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

(11) **EP 1 978 172 A2**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
08.10.2008 Bulletin 2008/41

(51) Int Cl.:
E04B 5/04 *(2006.01)* ***E04B 5/23*** *(2006.01)*
E04C 3/20 *(2006.01)*

(21) Application number: **08102446.5**

(22) Date of filing: **10.03.2008**

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

(30) Priority: **26.03.2007 NL 1033588**

(71) Applicants:
- **van Driesum, Anne Pieter**
  9123 KL Metslawier (NL)
- **Diepeveen, Hendrik Eelco**
  8019 XP Zwolle (NL)

(72) Inventors:
- **van Driesum, Anne Pieter**
  9123 KL Metslawier (NL)
- **Diepeveen, Hendrik Eelco**
  8019 XP Zwolle (NL)

(74) Representative: **Bakker, Hendrik**
Octrooibureau Mink B.V
Sluiskade NZ 104
7602 HW Almelo (NL)

(54) **Prefabricated beam and a method for realising a structural floor**

(57) The invention relates to a prefabricated beam (1) for supporting floor plates (2), like hollowcore plates or precast reinforced concrete plates. The beam (1) consists of a beam part (5) having a trapezoidal or triangular cross section and a rectangular bottom part (4), while the width of the beam part (5) and the width of the bottom part (4) are at least substantially the same. For pouring a structural floor, the floor plates (2) are placed between the beams (1) and separately supported.

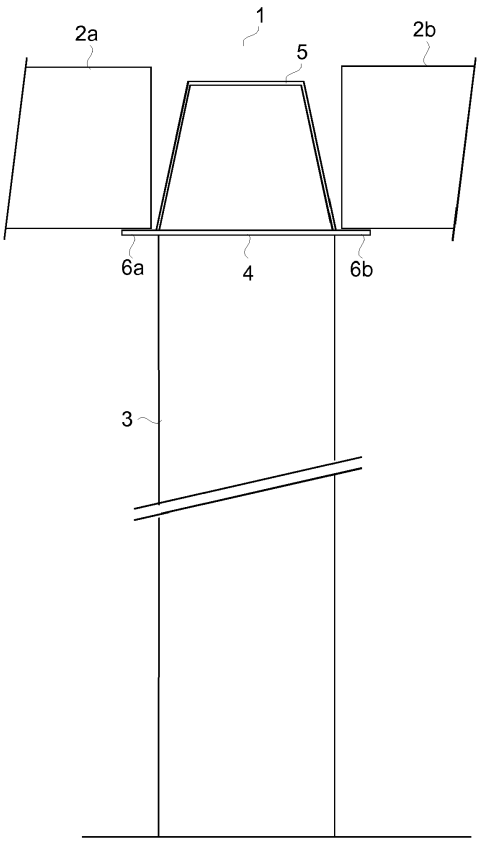

Fig. 1

EP 1 978 172 A2

Description

[0001] The invention relates to a prefabricated beam, for operationally supporting floor plates, like hollowcore concrete slabs or precast reinforced concrete plates, comprising a beam part having an at least substantially trapezoidal or triangular cross section and an at least substantially rectangular bottom part.

[0002] Prefabricated beams of this type are known. For these known beams, the rectangular bottom part is made wider than the trapezoidal or triangular beam part, in such a way that the ends of the floor plates may rest onto the projecting edges of the rectangular bottom part. In general it will not be necessary then to additionally support the floor plates before pouring the concrete. The disadvantage is that an underside of the structural floor thus obtained is not flat, as the protruding rectangular bottom parts will remain visible, which is undesirable from an aesthetic point of view. The prefabricated beam according to the invention substantially obviates this disadvantage and is characterised in that a width of the beam part and a width of the bottom part are at least substantially the same. This means that the bottom parts will be positioned between the floor plates and that the bottom side of the bottom parts and the bottom side of the floor plates will be positioned in one single plane, which means that a further finishing will normally no longer be necessary. It will be necessary however to support the floor plates before and during the pouring of concrete.

[0003] A favourable embodiment of the inventive prefabricated beam is characterised in that the beam is made of concrete, so that an underside of the structural floor thus obtained will form one single concrete surface.

