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(54) **STEEL BEAM**

STAHLTRÄGER

POUTRE D'ACIER

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Description

[0001] The invention relates to a steel beam that is arranged to serve together with concrete as a bearing composite structure for various slab systems, the composite structure comprising a base plate and two web parts arranged side by side at a distance from each other and joined at first ends of the web parts by means of a horizontal top part, whereby the base plate, web parts and horizontal top part are arranged to form a space that can be filled with concrete.

[0002] The invention relates to a beam, on which the bearing structures of a building, such as hollow-core slabs, composite slabs, shell slabs and cast-in-situ, can be supported. During seam grouting or other concreting, the beam is filled with concrete, and after the concrete has hardened, the beam serves as a composite structure. Beams of this type are today quite well known in the field of element structures. Examples of solutions known in the field are those described in Finnish publications 85745 and 92089. The use of a composite structure provides a steel beam that is lighter than the earlier ones and the beam can be used at longer bearings than those in the earlier beams.

As a further example of the prior art DE 1 267 405 B can be mentioned.

[0003] The solutions according to the prior art, such as the solutions known from the above-mentioned publications, work in various structures without problems. A need has, however, arisen during construction for a beam having a better shear capacity than the prior-art solutions.

[0004] It is an object of the invention to provide a steel beam, by means of which the drawbacks of the prior art can be eliminated. This is achieved by the present invention. The steel beam of the invention is characterized in that at least one web part is made of a plate part formed of two longitudinal parts extending over the whole length of the beam that are at an angle to each other, and that the plate part is fastened to the base plate and top part in such a manner that the lower part of the web part is at an angle to the base plate and the upper part is substantially perpendicular to the base plate.

[0005] The advantage of the invention over the prior art is above all the fact that the shear capacity of the beam of the invention is essentially better than the shear capacity of a prior-art beam. The steel beam of the invention is also simple, whereby the introduction and use of the invention are advantageous. A further advantage of the invention is that it can be modified as necessary, whereby its use is advantageous. A yet further advantage is that the beam of the invention can be manufactured in the same manufacturing lines as the prior-art beams.

[0006] In the following, the invention will be described in more detail by means of preferred embodiments described in the attached drawing, in which

Figures 1 is a longitudinal view of a first embodiment of the steel beam of the invention,

Figure 2 is a perspective view of the beam of Figure 1, Figure 3 is a longitudinal view of a second embodiment of the steel beam of the invention, and Figure 4 is a perspective view of the beam of Figure 3.

[0007] Figures 1 and 2 are general views of the steel beam of the invention intended to serve together with concrete as a bearing composite structure of various slab systems. The beam comprises a base plate 1 and two web parts 2, 3. The web parts 2, 3 are arranged on the base plate 1 at a distance from each other and joined at the first edges of the web parts 2, 3 by means of a horizontal top part 4. The base plate 1, web parts 2, 3 and horizontal top part 4 are arranged to form a space that can be filled with concrete. The web parts 2, 3 have openings, through which concrete can be fed into the space formed by the base plate 1, web parts 2, 3 and horizontal top part 4. The beam also has corbel flanges 5, on which a hollow-core slab, for instance, is arranged. All above-mentioned beam parts can be cut from a steel plate.

[0008] The operation of the steel beam as a composite structure is known to a person skilled in the art and, thus, need not be described in more detail herein. In this context, reference is made for instance to the Finnish publications 85745 and 92089 mentioned earlier.

[0009] According to the essential idea of the invention, at least one web part 2, 3 is made of a plate part formed of two longitudinal parts 2a, 2b and 3a, 3b, respectively, of the beam. The parts 2a, 2b and 3a, 3b, respectively, are at an angle to each other. The plate part forming the web part 2, 3 is fastened to the base plate 1 and top part 4 in such a manner that the lower part 2a and 3a, respectively, of the web part 2, 3 is at an angle to the base plate 1 and the upper part 2b and 3b, respectively, is substantially perpendicular to the base plate 1. The above-mentioned structure is particularly clearly shown in Figure 1. The openings 6, through which concrete can be fed into the space formed by the base plate 1, web parts 2, 3 and horizontal top part 4, is in this embodiment arranged to the upper parts 2b, 3b of the web parts 2, 3.

