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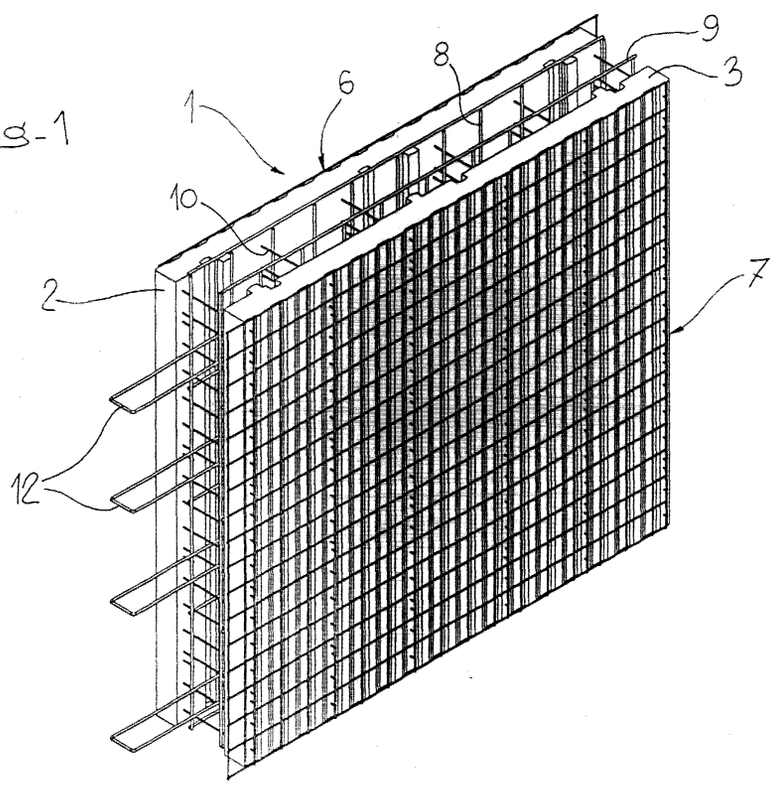
(54) Pre-armed formwork building panel

(57) Pre-armed formwork building panel comprising two parallel layers (2, 3) of expanded plastic material respectively placed between electro-welded steel wire meshes (6, 7) on the external faces and trussing in electro-welded reinforcement steel bars (8, 9) inserted on the inner faces, all assembled at given distances by crosspieces (10) in electro-welded steel wire on to these meshes(6, 7) and bars (8, 9) as well as pre-shaped brackets (11) in reinforcement steel bars protruding laterally (12) for linear connection with the armature of adjacent panels (1).

Fig-1



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Description

DETAILED SPECIFICATION

Prior Art

[0001]

- Sandwich-type building panels in a mesh of steel wire and expanded plastic material are well-known, made up of a core in expanded plastic material, such as polystyrene, caged between two networks of electro-welded steel wire, reciprocally connected again by means of electro-welding to segments of steel wire making up crosspieces perforating the core;
- the enbloc product thus manufactured can be installed in modular fashion and finished with plaster, held by the metal meshes, to construct prefabricated walls with excellent characteristics of strength, seismic resistance, thermal insulation, soundproofing and fire-proofing.
- Moreover, a twin pair of these panels can be used, with excellent results, as a formwork for so-called "lost applications", i.e. as a container for pouring cement conglomerate between two panels which remain incorporated with it, encompassed to help form the partition, finished for the purpose on the outer faces with plaster, as described above for the single panel.

Limitations of the known technique

[0002]

- The meshes of steel wire covering the opposing panels reciprocally assembled in the production of these "double building panels" or "lost formworks" are embedded in the mass of the cement conglomerate, thereby reinforcing it with appreciable results in terms of overcoming the static deficiencies of concrete, i.e. by acting as an armature, since the slenderness of the steel wires making up the meshes is overcome by their high number.
- Despite this, European (Eurocodes EC 2, design rules) and national regulations dictate a minimum section of five millimetres for concrete reinforcing steel bars, so that the said armature with "many wires" for "double panels" or "lost formworks" in accordance with the known technique, although actually feasible and effective, is not in keeping with reference to these compulsory dispositions, since reinforcement armature cross-sections of less than five millimetres are not even taken into consideration as such.

