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(54) Constructive element and method for producing said constructive element

(57) The constructive element comprises: a) a permanent formwork constituted by a pair of separate semi-forms, facing each other and defining a hollow space between them; b) a construction setting material arranged inside said hollow space; and c) auxiliary installations. In one aspect, each semi-form consists of a metal plate fitted with protuberances projecting from one side of the metal plate towards the construction setting material, and with slots housing said auxiliary installations. In another aspect, each semi-form consists of a plastic plate, wherein one of the plastic plates is fitted with protuberances and the other plastic plate is fitted with slots. The method comprises a) arrangement of the auxiliary installations in the slots; and b) arrangement of two semi-forms and subsequent filling with the construction material until it sets; and optionally connecting the systems and/or installing of the coating elements.

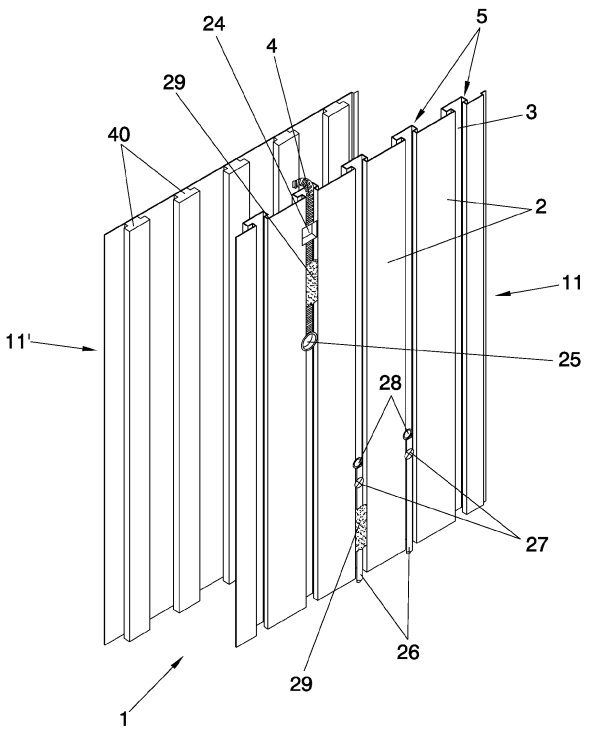

FIG. 1

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Description

OBJECT OF THE INVENTION

[0001] The invention can be included in the technical field of construction, specifically in the field of construction systems and elements.

[0002] The object of the present invention relates to a constructive element which can be manufactured in a particularly fast and efficient manner, and also provides precision in its finishing.

BACKGROUND OF THE INVENTION

[0003] There are plenty of precedents in the field of construction systems and of the materials used, as it is public knowledge that, in the most developed countries, activities related to construction constitute the main engine of the economy.

[0004] In any case, the higher the degree of development of a country, the higher the scarcity of labour force and, consequently, solutions which permit the saving of labour force are welcome, whether by mechanizing the construction processes, or by improving the performance of all the activities which take part in construction. Therefore, there is the trend of referring certain processes to integral manufacturing plants for prefabricated elements which can be easily and efficiently used in the civic work where they are required. On the other hand, development itself further involves compliance with ever more demanding regulations due to reasons of security, comfort and respect for nature.

[0005] Prefabricated elements nowadays play central roles in the construction of all buildings, whether they be for the structural work or for the complementary formation works such as roofs, retaining walls or partitions of all types.

[0006] This use of prefabricated elements normally requires complementary operations for surface finishing or for the formation of grooves intended to house the usual water, electricity, television wiring or other similar systems. In that sense, lightweight material panels are known which have built-in pipes, cable trays, connection boxes and other complements which facilitate the building work.

DESCRIPTION OF THE INVENTION

[0007] A first object of the present invention is constituted by the provision of a constructive element of the wall or partition type, which can be built with greater efficiency, speed and perfection in the finishing than those constructive elements described in the state of the art.

[0008] A second object of the present invention is constituted by a method for building said constructive element.

[0009] Therefore, in a first aspect of the invention, a constructive element is described which comprises a construction setting material arranged inside a permanent formwork, wherein said permanent formwork is adapted in its geometry to remain solidly attached to the construction material during the setting of said construction material.

[0010] The permanent formwork is constituted by a pair of semi-forms, equipped with fastening protuberances and/or recesses to the construction material. The semi-forms are arranged facing each other, and the construction setting material is poured between said semi-forms.

[0011] The protuberances and recesses define slots which comply with the favourable functions of:

- Provide fastening during the setting of the construction material between said construction material and the semi-forms, by holding said semi-forms together with the construction material;
- Provide a means of holding and fastening for different coating elements used in each case for finishing of the constructive element, by allowing the insertion of a respective collaborating fitting in the inner space of each slot in the anchoring of said coating elements;
- Permit the insertion of a wooden bar into said slots to achieve wooden, outer and inner finishing, screwing or nailing coating elements to said bars;
- Permit the passage of systems such as electrical, plumbing, telephone, etc. systems;
- Permit the placement of anchor clips to attach the construction systems of ventilated façades;
- All types of finishing, such as plaster sheets, door and window frames, etc., can be screwed onto the semi-forms with self-tapping screws;
- Permit the anchoring, fastening, attaching, nailing or screwing of all types of surface finishing elements on the outer part of the semi-forms, which a considerable saving in time and labour force with respect to the conventional techniques;
- Additionally, the space provided by the recesses and the protuberances, regardless of the cross-sectional configuration that they adopt, besides providing the aforementioned effects, can be used as channelling to house any type of piping, duct, wiring or such like, or any other element associated with those different services and supplies, so that in addition to permitting an easy and quick installation of these types of elements, it guarantees a suitable protection thereof.

