 11, **dadurch gekennzeichnet, daß** besagtes Mittel zur Befestigung des Verkleidungselements an den Kunststoffschaumplatten (5, 6) eine Vielzahl von Stiften (17) aufweist, die Bestandteil der besagten Grundfläche (10) sind und aus ihr herausragen.

14. Konstruktionselement nach Anspruch 11, **dadurch gekennzeichnet, daß** besagtes Mittel zur Befestigung des Verkleidungselements an den Kunststoffschaumplatten (5, 6) mindestens einen Block (29, 32a-32d) aufweist, der Bestandteil der besagten Grundfläche (10) ist.

15. Konstruktionselement nach Anspruch 11, **dadurch gekennzeichnet, daß** besagtes Mittel zur Befestigung des Verkleidungselements an den Kunststoffschaumplatten (5, 6) mindestens eine Öse (23, 24) aufweist, die als Brückenelement ausgebildet ist und die in überstehender Weise aus besagter Grundfläche (10) herausragt.

16. Konstruktionselement nach Anspruch 11, **dadurch gekennzeichnet, daß** besagtes Mittel zur Befestigung des Verkleidungselements an den Kunststoffschaumplatten (5, 6) einen Endabschnitt der besagten Verbindungsstange (4) aufweist.

17. Konstruktionselement nach einem der vorangehenden Ansprüche, das weiterhin ein Mittel (43) aufweist, um besagte waagerechte metallene Verstärkungsdrähte (19) mit besagter Verbindungsstange (4) zu verbinden.

Revendications

1. Elément de construction (7) destiné en particulier à la fabrication de parois de bâtiments en général, comprenant :

   - une paire de panneaux en matière plastique expansée (5, 6), reliés entre eux à une distance prédéterminée par des moyens d'écartement respectifs,
   - au moins un assemblage à cheville modulaire (1) destiné à fixer un élément de revêtement auxdits panneaux en matière plastique expansée (5, 6), ledit assemblage à cheville modulaire (1) comprenant au moins une paire d'inserts opposés (2, 3), reliés entre eux à une distance prédéterminée par un tirant d'assemblage (4) et encastrables dans lesdits panneaux (5, 6), l'un desdits inserts au moins (2,3) étant équipé de moyens respectifs accessibles de l'extérieur des panneaux (5, 6), afin de fixer ledit élément de revêtement aux panneaux, et
   - une pluralité de tringles de renfort en métal maintenues par ledit assemblage à cheville modulaire (1) entre lesdits panneaux en matière plastique expansée (5, 6)

   caractérisée en ce qu'à l'utilisation, les tringles de renfort (19, 20) sont verticales et horizontales, et **en ce que** les inserts (2, 3) sont reliés, de manière amovible ou réglable, à une extrémité dudit tirant d'assemblage (4) par des moyens de vissage, après la prise du béton versé entre les panneaux en matière plastique expansée (5, 6).

2. Elément de construction selon la revendication 1, **caractérisé en ce que** lesdits moyens de vissage

comprennent un trou (12, 13) formé dans un corps sensiblement cylindrique (8, 9) dudit au moins un insert (2, 3) engagé, de manière amovible ou réglable, sur une extrémité filetée (4a, 4b) dudit tirant d'assemblage (4).

3. Elément de construction selon la revendication 1, **caractérisé en ce que** lesdits moyens d'écartement comprennent ledit assemblage à cheville modulaire (1).

4. Elément de construction selon la revendication 1, comprenant en outre un treillage en plastique (18) afin de supporter au moins une couche de revêtement reliée à au moins un desdits panneaux en matière plastique expansée (5, 6).

5. Elément de construction selon l'une quelconque des revendications 1 à 4, comprenant en outre une couche en plâtre, en ciment ou en textile non-tissé et bitume, sur au moins un desdits panneaux en matière plastique expansée (5, 6).