Objects of the invention

[0003]

- The principal object of this invention is, in this context, to provide a "sandwich" building panel structure having a network of steel wire and expanded plastic material, in a double implementation form with functions as a "lost formwork", such as to satisfy the legislative and regulatory dispositions which require a minimum section of concrete reinforcing steel bars at the same time as not compromising the characteristics of the panels in question as regards pre-assembly, lightness, ease of installation, modularity and all other attributable advantages.
- Other objects of this invention are to achieve the purpose described above and simultaneously:
- ensure armature continuity between consecutive adjacent panels;
- ensure optimal incorporation between cement conglomerate and armature;
- enhance production, assembly and installation modularity as far as possible;
- ensure multi-function structure for various kinds of installation;
- provide a structure which is easily and rapidly implemented, which equally does not involve substantial modifications of the nature and configuration of the artefacts with which it is used;
- ensure a structure suitable for utilisation in the widest possible range of applications, as well as conforming to the multi-function and modularity requirements of components progressively developed in every technological sector and in particular in the building industry;
- provide a structure which readily ensures conformity with the strictest constructional standards in terms of safety.
- A further purpose of this invention is to achieve the foregoing purposes through a simple and functional structure, safe application and relatively economic cost in consideration of the results obtained.

Summary of the invention

[0004] These and other purposes are all achieved with the pre-armed formwork building panel, in accordance with this invention, comprising two parallel layers (2, 3) of expanded plastic material respectively placed between electro-welded steel wire meshes (6, 7) on the external faces and trussing in electro-welded reinforcement steel bars (8, 9) inserted on the inner faces, all assembled at given distances by crosspieces (10) in electro-welded steel wire on to these meshes (6, 7) and bars (8, 9) as well as pre-shaped brackets (11) in reinforcement steel bars protruding laterally (12) for linear connection with the armature of adjacent panels (1).

Brief description of the drawings

[0005]

- Other characteristics and advantages of the structure in accordance with this invention will be more readily appreciated in the following detailed description of a preferred but not exclusive embodiment, exemplified by but not limited to the six drawings enclosed, in which:
  - figure 1 is a perspective view of a panel in accordance with this invention;
  - figure 2 is a perspective view of a panel in accordance with this invention in partial cross-section;
  - figure 3 is a plan view;
  - figure 4 is a profile view;
  - figure 5 is a plan view omitting certain components;
  - figure 6 is a profile view omitting certain components.

Detailed static description of the preferred embodiment

[0006]

- With reference to these figures and in particular to the first figure, 1 depicts a "double building panel" or "formwork panel" in accordance with this invention, comprising two panels 2 and 3 of expanded plastic material, for example and preferably polystyrene, equally preferably prepared by splitting a single original solid piece of material.
- Panels 2 and 3 (see in particular fig. 3) have relief undulations 4 on the external faces and offset reliefs 5 on the respective linked internal faces, spaced out for the functions illustrated in more detail below.
- The undulation reliefs 4 on the external faces of panels 2 and 3 (see also figure 2) are respectively in contact with galvanised metallic meshes indicated with 6 and 7, formed by a dense network at right angles made up of electro-welded steel wires, for example and preferably with a cross-section of 2.5 mm.
- The offset reliefs 5 on the inner faces linking with panels 2 and 3 on the other hand are respectively in contact with trusses comprising vertical steel reinforcement bars 8, for example and preferably with a cross-section of 5 mm, electro-welded to identical horizontal bars 9, spaced by a series of crosspieces 10 (see in particular figures 3 and 4) made up of segments of steel wire, for example and preferably with a cross-section of 2.5 mm, electro-welded to these as well as passing through panels 2 and 3 and also electro-welded externally to these to meshes 6 and 7, thereby assembling the entire double building panel 1.
- The crosspieces 10, between the trusses made up of right-angled bars 8 and 9, supports shaped brackets 11 (see in particular figures 5 and 6), formed by reinforcement steel bars, for example and preferably also having a cross-section of 5 mm, closed on themselves and dimensioned to protrude over a section 12 externally to one side of the formwork panel 1 when placed flush with the other, where they are equipped with an attachment 13 designed to be fitted into the body of panels 2 and 3, all for the functions described in more detail below.