[0012] The protuberances and recesses can have extremely varied cross-sections, both of regular and irregular geometries, and can consequently be rectangular, circular, trapezoidal or of any other shape, leaving an inner space large enough to allow the insertion of the aforementioned anchoring fittings of coating elements, of the profile-type or of any other configuration. The anchoring fittings can be solidly joined to respective internal fittings with the assistance of pin bolts, screws or such

like which, passing through a frontal aperture, are nailed to the corresponding internal fitting.

[0013] In accordance with another preferred embodiment, the recesses and the protuberances are used to anchor external fittings with the aid of pin bolts or screws which pass through the longitudinal apertures and whose heads, of a larger diameter than said aperture, are housed inside.

[0014] According to another preferred embodiment, the recesses and the protuberances permit the application of intermediate spacers which keep the separation between the semi-forms of both faces constant, in accordance with the thickness planned for the wall or partition to be built. If you move away from what is described, the use of semi-forms according to the invention permits an improvement of the building of constructive elements, such as walls and partitions object of the invention, simplifying the construction operations and considerably reducing the time invested in such operations, while at the same time providing flat surfaces, duly prepared to receive and fasten the coating and finishing elements provided for to finish the building work.

[0015] According to a preferred embodiment of the invention, the semi-forms are materialized in metal plates, such as black plates, zinc-coated plates, galvanized plates, lacquered plates, plastic-coated plates, or any other of similar nature, of a thickness which is preferably between 0.50 and 0.75 mm, shaped as is usual in this state of the art, for example by folding or drawing. In this case, the protuberances and recesses are defined in the plate by means of the shaping method itself, whether it is folding, drawing or any of those known and usually used in the state of the art. Each metal plate is fitted with protuberances projecting from one side of the metal plate towards the construction setting material, and with slots defined in correspondence with said protuberances in the other side of said metal plate, said slots housing auxiliary installations.

[0016] Preferably, in the case of semi-forms manufactured from metal plate, said semi-forms can incorporate stiffening projections which, similar to the protuberances and the recesses, can be shaped by drawing or folding, preferably, and which provide said semi-forms with greater rigidity and strength. Preferably, the stiffening projections feature rectangular forms or substantially smaller dimensions to those of the protuberances and the recesses.

[0017] According to a second preferred embodiment of the invention, the semi-forms are constituted by plates built from plastic (preferably polymeric) materials, reinforced or not, such as polyester fibre glass, PVC, etc. One of the semi-forms is fitted with protuberances projecting from one side of the plastic plate, and the other semi-form is fitted with slots housing said auxiliary installations.

[0018] In the case of semi-forms built with plastic plates, the recesses, both inner and outer, can be created in the manufacturing process of the semi-form, through casting or any of the methods usually used in the state of the art. In the same manner, the protuberances can be materialized by bars, preferably wooden, fastened innerly to the semi-forms. The shape (trapezoidal or operationally equivalent) of the cross-section of the bars permits a fastening between the semi-form, the bar and the construction material wherefrom the wall or partition is manufactured.

[0019] Also alternatively, in the case of semi-forms manufactured with plates of plastic material, said plates can be hollow and be filled with a water-proof agglomerate.

[0020] As has been previously stated, a second object of the invention is constituted by a method for producing wall or partition type constructive elements by using the aforementioned semi-forms.

[0021] The method comprises three main stages, in addition to a preliminary production stage (which does not constitute an object of the present invention) of a construction project with its plans and details for the redesign. That defines the measurement of the formwork to be used and the design of the systems which must run through each one of the constructive elements.

[0022] In the first phase, the semi-forms positioned on the floor are comfortably worked with so that the planned systems (electric, water, communications channelling, etc.) can be placed in the corresponding slots, subsequently securing them by casting a polyurethane foam filling or similar product. It is implied that said systems are preferably vertical, even though it is possibly advisable to make a cut to place, depending on dimensions, the cable box, mechanism box, or some horizontal or oblique channelling of short length. That is based on the physical design of the semi-forms which, as is known, have the slots in the vertical direction. In the upper or lower part, as applicable, the appropriate instalments will be left for the subsequent connections which will run through a false ceiling or floating floor.

[0023] To finish up this first phase the necessary fittings must be placed in the slots which will eventually serve to reinforce the coating and finishing elements planned in the project.

[0024] The first phase being completed, the second phase is carried out, which consists of lifting the semi-forms with all of the systems and fittings built-in during the first phase, until positioning them vertically and using them traditionally as permanent formworks. The semi-forms are arranged in pairs to define both sides of the constructive elements, supporting them on foundation bases, securing them vertically with braces, or in whatever is considered advisable, and securing the distance between semi-forms with spacing elements, with the purpose of the idea that filling them with the filling material (concrete, lightweight mortar or plastic foams, for example) will maintain both the verticality and the distance between the semi-forms, which are decisive in the final finishing.