[0004] Due to the trapezoidal or triangular form of the beam, wedges made of concrete will be formed while pouring between the beams and the floor plates. These concrete wedges form, together with the floor coupling reinforcement, a shearing force transfer mechanism, where the coupling reinforcement prevents the yielding or opening of the cross sections which transfer the shearing forces. A favourable embodiment of the inventive beam with which this connection may be improved even further is characterised in that the beam is provided with body holes, extending at least substantially perpendicular to the beam, through which coupling reinforcement may be put before concrete is poured.

[0005] A favourable alternative embodiment is characterised in that the beam is provided with coupling reinforcement rods, extending at least substantially perpendicular to the beam. Preferably, the ends of the coupling reinforcement rods are provided with hooks or looped ends, in such a way that they do not protrude outside the beam. Reinforcement rods extending inside or between the floor plates may then simply be hooked on to the hooks or looped ends. If desired, the hooks or looped ends may be positioned at least substantially inside recesses made in the beam, which implies that beams may be stored and transported while stacked in a compact manner.

[0006] A further favourable embodiment is characterised in that a bottom side of the beam is provided with reinforcement extending in a longitudinal direction, preferably in the form of prestressed reinforcement wires or reinforcement rods. Also the top side may be provided with prestressed reinforcement wires or reinforcement rods if desired.

[0007] The invention also relates to a method for realising a structural floor, in the process of which prefabricated beams and prefabricated floor plates or floor parts are placed and supported, after which concrete is poured, after which the beams and the floor plates or floor parts form one integral part. The inventive method is characterised in that beams having an at least substantially trapezoidal or triangular cross section are placed between the floor plates or floor parts, while the beams and the floor plates or floor parts are supported by support means, which results in a structural floor of which the underside forms one single surface.

[0008] A favourable realisation of the inventive method with which a relatively light floor may be constructed is characterised in that before pouring the concrete, coupling reinforcement rods are inserted straight across the beams.

[0009] The invention will now be further explained with a reference to the following figures, in which:

- Fig. 1 represents a steel beam according to the state of the art in side view;
- Fig. 2 represents a possible embodiment of a steel beam according to the invention in side view;
- Fig. 3 represents a possible embodiment of a concrete beam according to the invention in side view;
- Fig. 4A represents a possible embodiment of a concrete beam according to the invention in front view;
- Fig. 4B represents an alternative embodiment of a concrete beam according to the invention in front view;
- Fig. 4C represents a further alternative embodiment of a concrete beam according to the invention in front view;
- Fig. 5 represents a possible embodiment of a concrete beam according to the invention in side view;
- Fig. 6A represents a beam provided with cross coupling reinforcement rods in front view;
- Fig. 6B represents a beam provided with cross coupling reinforcement rods with hooks or looped ends in front view;
- Fig. 6C represents a beam provided with cross coupling reinforcement rods with recessed hooks or looped ends in front view.

[0010] Fig. 1 represents a steel beam 1 according to the state of the art in side view, with beam 1 forming part

of a floor to be poured. Beam 1 rests on concrete columns 3 and onto beam 1 floor plates or floor parts 2a,2b are placed. In the embodiment shown here, beam 1 has an at least substantially trapezoidal cross section and it consists of a bottom part 4 and a beam part 5 which have been welded together. Bottom part 4 is wider than beam part 5, which means that rims 6a,6b are available for supporting floor plates or floor parts 2a,2b before and during pouring concrete and during curing of the concrete. A disadvantage of the floor thus obtained is that bottom part 4 protrudes outside the ceiling formed by the underside of floor plates or floor parts 2a,2b, which is undesirable from an aesthetic point of view.

[0011] Fig. 2 represents a possible embodiment of a steel beam 1 according to the invention in side view, where beam 1 forms part of a floor to be poured, together with floor plates or floor parts 2a,2b and concrete columns 3 onto which beam 1 rests. In this embodiment, beam 1 has an at least substantially trapezoidal cross section and consists of a bottom part 4 and a beam part 5 which have been welded together. Bottom part 4 is as wide as beam part 5, which means that floor plates or floor parts 2a,2b must be supported before and during pouring and during curing of the concrete, for example with the aid of struts 7a,7b. The undersides of floor plates or floor parts 2a,2b and bottom part 4 form one single surface now, which means that further finishing of the ceiling formed by the undersides of floor plates or floor parts 2a,2b and bottom part 4 is not necessary. As soon as the poured concrete is cured, the concrete wedges created in the spaces 8a,8b form a connection between beam 1 and floor plates or floor parts 2a,2b. The mutual connection is further increased by concrete that will enter into ducts 9a,9b in floor plates or floor parts 2a,2b and in body holes 10a,10b in beam 1. Moreover, reinforcement rods 11 may be inserted through body holes 10a,10b, which also enter ducts 9a,9b.