Detailed dynamic description of the preferred embodiment

[0007]

- Having thus completed the Static Description of a preferred implementation example of the structure in accordance with this invention, there follows a dynamic description relating to:
  the "double building panel" or "formwork panel" in accordance with this invention is pre-assembled in its structure as described in static terms above, so that the device for the production of electro-welded metallic meshes and the device for inserting and cutting of crosspieces in metallic wire for the manufacture of building panels already covered by patents owned by the present applicant are suitable.
- The double building panel 1 thus emerges from the production line complete in every part, as shown in figure 1, lacking only the brackets 11 therein illustrated, and in view of its permanent characteristics of lightness can be easily transported, handled and installed by operators in the walls of the building under construction.
- Having installed two consecutive formwork panels 1, on the one hand one of these may be fitted with a number of overlapping brackets 11, inserted until flush with the insertion side and clamped with the perforating link of attachment 13 within a panel 2 or 3;
- in this way, on the other side, the brackets 11 protrude by section 12 within the adjacent formwork panel 1, and thus for the length of wall to be built.
- At this stage, cement conglomerate may be pouted into the gap or the formwork defined by panels 2 and 3, which is thus reinforced in accordance with legal requirements by vertical steel bars 8 electro-welded to identical horizontal steel bars 9 flush with panels 2 and 3, yet held apart in accordance with legal requirements by reliefs 5;
- in this context, the discontinuity of the armature imposed by the prefabricated nature of the panels is overcome by the brackets 11, and in particular by the relative portions 12 inserted into the adjacent panel, thus ensuring seamless continuity of the ar-

mature always in keeping with legal requirements.

- The square-network plaster support meshes 6 and 7 may then be finished with plaster which is held in place by known techniques.

Implementation Alternatives

[0008]

- Evidently, in alternative forms of implementation, while always in keeping with the solution concept in the implementation example illustrated above and below in relative claims, the pre-armed formwork panel structure in accordance with this invention may also be implemented and installed in other ways, with technical and mechanical equivalents or integrative adaptations while always in keeping with the descriptions outlined above and detailed below in the conceptual solution claims.

Advantages of the invention

[0009]

- As evidenced by the above detailed description of a preferred but not exclusive form of implementation and the above comments concerning alternative forms of implementation, the pre-armed formwork panel in accordance with this invention offers the following advantages for the purposes envisaged and other purposes:

- it in fact integrates a simple, economic and multifunction structure of "lost formwork" designed to be manufactured, handled and installed as artefacts in accordance with known technique, i.e. with all the relative advantages in terms of lightness, rapidity and modularity, but at the same time suitable for satisfying the strictest parameters of law and regulations in terms of concrete reinforcement and seismic criteria, as well as presenting excellent characteristics in terms of thermal insulation (KT 0.36 W/m2 x K°) and fire resistance (REI 180).

KEY TO NUMBERS

[0010]

1) overall view of the double panel or formwork panel
2) panel
3) panel
4) external undulation reliefs
5) internal offset reliefs
6) overall view of the metallic network
7) overall view of the metallic network
8) vertical reinforcement steel bars
9) horizontal reinforcement steel bars
10) crosspieces
11) shaped brackets
12) relative protruding portions
13) relative panel insertion attachment

Claims

1. Formwork building panel **characterised by** the fact that it includes at least two panels (2, 3) in expanded plastic material respectively placed between metallic meshes (6, 7) on the external faces and reinforcement bar meshes (8, 9) inserted on the inner faces, all assembled at given distances by metallic crosspieces (10) welded to these meshes (6, 7) and bars (8, 9) as well as pre-shaped metal brackets (11) protruding laterally (12) for linear connection with the armature of adjacent panels (1).