[0025] Lastly, once a necessary setting for the con-

structive element to acquire the suitable consistency and strength has been produced, the third phase is started, which comprises, in the first place, completing the electricity, water, communications or any other type of systems and, following this, placing the coating elements planned for the project, attaching them as specified in each case by means of nails, lag screws, screws/nuts, etc.

[0026] This way of proceeding in the construction system which is the object of the invention featured herein has a series of advantages with respect to other more traditional methods. The main advantage is the cheapening of the final product stemming from the important reduction in labour force costs as a consequence of the quickness with which the building is carried out.

[0027] Furthermore, the programming, the meticulous preparation of the work to be done and the quickness of the construction have a direct impact on the improvement in efficiency, on the overall performances and on the decrease in the financial costs.

[0028] Additionally, the method of the invention stands out in that it reduces transportation costs, as one only needs to stock up on the semi-forms, finishing materials and system fittings; the construction material, such as mortar or such like, is supplied in cement mixers and is pumped, which means that when fillings based on lightweight mortars and polyurethane foams are used, the total loads are less than those of the traditional construction systems.

[0029] The use of the semi-forms permits an accurate preparation of hollow spaces, windows and doors which are perfectly built, including anchors, and avoiding the use of frames in doors and windows.

[0030] As an added advantage, it must be pointed out that the semi-forms themselves provide not only the waterproofing of the façades but also noticeable improvements from the acoustic and thermal standpoints.

[0031] The use of radial systems is particularly interesting. In said radial electrical systems, the main switchboard, as well as all of the wiring in the housing or, in general, in the building, arrives in the workshop already prepared, the terminals for the wires having been installed and duly numbered, so that the on site installation can be carried out by the workers themselves, since the route and installation of each wire is specified in a plan. This radial electrical installation system achieves an improvement in quality of installation, as well as a savings in labour force and, in general, in costs.

BRIEF DESCRIPTION OF THE DRAWINGS

[0032]

Figure 1 shows two semi-forms facing each other and arranged in vertical position

Figure 2 shows a perspective view of a semi-form manufactured from metal plate which comprises stiffening projections inserted between the protuberances.

Figures 3a and 3b shows two examples of preferred embodiment wherein the semi-form is constituted by a plate of plastic material filled with a water-proof agglomerate, in a first case, (fig. 3a) equipped with recesses and, in a second case, (fig. 3b) equipped with bars in the form of protuberances.

Figure 4 represents the general arrangement of the different elements which take part in the forming and concreting process for the formation of a partition.

Figure 5 represents the final phase of the constructive method, wherein the auxiliary structures are eliminated and the inner and outer surfaces are coated according to the type of finishing chosen. In this case, coating tiles have been decided upon on the outer and plaster on the inner.

PREFERRED EMBODIMENTS OF THE INVENTION

[0033] As has been previously mentioned, the detailed description of the forms of preferred embodiment of the constructive element of the invention and of the production method of said construction method is going to be carried out in the following with the help of the attached drawings, wherethrough these drawings use the same numeric references to designate the equal or similar parts.

FIRST EMBODIMENT: SEMI-FORM PLATES

[0034] Referring in the first place to Figure 1, a schematic view can be observed, viewed from an overhead perspective, of a permanent formwork (1) in accordance with the invention, made up of two semi-forms (11, 11') manufactured from folded or drawn metal plate, and which adopt a substantially flat configuration, wherefrom one of whose faces project multiple protuberances (5) and recesses (2), built into the body of the semi-form (11, 11'), extended in the longitudinal direction of said semi-form (11, 11'), equal and parallel to each other, and in successively equidistant positions.

[0035] The protuberances (5) and the recesses (2) feature a profile whose cross-section can adopt different alternative forms. The protuberances (5) are projected from one side of the metal plate and slots (3) are defined in correspondence with said protuberances (5) in the other side of the plate.

[0036] Figure 2 illustrates an embodiment wherein the semi-form (11, 11') additionally incorporates stiffening projections (32) defined between the protuberances (5), which provide greater rigidity and strength.

[0037] Figure 4 schematically shows a wall or such like under construction, whose external faces are delimited by an array of semi-forms (11, 11') successively aligned by each one of the sides of the wall, and separated by a pre-set distance which is going to define the thickness of the wall or partition once it is filled with a construction material (20). As can be observed (see figure 1), the pro-

tuberances (5) and the recesses (2) constitute the means of maintaining said semi-forms (11, 11') in their position fitting in the material (20) once said material (20) has set. On the external face, the slots (3) are left uncovered to fasten an outer coating (7).

[0038] In figure 5, a schematic view can be observed wherein semi-forms (11, 11') appear positioned vertically on both sides of a wall or such like under construction with the use of mortar, concrete or other material (20), where the thickness of the wall is precisely determined by the separation between the semi-forms (11, 11'). Thanks to the configuration of the recesses (2) (see figure 1), a multiplicity of spacers (13), which will be described below in greater detail, can be coupled.