[0012] Fig. 3 represents a possible embodiment of a concrete beam 1 according to the invention in side view, where beam 1 forms part of a floor to be poured, together with floor plates or floor parts 2a,2b and concrete columns 3 onto which beam 1 rests. In this embodiment, beam 1 has an at least substantially trapezoidal cross section and consists of a bottom part 4, provided with reinforcement rods 12, and a beam part 5, which are poured together and actually form one single part. Bottom part 4 is as wide as beam part 5, which means that precast reinforced concrete plates 2a,2b before and during pouring and during curing of the concrete must be supported, for example with the aid of struts 7a,7b. The undersides of precast reinforced concrete plates 2a,2b and bottom part 4 form one single surface now, which means that further finishing of the ceiling formed by the undersides of precast reinforced concrete plates 2a,2b and bottom part 4 is not necessary. As soon as the poured concrete is cured, the concrete wedges created in the spaces 8a, 8b form a connection between beam 1 and precast reinforced concrete plates 2a,2b. The mutual connection is further increased by concrete that will enter body holes 10a,10b in beam 1. Moreover, coupling reinforcement rods 11 must be inserted in body holes 10a,10b, which connect to the reinforcement 13 of precast reinforced concrete plates 2a,2b.

[0013] Fig. 4A represents a possible embodiment of a concrete beam 1 according to the invention in front view, provided with reinforcement rods 12 and body holes 10, similar to beam 1 shown in Fig. 3. Fig. 4B represents an alternative, triangular embodiment of a concrete beam 1 according to the invention in front view, also provided with reinforcement rods 12 and body holes 10. Fig. 4C represents a further alternative embodiment of a concrete beam according to the invention in front view, provided with reinforcement rods 12 and body holes 10 and with additional reinforcement rods 14 on the top side of beam 1.

[0014] Fig. 5 represents a possible embodiment of a concrete beam according to the invention in side view, provided with reinforcement rods 12 and body holes 10 which are positioned for example such that they operationally join the ducts of neighbouring floor plates, which means that coupling reinforcement rods may be inserted.

[0015] Fig. 6A represents a beam 1 provided with cross coupling reinforcement rods 11 in front view, which have been inserted while beam 1 was poured. Floor plates or floor parts 2a,2b may be simply pushed in place, while coupling reinforcement rods 11 slide inside the ducts of floor plates of the hollow core type or between the reinforcement of floor plates of the precast reinforced concrete plate type. Fig. 6B represents a beam 1 provided with cross coupling reinforcement rods 11 with hooks or looped ends 15a,15b in front view. A beam 1 manufactured in this way can be stored and transported more easily as compared with the beam shown in Fig. 6A, while reinforcement rods for the structural floor can simply be hooked on now. Fig. 6C represents a beam 1 provided with cross coupling reinforcement rods 11 with hooks or looped ends 15a,15b in front view, where the hooks or looped ends are positioned inside recesses 16a,16b in beam 1. This means that beams 1 may be stored and transported while stacked in a compact manner. Moreover there is no risk of damaging hooks or looped ends 15a,15b.

Claims

1. Prefabricated beam, for operationally supporting floor plates, like hollowcore concrete slabs or precast reinforced concrete plates, comprising a beam part having an at least substantially trapezoidal or triangular cross section and an at least substantially rectangular bottom part, **characterised in that** a width of the beam part and a width of the bottom part are at least substantially the same.

2. Prefabricated beam according to claim 1, **charac-**

terised in that the beam is made of concrete.

3. Prefabricated beam according to claim 2, **characterised in that** the beam is provided with body holes, extending at least substantially perpendicular to the beam.

4. Prefabricated beam according to claim 2, **characterised in that** the beam is provided with coupling reinforcement rods, extending at least substantially perpendicular to the beam.

5. Prefabricated beam according to claim 4, **characterised in that** ends of the coupling reinforcement rods are provided with hooks or looped ends.

6. Prefabricated beam according to claim 5, **characterised in that** the hooks or looped ends are at least substantially positioned inside recesses made in the beam.