2. Formwork building panel **characterised by** the fact that it includes two parallel panels (2, 3) in expanded plastic material respectively placed between electro-welded steel wire meshes (6, 7) on the external faces and electro-welded reinforcement steel bar meshes (8, 9) inserted on the inner faces, assembled at given distances by metallic crosspieces (10) in electro-welded steel wire welded to these meshes (6, 7) and bars (8, 9) as well as pre-shaped steel bar armature brackets (11) protruding laterally (12) for linear connection with the armature of adjacent panels (1).

3. Formwork building panel, according to claim 2, **characterised by** the fact that said panels (2, 3) have relief undulations (4) on the external faces in contact with these meshes (6, 7) in electro-welded steel wire.

4. Formwork building panel, according to claim 2, **characterised by** the fact that said panels (2, 3) have linking inner faces with protruding reliefs to maintain the armature steel bars (8, 9) separated by at least the minimum distance required by law.

5. Formwork building panel, according to claim 2, **characterised by** the fact that said pre-shaped brackets (11) are made up of steel armature bars closed on themselves and dimensioned to protrude over a section (12) externally to one side of the formwork panel (1) when placed flush with the other.

6. Formwork building panel, according to claim 2, **characterised by** the fact that said pre-shaped brackets (11) are fitted with an attachment (13) designed to be inserted in the body of these panels (2, 3).

7. Formwork building panel, according to claim 2,

characterised by the fact that said panels (2, 3) have any configuration and dimension suitable for the purpose.

8. Formwork building panel, according to claim 2, **characterised by** the fact that said steel wire making up said meshes (6, 7) has a cross-section of 2.5 mm (two point five millimetres).

9. Formwork building panel, according to claim 2, **characterised by** the fact that said steel armature bars (8, 9) have a cross-section of 5 mm (five millimetres).

10. Formwork building panel, according to claim 2, **characterised by** the fact that said pre-shaped brackets (11) have a cross-section of 5 mm (five millimetres) .

11. Formwork building panel, according to claim 2, **characterised by** the fact that said steel wire making up said meshes (6, 7) have any cross-section suitable for the purpose.

12. Formwork building panel, according to claim 2, **characterised by** the fact that said steel armature bars (8, 9) have any cross-section suitable for the purpose.

13. Formwork building panel, according to claim 2, **characterised by** the fact that said pre-shaped brackets (11) have any cross-section suitable for the purpose.