6. Elément de construction selon la revendication 1, comprenant en outre un panneau de revêtement en plaque de plâtre, en bois ou en marbre, sur au moins un desdits panneaux en matière plastique expansée (5, 6).

7. Elément de construction selon l'une quelconque des revendications 1 à 6, comprenant en outre un panneau en matière plastique expansée (57) maintenu entre ladite paire de panneaux en matière plastique expansée (5, 6) au moyen dudit assemblage à cheville modulaire (1).

8. Elément de construction selon la revendication 7, comprenant en outre une seconde paire d'inserts (59, 60), encastrables dans le panneau en matière plastique expansée (57) maintenu entre ladite paire de panneaux en matière plastique expansée (5, 6), ladite seconde paire d'inserts (59, 60) étant maintenue par ledit tirant d'assemblage (4) au niveau de la partie médiane de ce dernier.

9. Elément de construction selon l'une quelconque des revendications précédentes, **caractérisé en ce que** l'un desdits inserts au moins (2, 3) comprend une partie sensiblement cylindrique (8, 9) munie, à l'extérieur, de moyens de fixation au panneau afin de fixer ledit au moins un insert (2, 3) auxdits panneaux en matière plastique expansée (5, 6).

10. Elément de construction selon la revendication 9, **caractérisé en ce que** lesdits moyens de fixation au panneau comprennent un filetage (14, 15) intégré à ladite partie sensiblement cylindrique (8, 9).

11. Elément de construction selon l'une quelconque des revendications précédentes, **caractérisé en ce que** les moyens destinés à fixer l'élément de revêtement aux panneaux (5, 6) s'étirent à partir d'une base (10), formée à une extrémité dudit au moins un insert (2, 3), accessible de l'extérieur des panneaux (5, 6).

12. Elément de construction selon la revendication 11, **caractérisé en ce que** lesdits moyens de fixation comprennent un élément de support (25), sensiblement en forme U, comportant des branches opposées (26, 27) engagées de manière amovible dans ledit insert (2, 3), et une partie de base (28) définissant un élément de support en forme d'oeil dépassant de ladite base (10).

13. Elément de construction selon la revendication 11, **caractérisé en ce que** les moyens destinés à fixer l'élément de revêtement aux panneaux en matière plastique expansée (5, 6) comprennent une pluralité de pointeaux (17) intégrés à ladite base (10) et s'étirant à partir d'elle.

14. Elément de construction selon la revendication 11, **caractérisé en ce que** lesdits moyens destinés à fixer l'élément de revêtement aux panneaux en matière plastique expansée (5, 6) comprennent au moins un bloc (29, 32a à 32d) intégré à ladite base (10).

15. Elément de construction selon la revendication 11, **caractérisé en ce que** lesdits moyens destinés à fixer l'élément de revêtement aux panneaux en matière plastique expansée (5, 6) comprennent au moins un oeil (23, 24) formant un élément en portique qui s'étire en dépassant de ladite base (10).

16. Elément de construction selon la revendication 11, **caractérisé en ce que** lesdits moyens destinés à fixer l'élément de revêtement aux panneaux en matière plastique expansée (5, 6) comprennent une partie d'extrémité dudit tirant d'assemblage (4).

17. Elément de construction selon l'une quelconque des revendications précédentes, comprenant en outre des moyens (43) destinés à relier lesdites tringles de renfort en métal horizontales (19) audit tirant d'assemblage (4).