[0039] Said coupling by means of spacers (13) immobilises a semi-form (11) from one side of the wall with respect to the semi-form (11') of the opposite side of the wall, thereby guaranteeing the maintenance of the uniformity of the thickness of the wall, and these spacers (13) being buried by the material (20) of the wall, thereby helping reinforce said wall after the setting of the material (20).

SECOND EMBODIMENT: PLASTIC SEMI-FORMS

[0040] Both examples of embodiment of semi-forms (12, 12') in plates of plastic material are observed in figures 3a and 3b.

[0041] The protuberances (5) and/or the recesses (2) feature a profile whose cross-section can adopt different alternative shapes, to form inner housings which are accessible through a longitudinal slot (3) of considerably smaller width than that of the housing space.

[0042] A semi-form (12) is observed in figure 3a which is manufactured with plates of plastic materials provided with a water-proof agglomerate filling (33). The semi-form (12) is fitted with slots (3) housing auxiliary installations.

[0043] A semi-form (12') is observed in figure 3b which is produced with plastic plates filled of water-proof agglomerate (33) which comprises protuberances consisting of bars (30) fastened on the inside of the semi-form (12'). The protuberances (5) project from one side of the semi-form.

THIRD EMBODIMENT: PRODUCTION METHOD

[0044] The construction method used in the production of walls or partitions using the semi-forms (11, 11') previously described as permanent formwork (1) is described below again with help of figure 1, 4 and 5. The method is carried out according to the following three phases:

First phase.- (see figure 1)

[0045] Once the dimensions of an inner semi-form (11) and an outer semi-form (11') are known, said semi-forms (11, 11') are placed horizontally or in the position which is considered to be most comfortable and in the inner semi-form (11), flexible tubes for electrical pipes (4), the junction boxes (24), the boxes for switches or plugs (25), the pipes for the conduction of water (26) with their stopcocks (27) and outlet connectors for pigtails (28), leaving instalments for the upper and lower part with the purpose of, when it is time, to proceed to the splicing with the systems which run on a false roof or under a floating floor. Once the placement of all the necessary elements on the corresponding slots (3) has been finished, they are secured and immobilised in their position with a foam polyurethane filling (29) or similar product.

[0046] The outer semi-form (11') is equipped with adapted fittings for the holding of coating elements (7), such as wooden bars (40), hooks, blind plugs, special screws, etc., whose operation is very easy as all of these elements can be strengthened on slots (3). In the case represented in figure 1, wooden bars (40) have been decided upon which are perfectly fit into said slots (3) as their cross-section has been prepared so that they can slide inside said slots (3) without the possibility of them coming out when they have to work as support for the coating elements (7). Another possibility is to fasten the bars (40) to the semi-forms (11, 11') by means of lag screws (not represented).

Second phase.- (see figure 4)

[0047] In this second phase, the semi-forms (11, 11') are lifted with all of the elements installed thereon which have been immobilised thanks to the foam filling (29) (see figure 1) placed for this purpose. Then, said semi-forms (11, 11') are placed precisely on the firm floor, or on the foundation (31) built for this purpose, fastening them with provisional support structures (14), guaranteeing the uniform separation of the semi-forms (11, 11') by means of spacers (13) which incorporate cladding (18), and the solidity of the array with threaded bars (16) and nuts (17). Taking advantage of the support structure (14), scaffolding boards (15) can be placed, as is normal in constructions.

[0048] Lastly, the construction material (20), which can be concrete, mortar or the type of mixture chosen for the project, is pumped, pouring it through a supply hose (19) in the space between both semi-forms (11, 11') which, as has been indicated, act as permanent formwork (1).

[0049] Once the setting period has passed, the support structure (14), scaffolding boards (15) and the rest of the elements such as nuts (17) and threaded bars (16) are removed.

Third phase.- (see figure 5)

[0050] The finishing operations are performed in this phase:

a) systems, making the correct connections from the installations which have remained visible.

b) inner facing, adding a layer of plaster (22) or any other type of finishing which is considered by the project of the construction work.
c) an outer facing, placing the coating tiles (7), which are nailed on the wooden bars (30) (see figure 1).

Claims

1. Constructive element which comprises:

a permanent formwork constituted by a pair of separate semi-forms, each semi-form consists of a metal plate and faces the other semi-form defining a hollow space between them,
a construction setting material arranged inside said hollow space,
auxiliary installations,

wherein each metal plate is fitted with protuberances projecting from one side of the metal plate towards the construction setting material, and with slots defined in correspondence with said protuberances in the other side of said metal plate, said slots housing said auxiliary installations.

2. Constructive element according to claim 1, wherein each metal plate is fitted with stiffening projections located between the protuberances.

3. Constructive element according to claim 1, wherein the auxiliary installations are water and/or electricity and/or fibre optics installations.

4. Constructive element according to claim 1 wherein it further comprises a coating element fitted with fastening means adapted to be fixed to the semi-form.