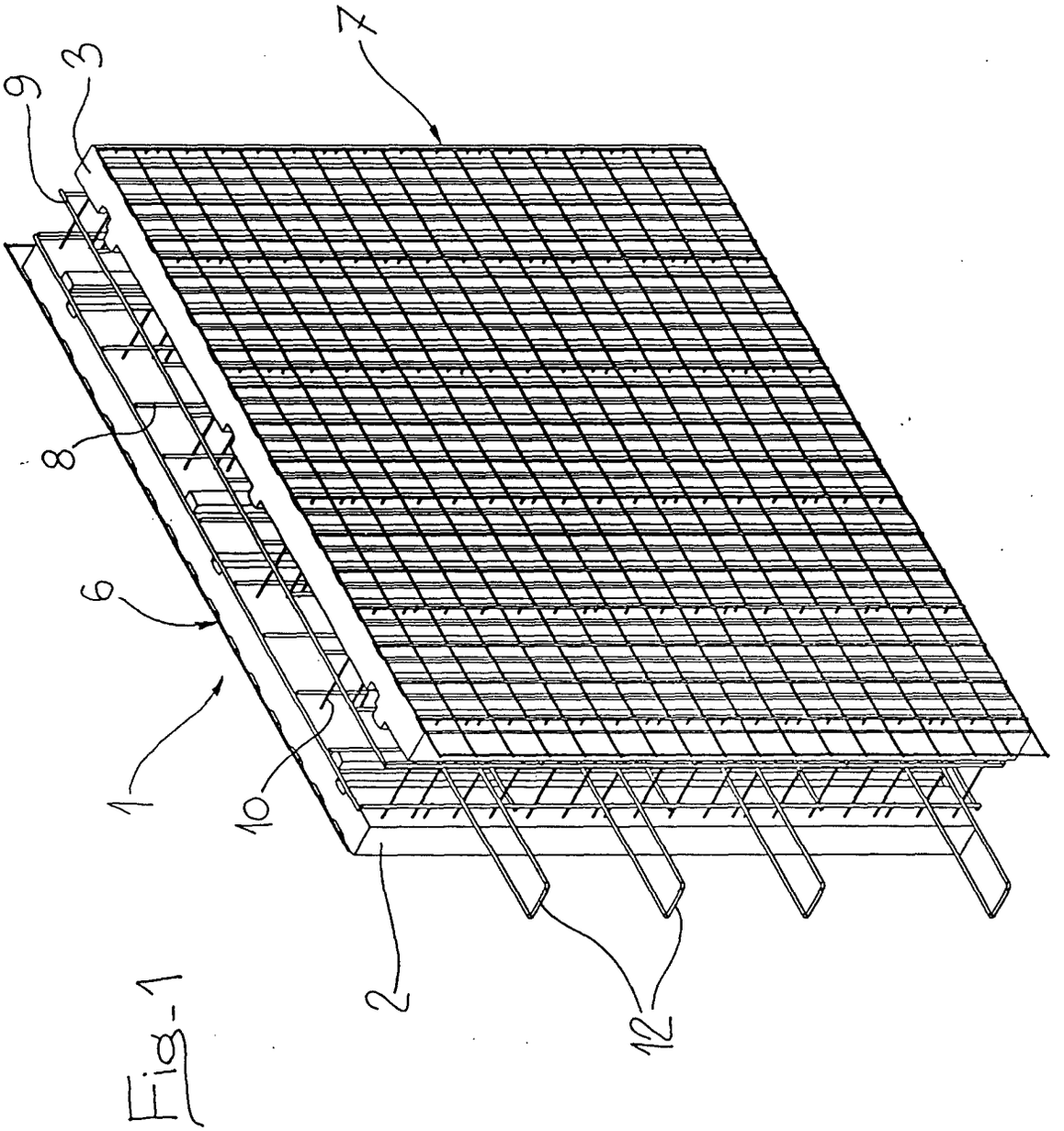

Fig-1