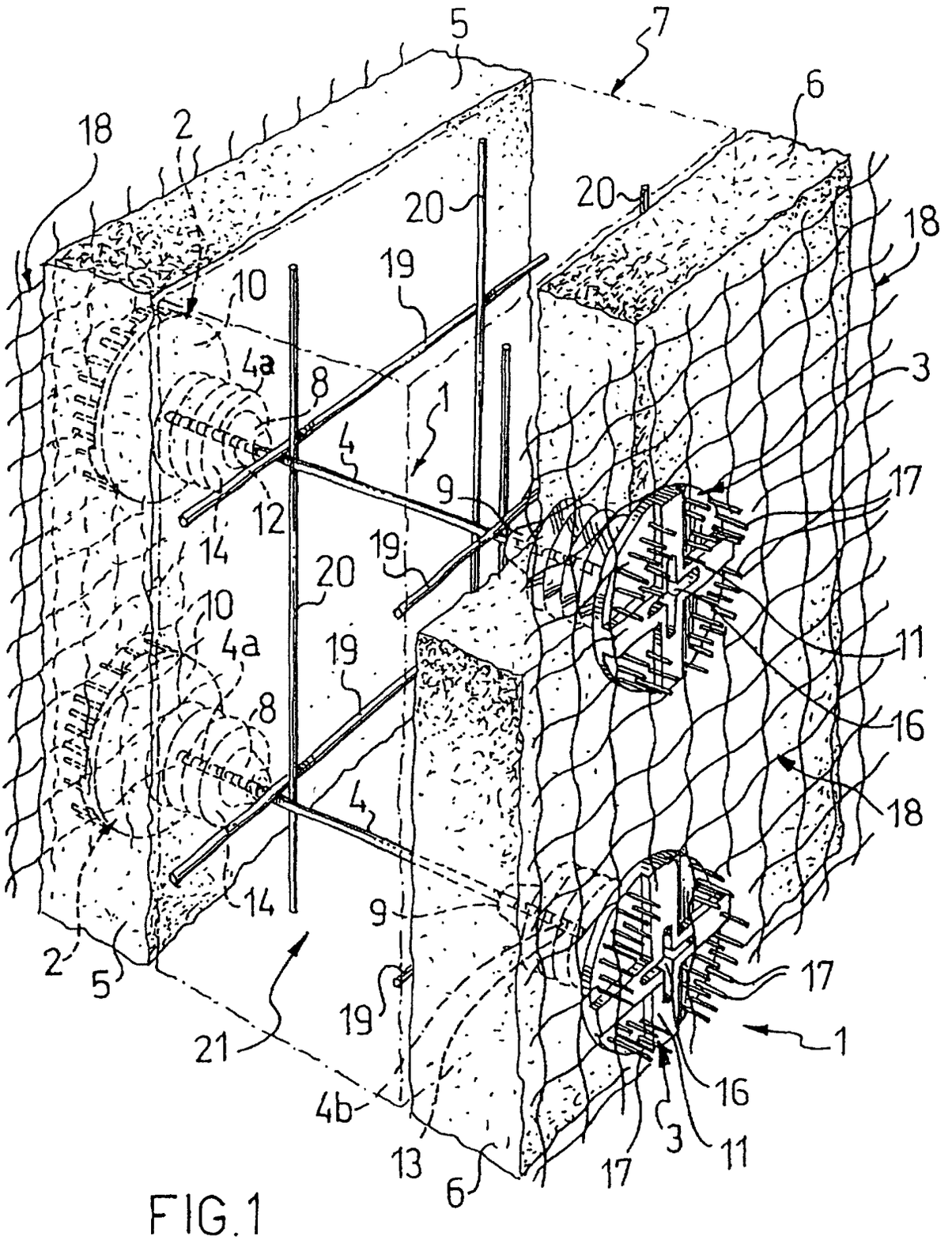

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FIG.1

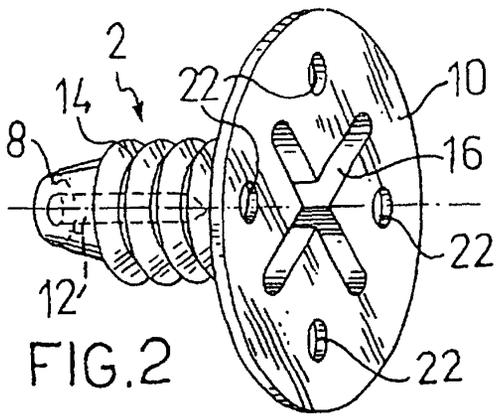


FIG.2