7. Prefabricated beam according to one of the claims 2 to 6, **characterised in that** a bottom side of the beam is provided with reinforcement extending in a longitudinal direction.

8. Prefabricated beam according to claim 7, **characterised in that** the reinforcement comprises prestressed reinforcement wires or reinforcement rods.

9. Method for realising a structural floor, in the process of which prefabricated beams and prefabricated floor plates or floor parts are placed and supported, after which concrete is poured, after which the beams and the floor plates or floor parts form one integral part, **characterised in that** beams having an at least substantially trapezoidal or triangular cross section are placed between the floor plates or floor parts, while the beams and the floor plates or floor parts are supported by support means.

10. Method according to claim 9, **characterised in that** before pouring the concrete, coupling reinforcement rods are inserted straight across the beams.

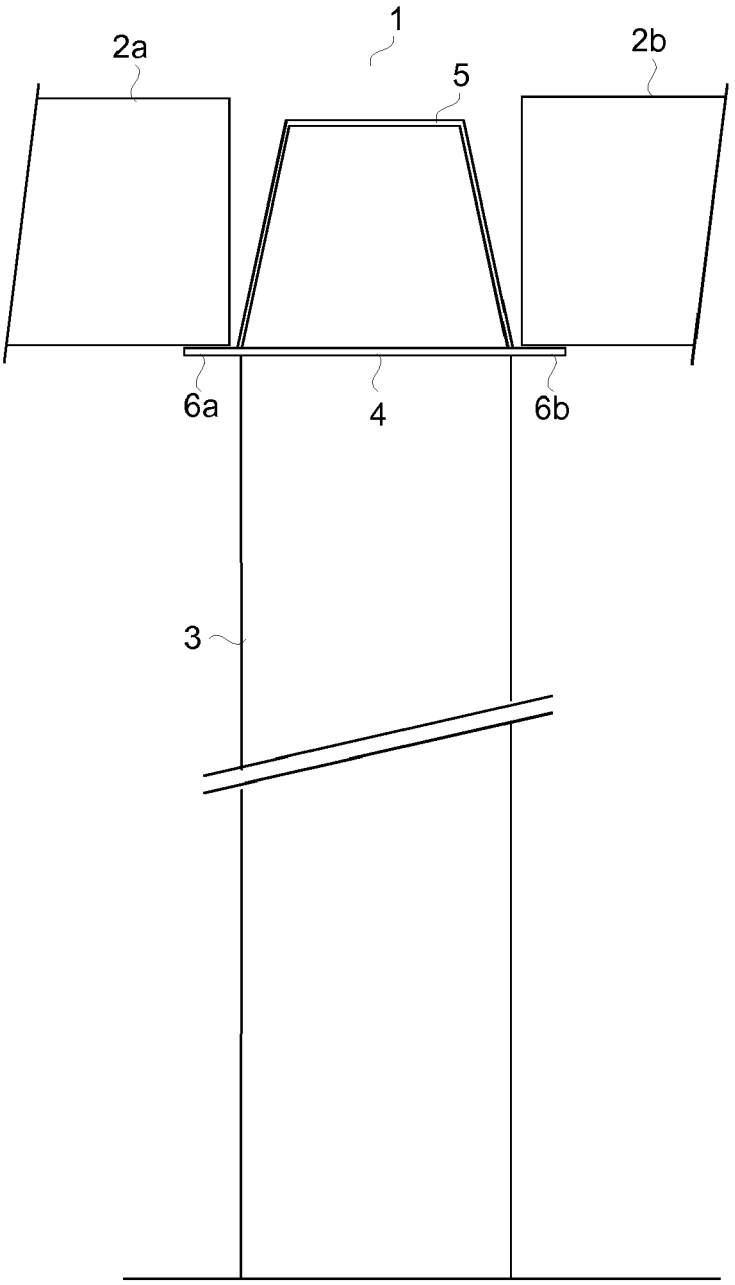

Fig. 1

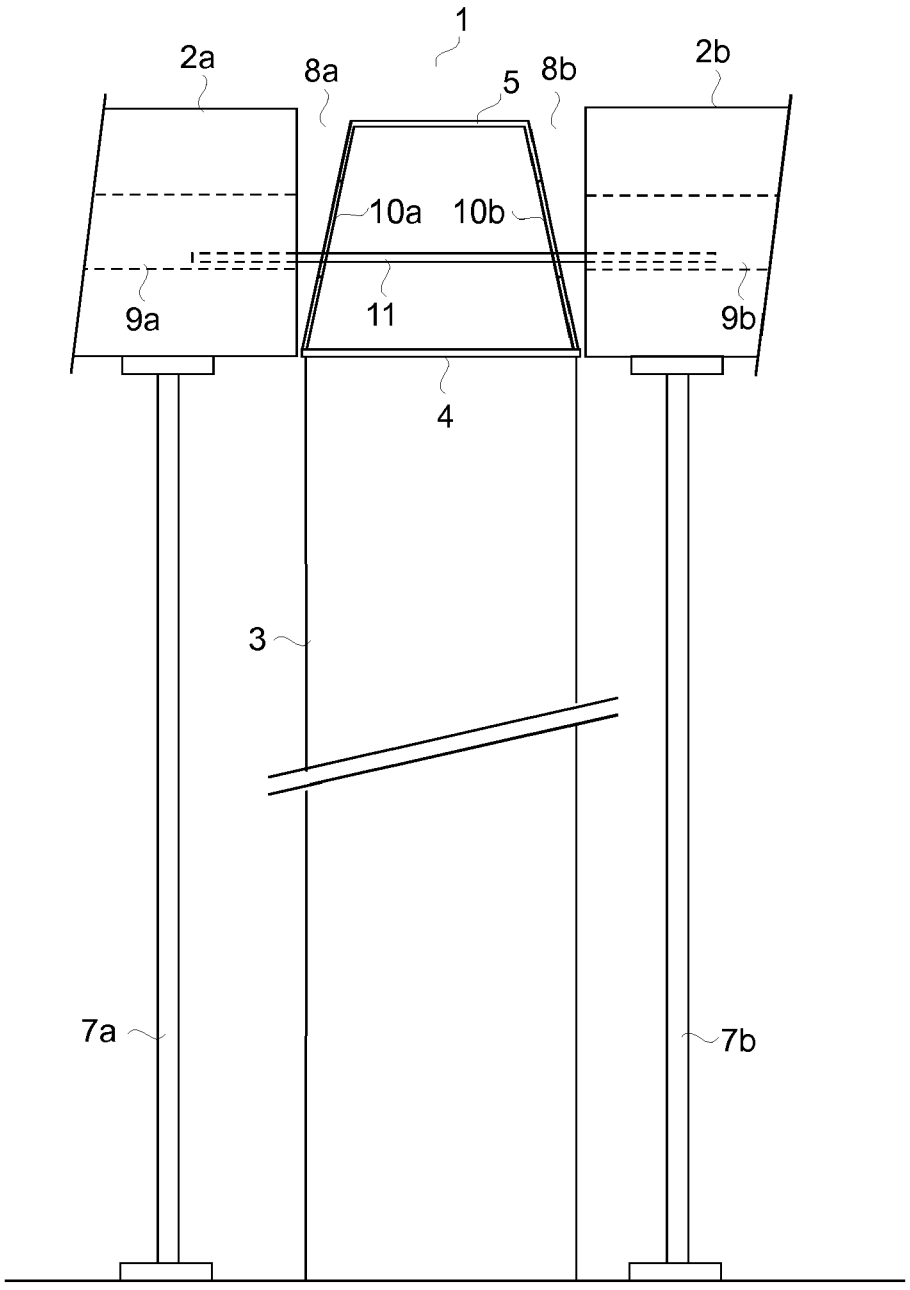

Fig. 2

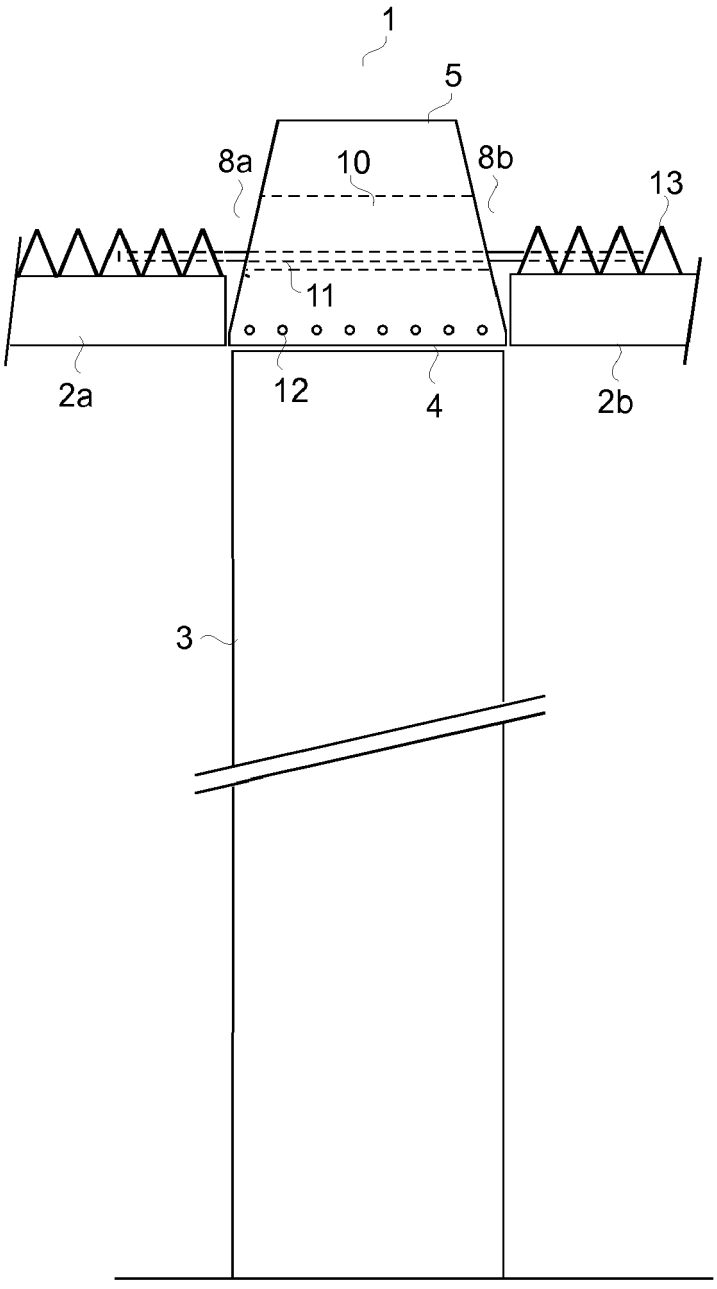