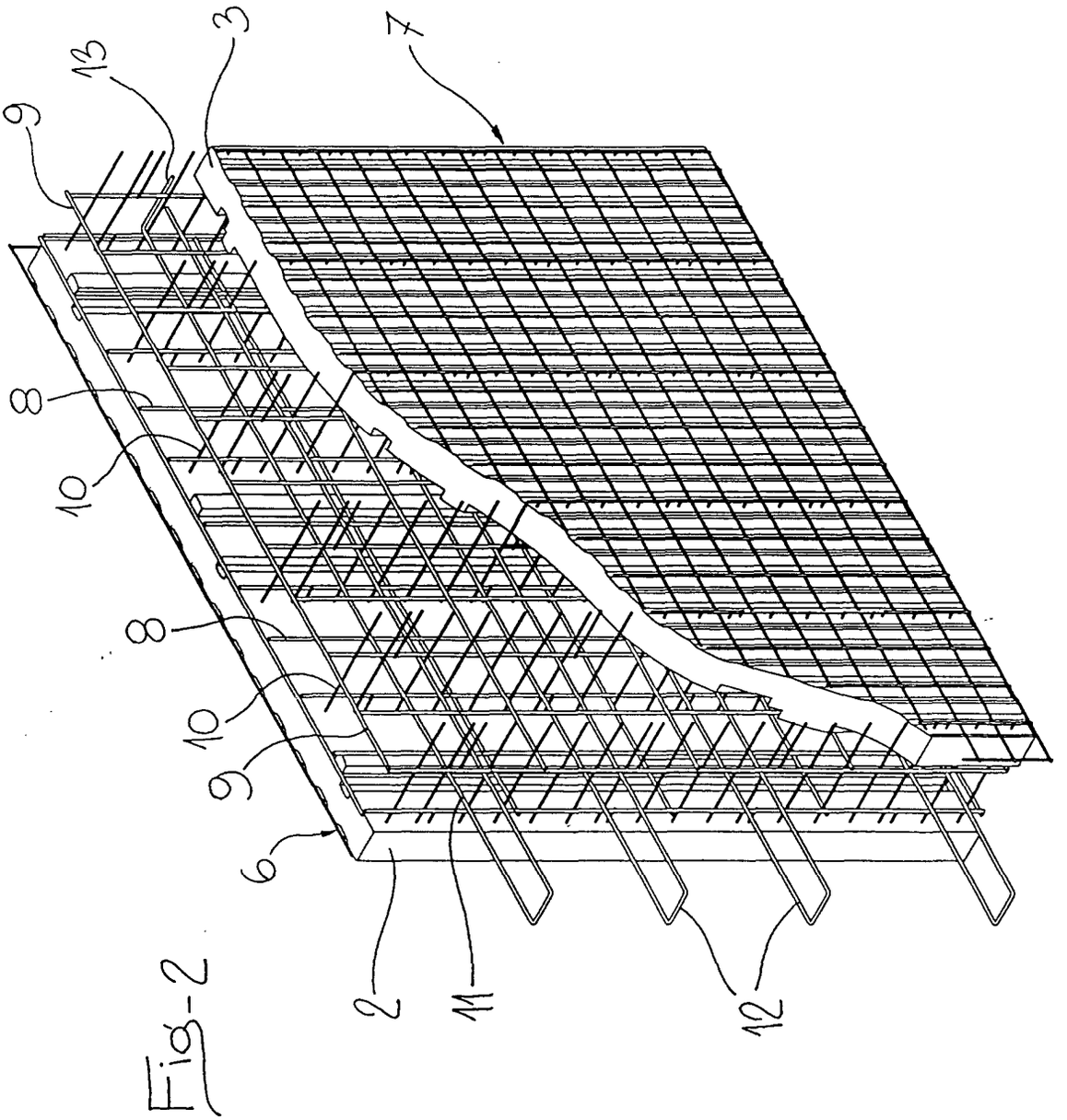

Fig-2

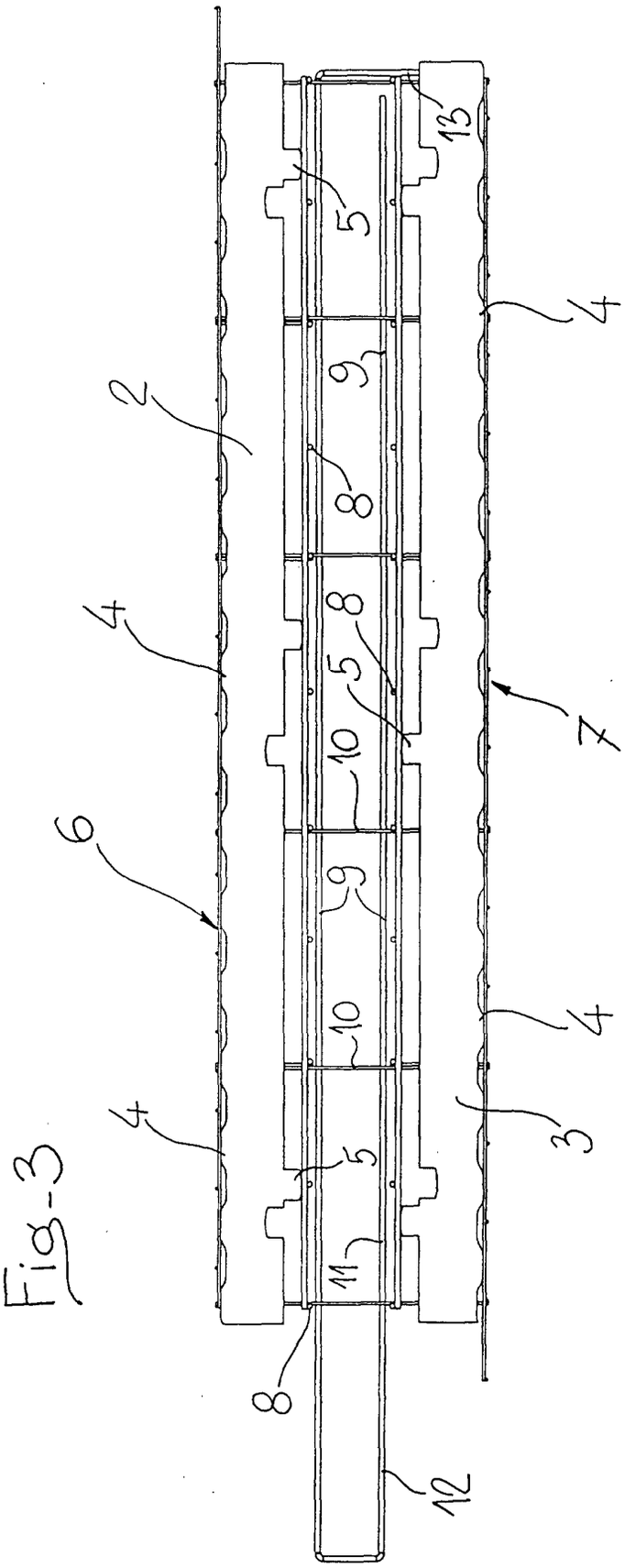