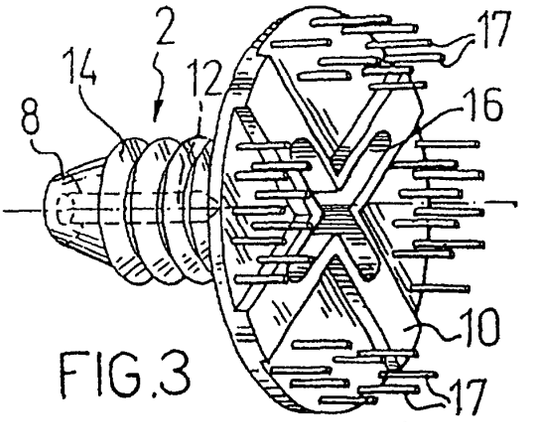


FIG.3

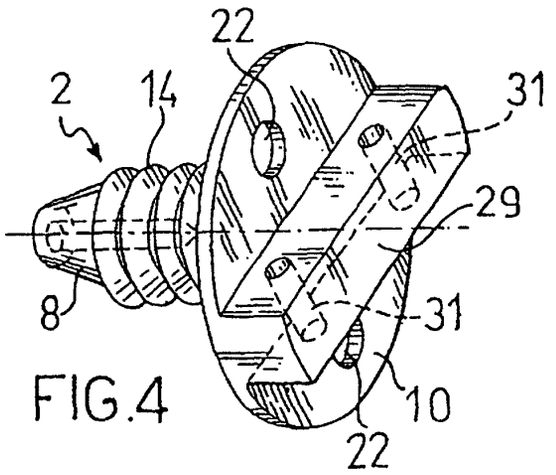


FIG.4

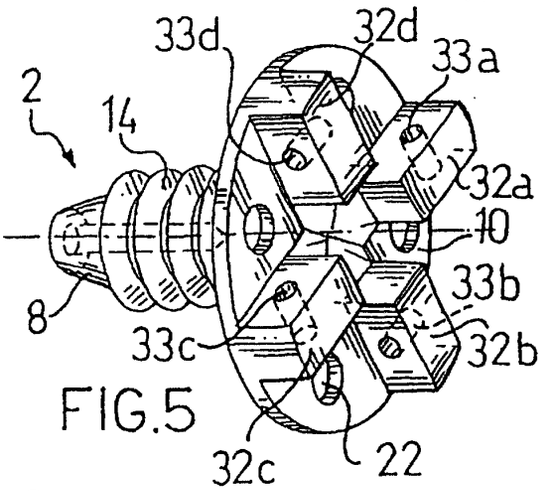


FIG.5

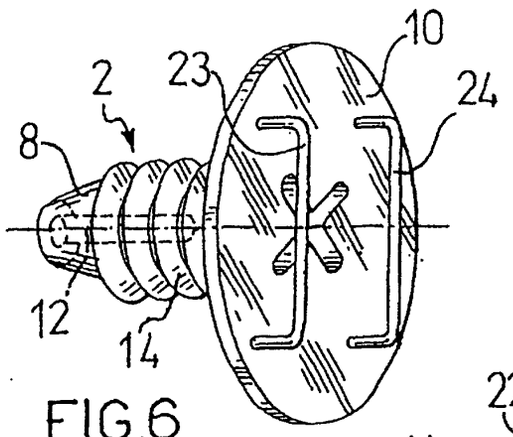