[0010] In the embodiment of Figures 1 and 2, both web parts 2, 3 are made of a plate part, the parts 2a, 2b and 3a, 3b, respectively, of which are at an angle to each other. This type of solution is, however, not the only possible solution, and the invention can also be applied in a slightly different manner.

[0011] Figures 3 and 4 show a second embodiment of the invention. The same reference numerals as in Figures 1 and 2 are used in Figures 3 and 4 for corresponding items.

[0012] The embodiment of Figures 3 and 4 differs from the embodiment shown in Figures 1 and 2 in that in the embodiment of Figures 3 and 4, only one web part 2 is made of a plate part, the parts 2a, 2b of which are at an angle to each other. In this embodiment, the second web part 3 is made of a straight plate part without openings.

[0013] The embodiment of Figures 3 and 4 is an asymmetric beam that is especially advantageous in edge

structures. A beam suitable for edge structures refers herein to the beam forming the edge of a structure, such as a plane of a building, in such a manner that the opening-free web part 3 forms the edge surface of the plane.

[0014] When manufacturing the beam of the invention, it has been found advantageous to use side supports 7 and centre supports 8, which are shown with dashed lines in Figure 3. The side supports 7 and centre supports 8 can be arranged on the base plate 1 at regular intervals in the longitudinal direction of the beam. They can be fastened by welding, for instance. The side supports 7 are arranged to determine the position of the web parts equipped with openings 6 in relation to the base plate 7 and the centre parts 8 are, in turn, arranged to determine the location of the plate forming the top part 4. The side supports 7 can be L-shaped, for instance, as in Figure 3. The side supports and centre supports can for instance be cut from a plate material.

[0015] The invention can also be applied in such a manner that the web parts 2, 3 are cut to a curved shape according to the pre-cambering of the beam. In this type of solution, the use of the side and centre supports is especially advantageous, since the side and centre supports support and guide the web parts and the horizontal top part very effectively during the manufacturing stage, in which the base plate is bent to the curvature according to the web plates. When the base plate is bent in the manner described above, the plate forming the top part 4 is also shaped by means of the centre supports to the correct curvature.

[0016] The base plate 1, web parts 2, 3 and top part 4 can be fastened to each other preferably by welding. If necessary, the beam can also be equipped with end flanges that close the end parts. The end parts are fastened by welding to the ends of the beam.

Claims

1. A steel beam that is arranged to serve together with concrete as a bearing composite structure for various slab systems, the composite structure comprising a base plate (1) and two web parts (2, 3) arranged side by side at a distance from each other and joined at first ends of the web parts by means of a horizontal top part (4), whereby the base plate (1), web parts (2, 3) and horizontal top part (4) are arranged to form a space that can be filled with concrete, **characterized in that** at least one web part (2,3) is made of a plate part formed of two longitudinal parts (2a, 2b, 3a, 3b) extending over the whole length of the beam that are at an angle to each other, and that the plate part is fastened to the base plate (1) and top part (4) in such a manner that the lower part (2a, 3a) of the web part (2, 3) is at an angle to the base plate (1) and the upper part (2b, 3b) is substantially perpendicular to the base plate (1).

2. A steel beam as claimed in claim 1, **characterized in that** both web parts (2, 3) are made of a plate part, the parts (2a, 2b, 3a, 3b) of which are at an angle to each other.

3. A steel beam as claimed in claim 1, **characterized in that** one web part (2) is made of a plate part, the parts (2a, 2b) of which are at an angle to each other, and the other web part (3) is made of a straight plate part.

4. A steel beam as claimed in any one of claims 1 to 3, **characterized in that** the upper part (2b, 3b) of the plate part is equipped with openings (6) for feeding concrete to the space formed by the base plate (1), web parts (2, 3) and top part (4).