5. Constructive element according to claim 4 wherein the coating element is a plaster coating.

6. Constructive element which comprises:

a permanent formwork constituted by a pair of separate semi-forms, each semi-form consists of a plastic plate and faces the other semi-form defining a hollow space between them,
a construction setting material arranged inside said hollow space,
auxiliary installations,

wherein one of the plastic plates is fitted with protuberances projecting from one side of the plastic plate, and the other plastic plate is fitted with slots housing said auxiliary installations.

7. Constructive element according to claim 6, wherein the auxiliary installations are water and/or electricity and/or fibre optics installations.

8. Constructive element according to claim 6, wherein the plastic material is a polymeric material.

9. Constructive element according to claim 6, wherein the plates are filled with water-proof agglomerate.

10. Constructive element according to claim 6, wherein the protuberances consist of bars.

11. Constructive element according to claim 6 wherein it further comprises a coating element fitted with fastening means adapted to be fixed to the semi-form.

12. Constructive element according to claim 11 wherein the coating element is a plaster coating.

13. Method for producing a constructive element comprising the following steps:

placing auxiliary installations in slots defined in one side of at least one metal plate semi-form which is also fitted with protuberances in its other side in correspondence with said slots,
separate arrangement of two of said semi-forms, with the protuberances of said semi-forms facing each other, defining an inner space therebetween,
subsequent filling of said inner space with a construction material until it is set.

14. Method for producing a constructive element according to claim 13 wherein the auxiliary installations are water and/or electricity and/or fibre optics installations.

15. Method for producing constructive elements according to claim 13 wherein it further comprises the arrangement of at least a coating element on at least one of the semi-forms.

16. Method for producing a constructive element comprising the following steps:

placing auxiliary installations in slots defined in one side of a plastic semi-form filled with water-proof agglomerate,
separate arrangement of said plastic semi-form and another plastic semi-form provided with protuberances consisting of bars, said semi-forms facing each other defining an inner space therebetween, having said protuberances oriented towards said inner space and the slots oriented outside said inner space,
subsequent filling of said inner space with a construction material until it is set.

17. Method for producing a constructive element according to claim 16 wherein the auxiliary installations are water and/or electricity and/or fibre optics installations.

18. Method for producing constructive elements according to claim 16 wherein it further comprises the arrangement of at least a coating element on at least one of the semi-forms.