Fig-3

Fig-4

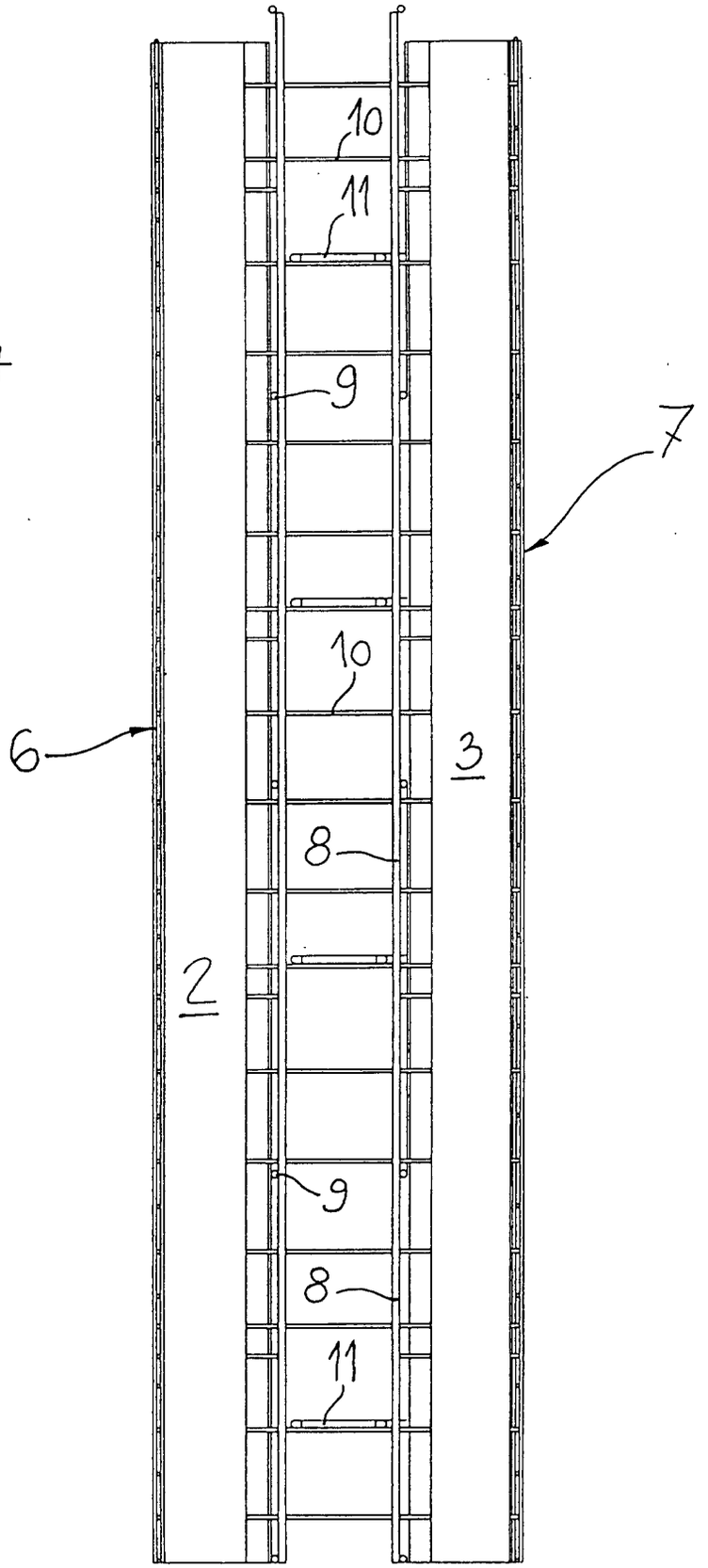