Patentansprüche

1. Stahlträger, der vorgesehen ist, zusammen mit Beton als eine stützende Verbundkonstruktion für unterschiedliche Plattensysteme zu fungieren, welche Verbundkonstruktion eine Grundplatte (1) und zwei Stegteile (2, 3) aufweist, die in einem Abstand voneinander nebeneinander angeordnet und an ersten Enden der Stegteile durch einen horizontalen Ober- teil (4) miteinander verbunden sind, wobei die Grundplatte (1), die Stegteile (2, 3) und der horizontale Ober- teil (4) vorgesehen sind, einen Raum zu bilden, der mit Beton gefüllt werden kann, **dadurch gekennzeichnet, dass** zumindest ein Stegteil (2, 3) aus einem Plattenteil besteht, das aus zwei sich über die gesamte Länge des Trägers erstreckenden und in einem Winkel zueinander stehenden Längsteilen (2a, 2b, 3a, 3b) ausgebildet ist, und dass der Plattenteil an die Grundplatte (1) und den Ober- teil (4) derart befestigt wird, dass der untere Teil (2a, 3a) des Stegteils (2, 3) in einem Winkel zur Grundplatte (1) steht und der obere Teil (2b, 3b) wesentlich senkrecht zur Grundplatte (1) ist.

2. Stahlträger nach Anspruch 1, **dadurch gekennzeichnet, dass** beide Stegteile (2, 3) aus einem Plattenteil bestehen, dessen Teile (2a, 2b, 3a, 3b) in einem Winkel zueinander stehen.

3. Stahlträger nach Anspruch 1, **dadurch gekennzeichnet, dass** der eine Stegteil (2) aus einem Plattenteil besteht, dessen Teile (2a, 2b) in einem Winkel zueinander stehen, und der andere Stegteil (3) aus einem geraden Plattenteil besteht.

4. Stahlträger nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** der obere Teil (2b, 3b) des Plattenteils mit Öffnungen (6) versehen ist, um dem von der Grundplatte (1), den Stegteilen (2, 3) und dem Ober- teil (4) gebildeten Raum Beton zu-

zuführen.

Revendications

1. Poutre d'acier conçue pour coopérer avec du béton pour former une structure porteuse composite pour différents systèmes de dallage, cette structure composite comprenant une semelle (1) et deux éléments d'âme (2, 3) disposés côte à côte, à distance l'un de l'autre et reliés entre eux au niveau de leurs premières extrémités par un élément supérieur horizontal (4), la semelle (1), les éléments d'âme (2, 3) et l'élément supérieur horizontal (4) étant disposés de manière à délimiter un espace pouvant être rempli de béton, **caractérisée en ce qu'**au moins un élément d'âme (2, 3) est constitué d'une plaque formée de deux parties longitudinales (2a, 2b, 3a, 3b) qui s'étendent sur toute la longueur de la poutre et qui forment entre elles un angle, et **en ce que** la plaque est fixée à la semelle (1) et à l'élément supérieur (4) de manière à ce que la partie inférieure (2a, 3a) de l'élément d'âme (2, 3) forme un angle avec la semelle (1) et que la partie supérieure (2b, 3b) soit sensiblement perpendiculaire à la semelle (1).
2. Poutre d'acier selon la revendication 1, **caractérisée en ce que** les deux éléments d'âme (2, 3) sont constitués d'une plaque dont les parties (2a, 2b, 3a, 3b) forment un angle entre elles.
3. Poutre d'acier selon la revendication 1, **caractérisée en ce que** l'un des éléments d'âme (2) est constitué d'une plaque dont les parties (2a, 2b) forment entre elles un angle et **en ce que** l'autre élément d'âme (3) est constitué d'une plaque droite.
4. Poutre d'acier selon l'une quelconque des revendications 1 à 3, **caractérisée en ce que** la partie supérieure (2b, 3b) de la plaque présente des ouvertures (6) destinées à permettre l'introduction de béton dans l'espace délimité par la semelle (1), les éléments d'âme (2, 3) et l'élément supérieur (4).