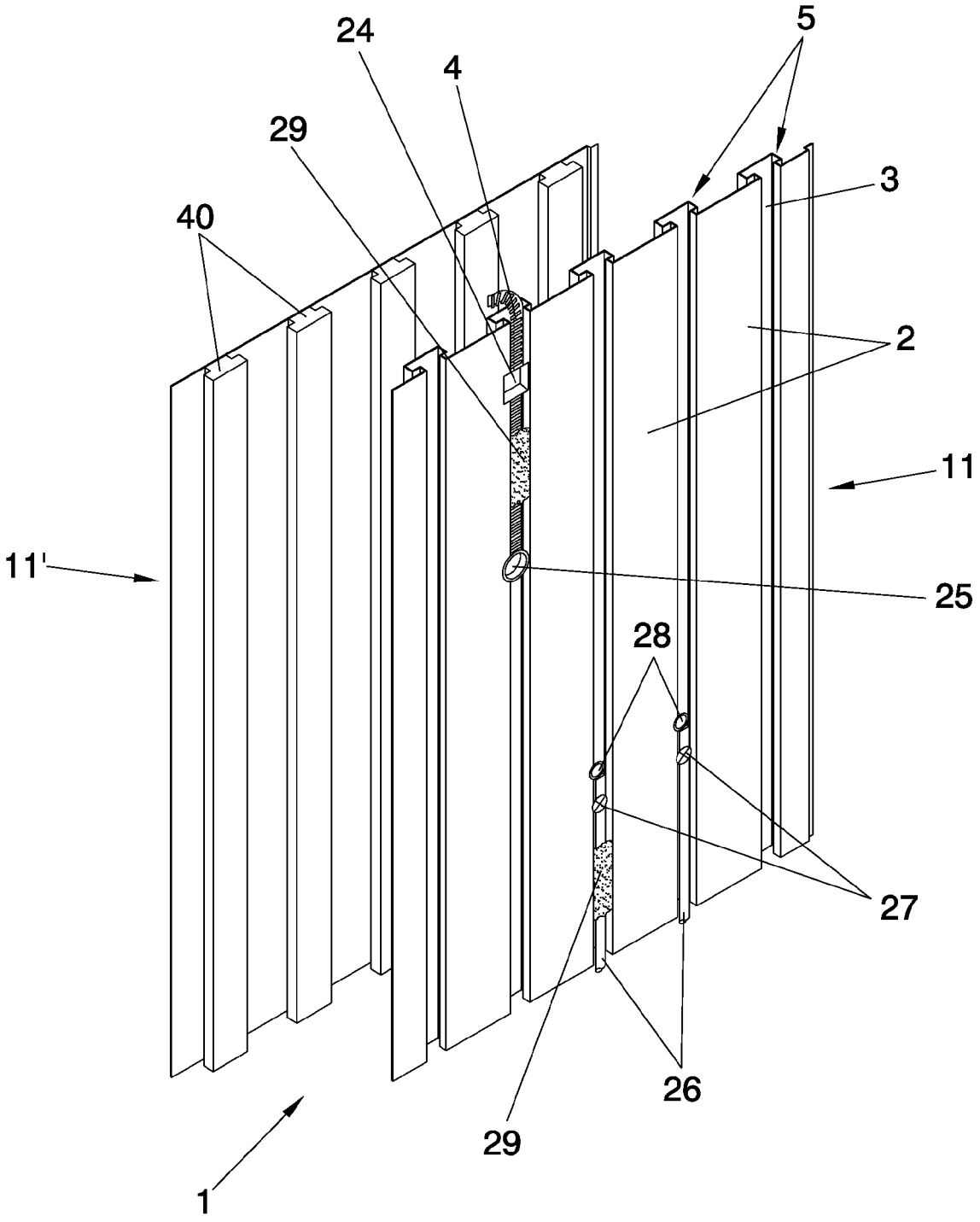

FIG. 1

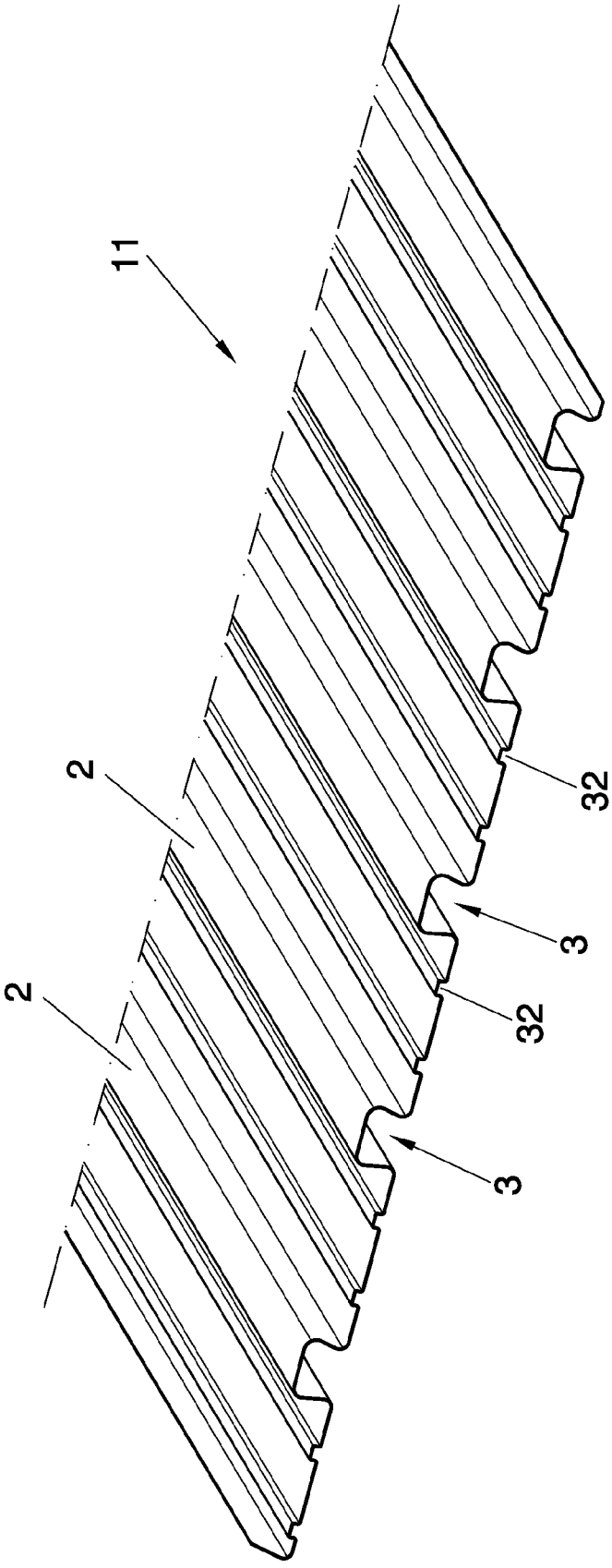

FIG. 2