Fig. 3

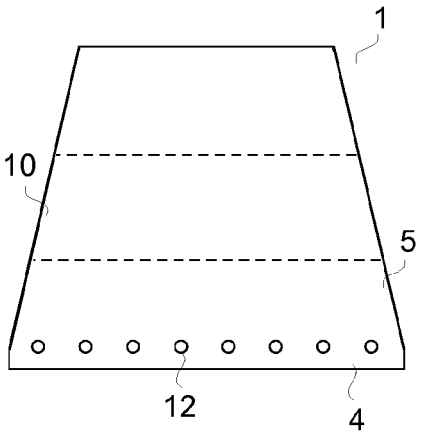

Fig. 4A

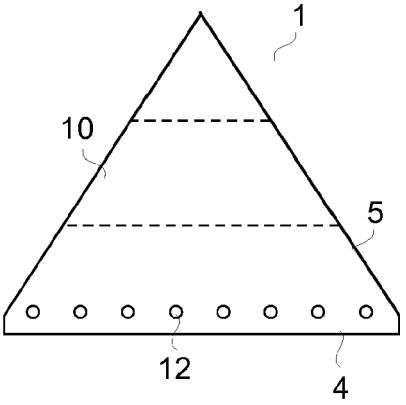

Fig.4B

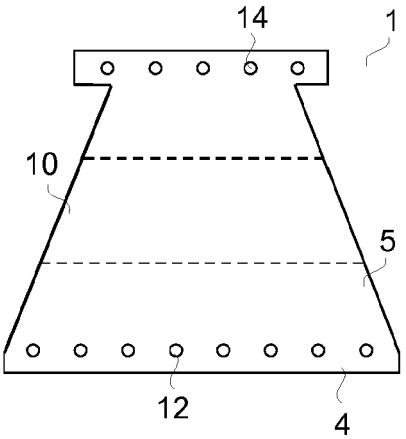

Fig. 4C

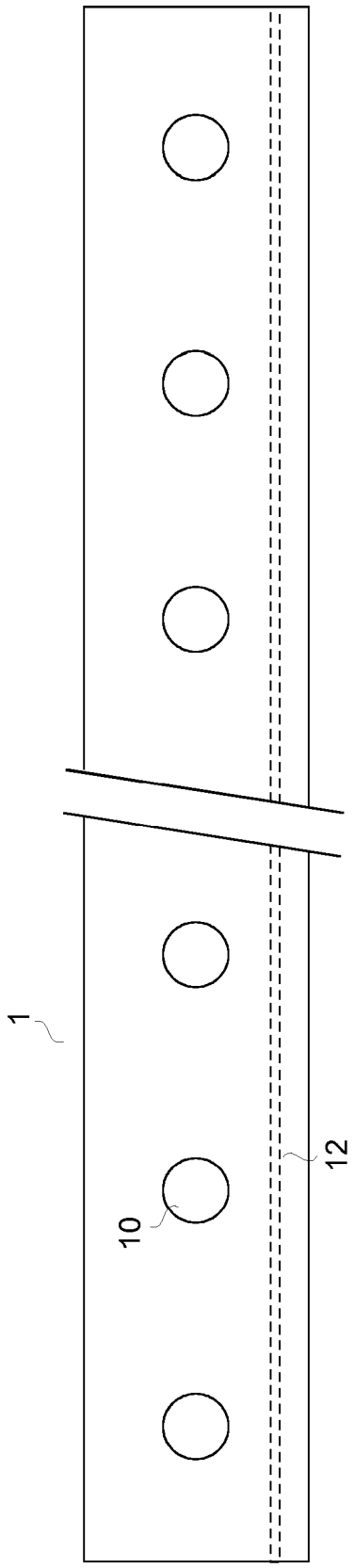

Fig. 5

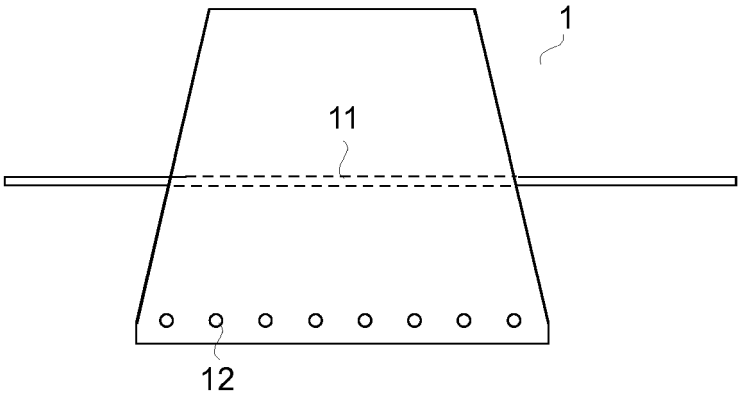

Fig. 6A

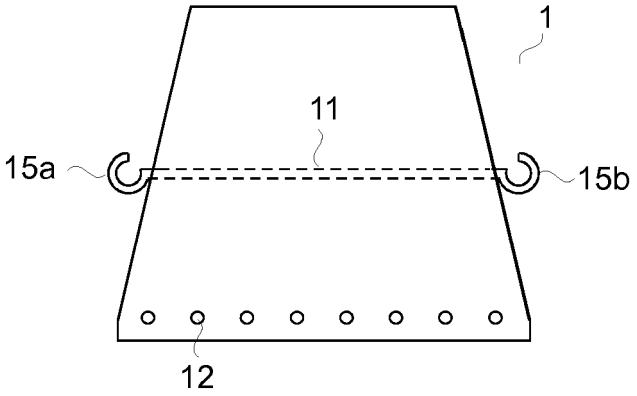

Fig.6B

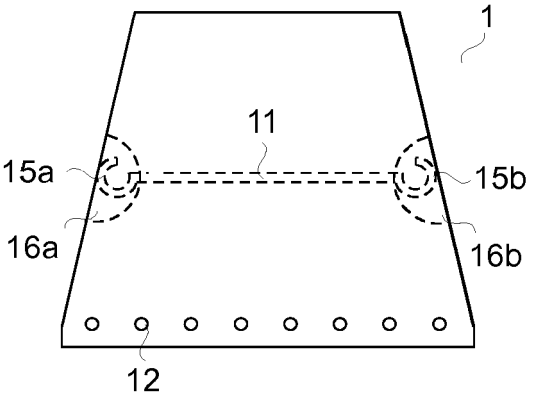

Fig. 6C