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Fig. 1

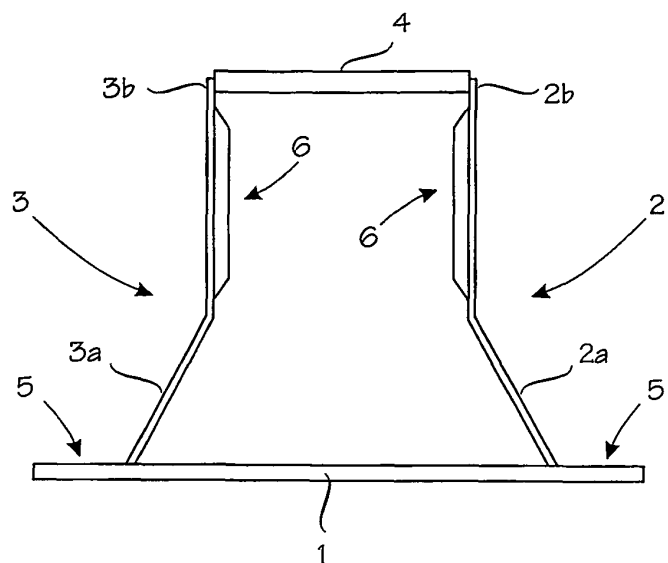


Fig. 2

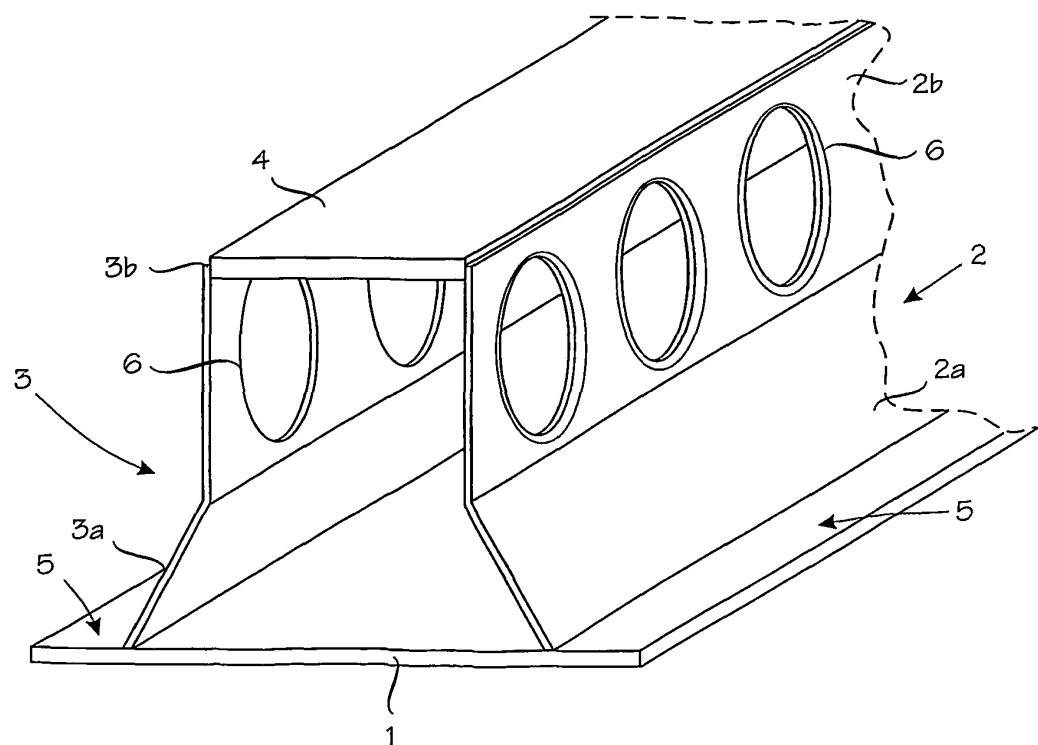


Fig. 3