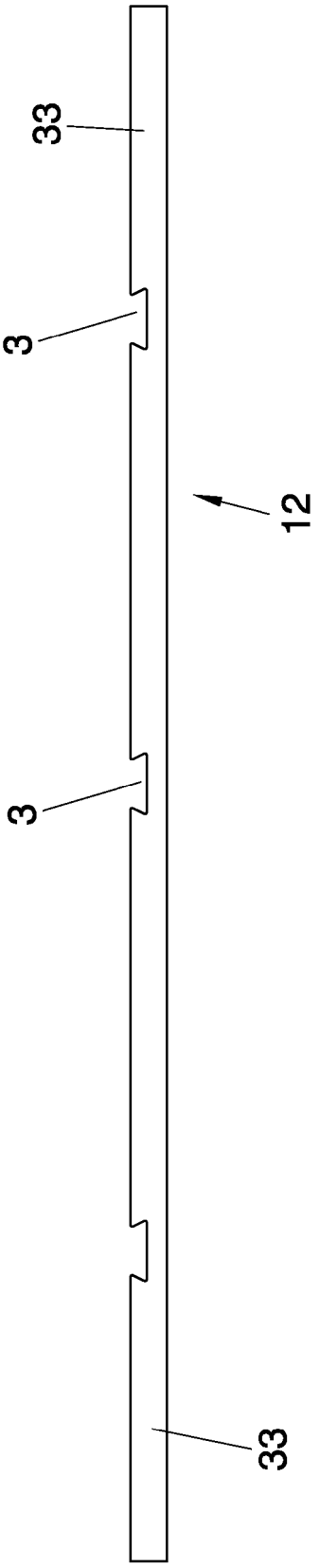

FIG. 3a

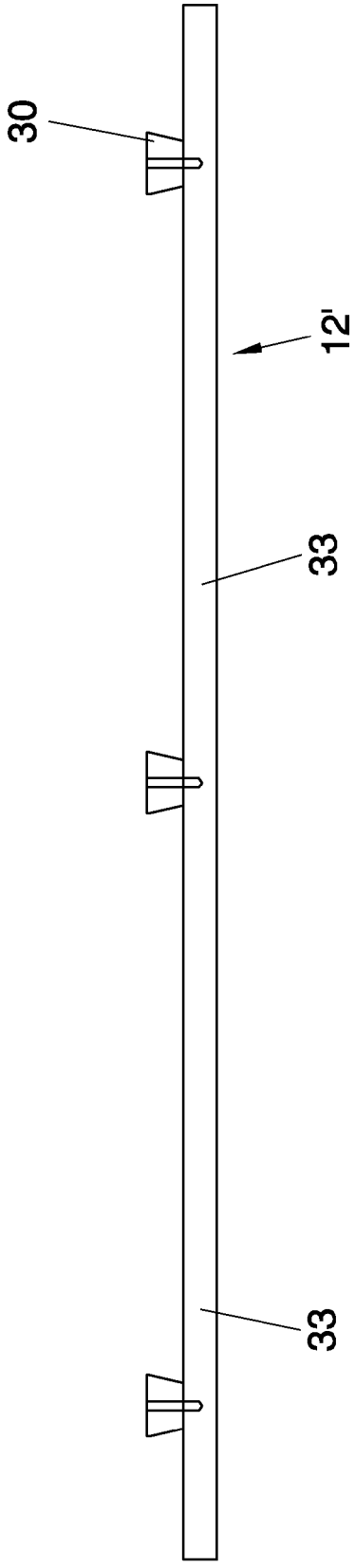

FIG. 3b