Fig-5

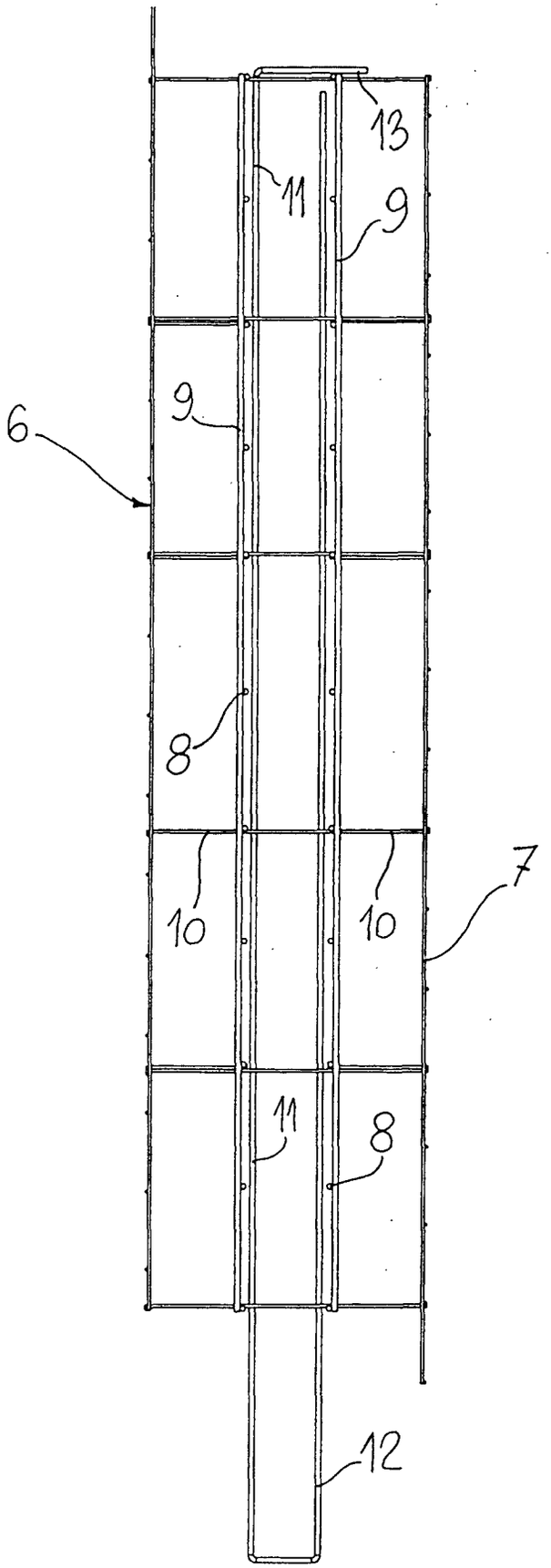

Fig-6