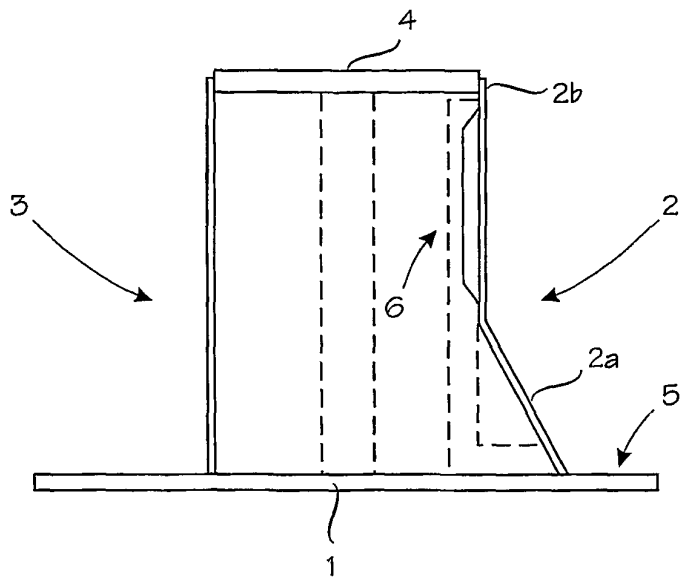
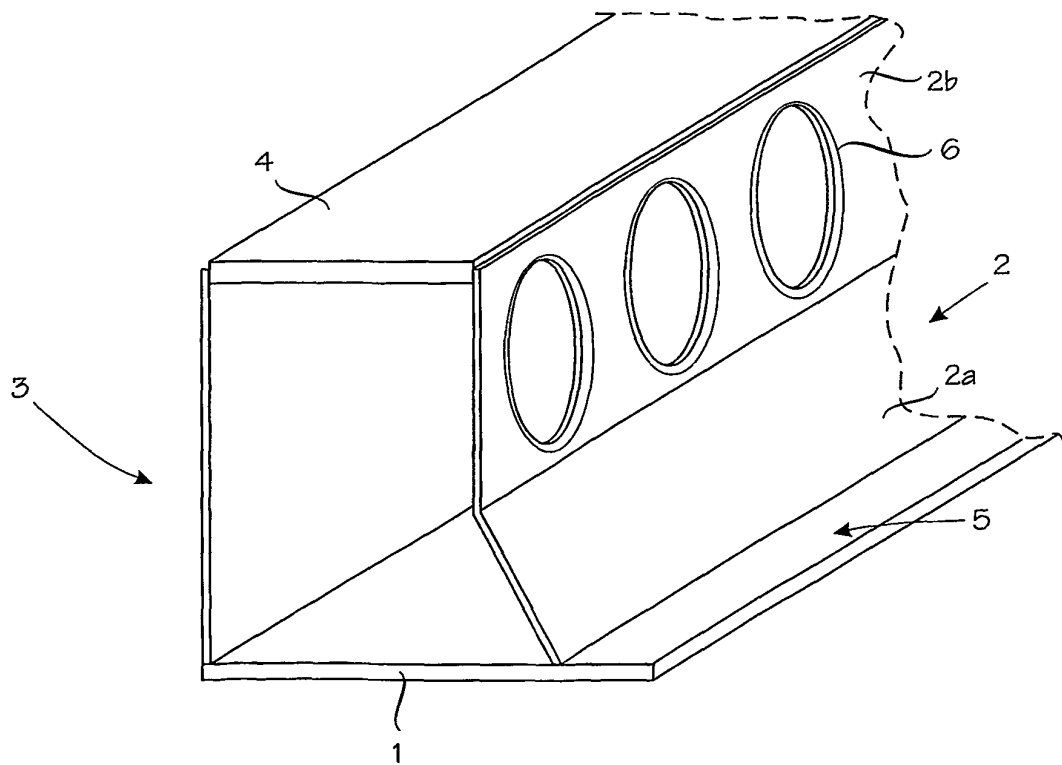


Fig. 4



REFERENCES CITED IN THE DESCRIPTION

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