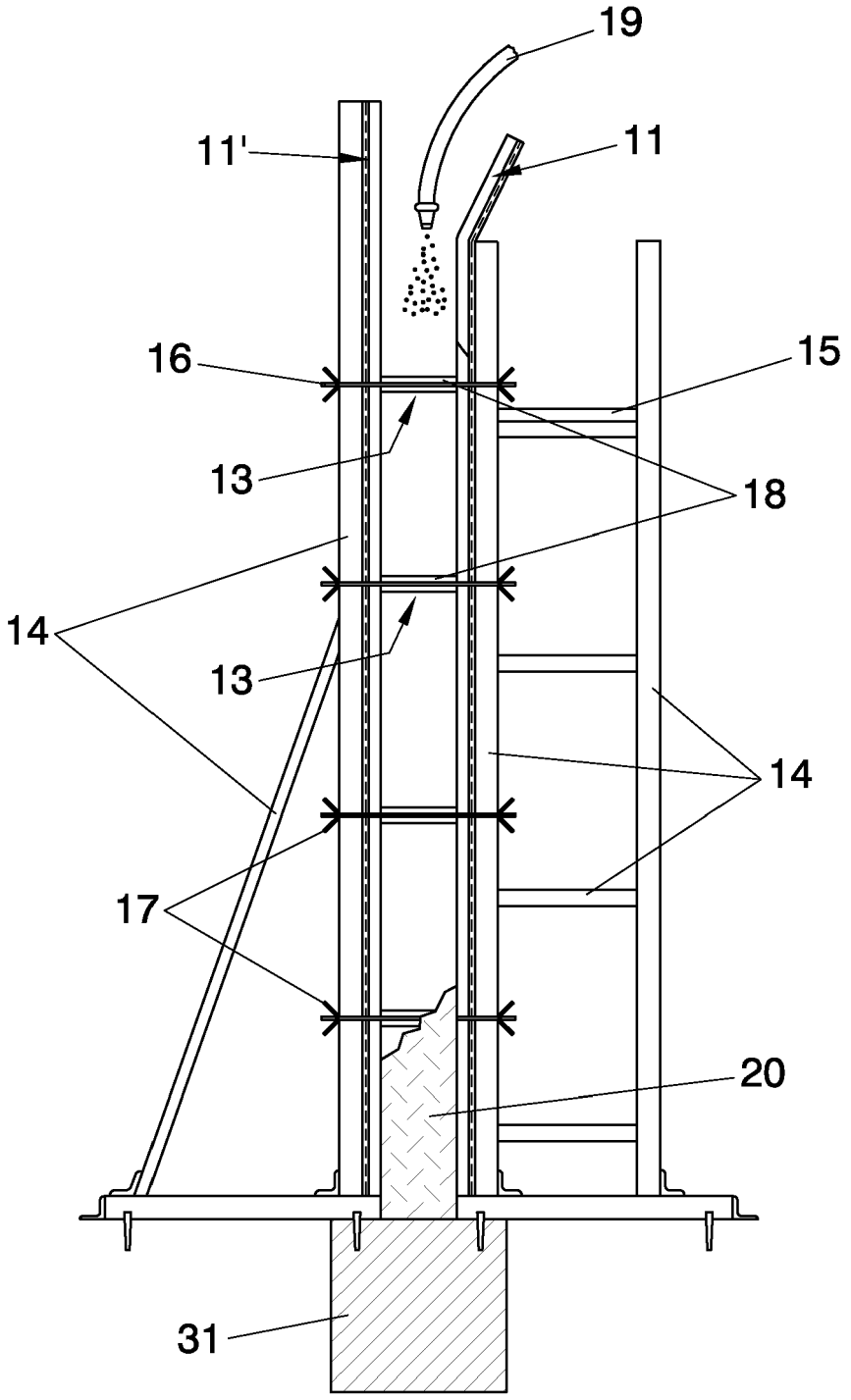

FIG. 4

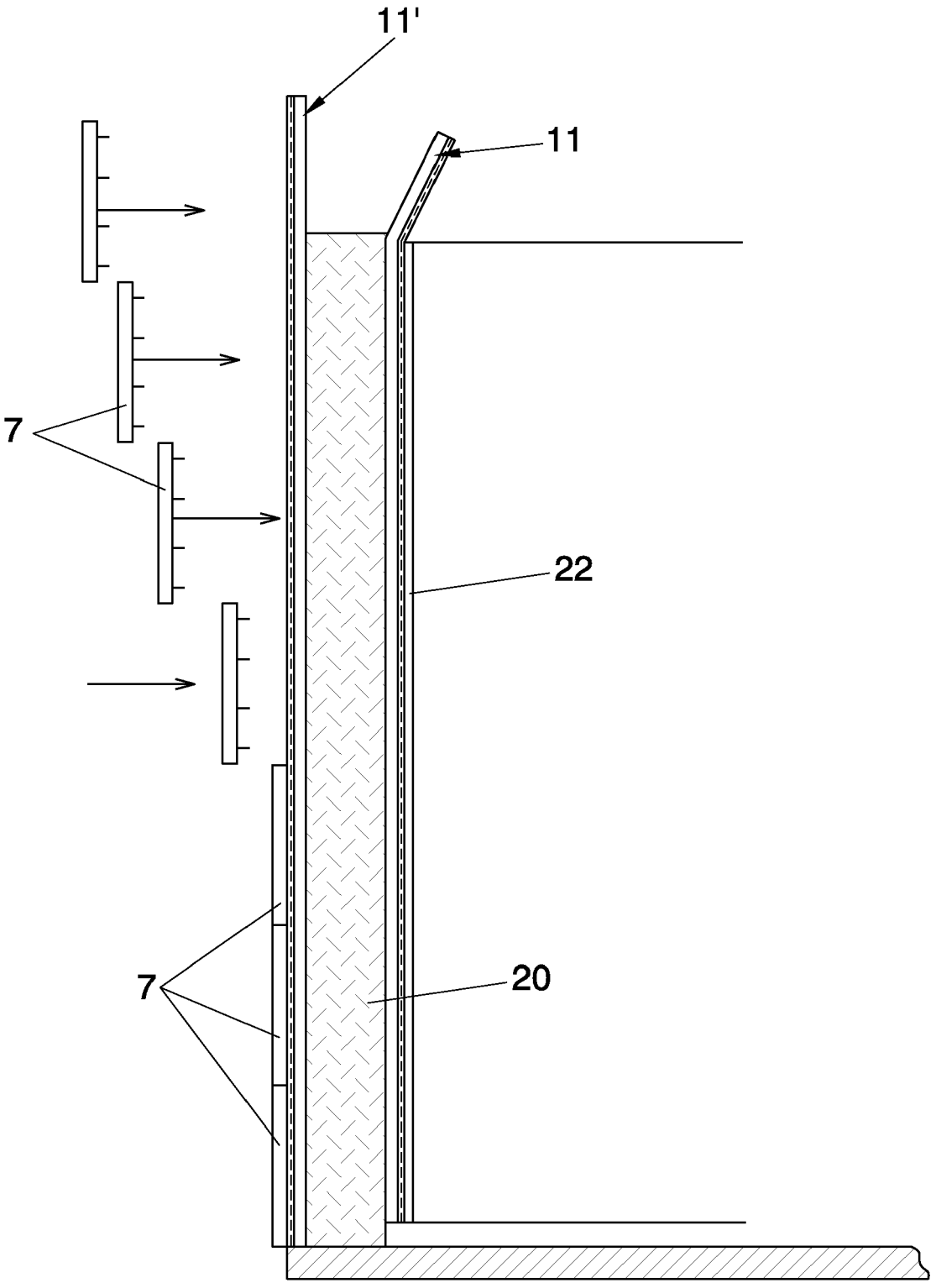

FIG. 5