FIG.6

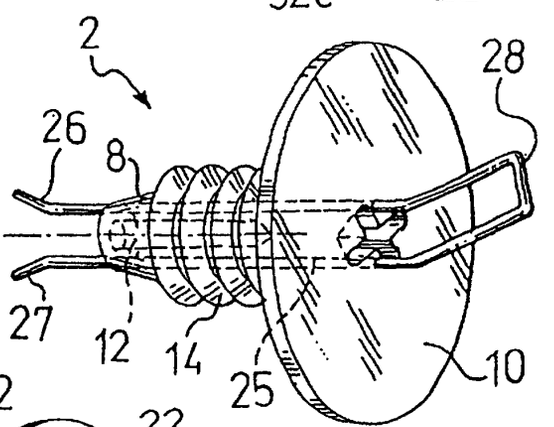


FIG.7

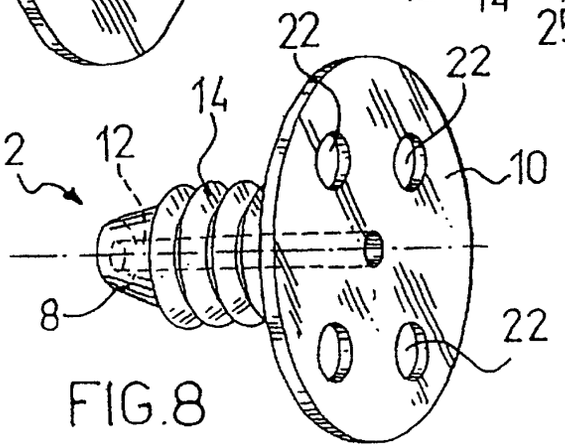


FIG.8

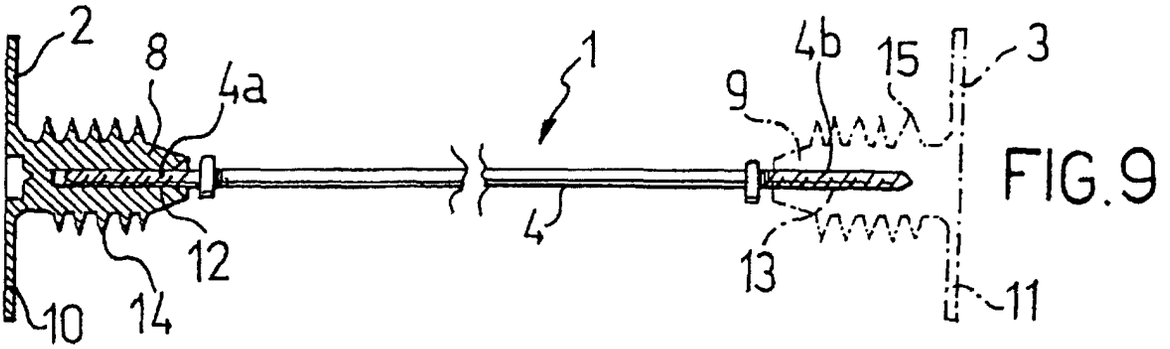


FIG.9

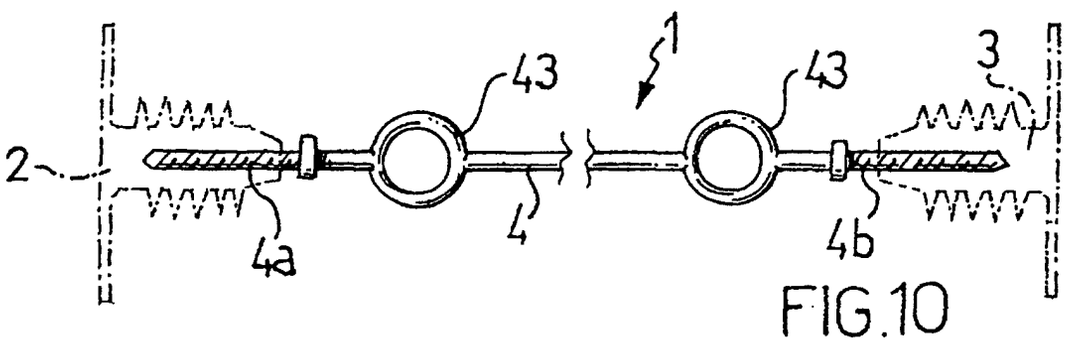


FIG.10

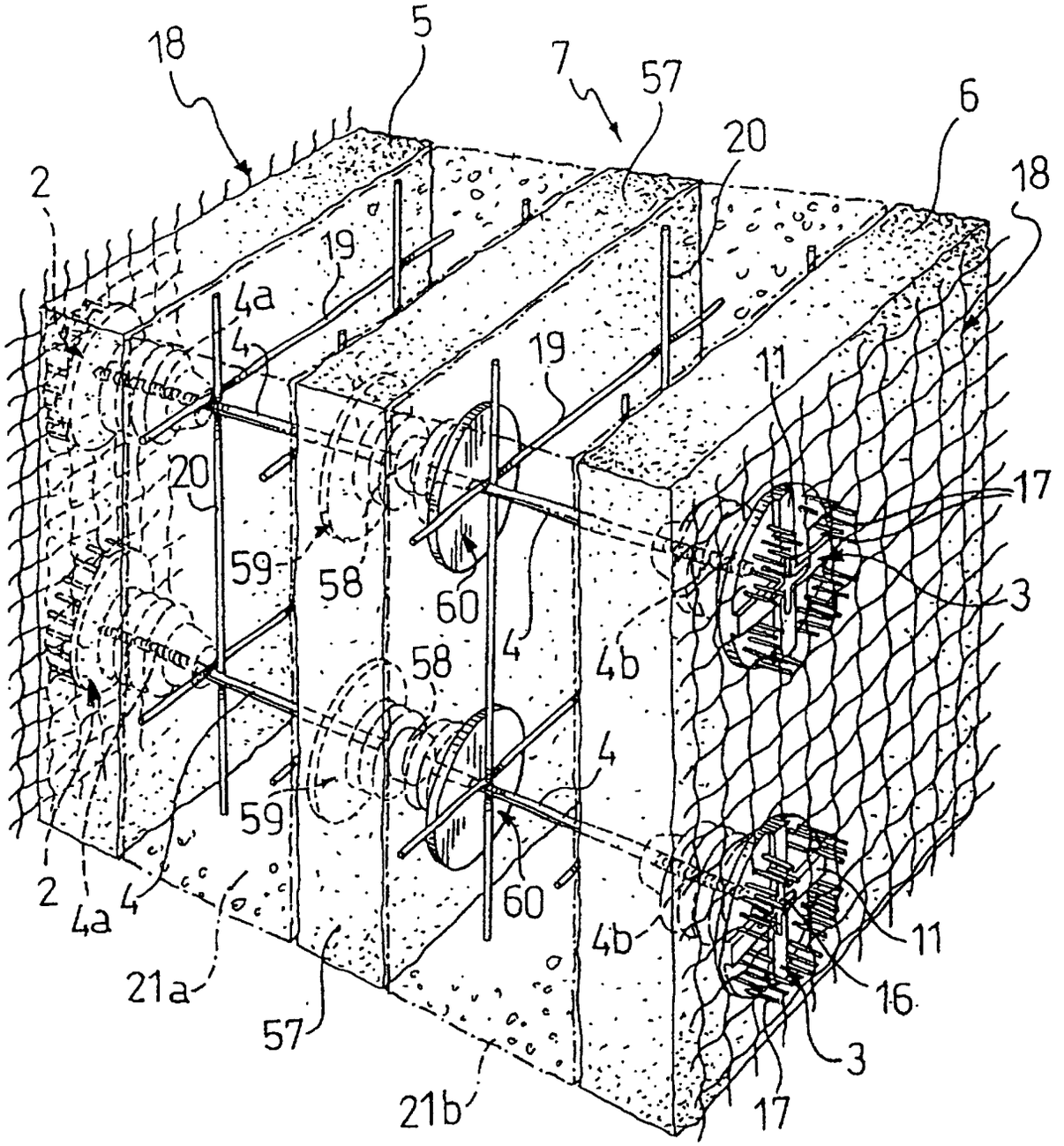

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FIG.11