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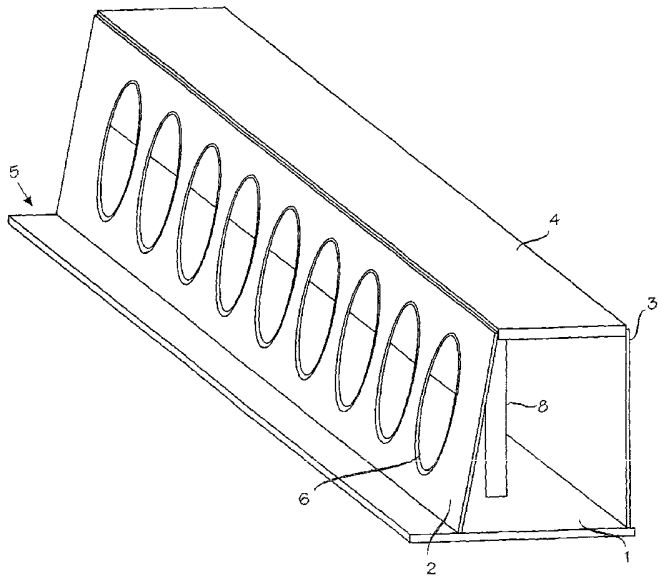
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[Continued on next page]

(54) Title: STEEL BEAM



(57) Abstract: 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 com-posite 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. One web part (2) is in a manner known per se made slanted relative to the base plate (1) and a corbel flange (5) extending from it and equipped with openings (6). The other web part (3) is, in turn, made sub-stantially perpendicular to the base plate (1) and has no openings.

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KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

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STEEL BEAM

[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.

[0003] The solutions according to the prior art, such as the solutions known from the above-mentioned publications, work in various structures without problems. Various edge structures, which generate additional work, and consequently also additional costs, when the prior art is used, constitute, however, a drawback.

[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 one web part is in a manner known per se made slanted relative to the base plate and a corbel flange extending from it and equipped with openings, and that the other web part is made substantially perpendicular to the base plate and has no openings.

[0005] The advantage of the invention over the prior art is above all the fact that the additional costs related to edge structures are eliminated in a very advantageous manner. The steel beam of the invention is also simple, whereby the introduction and use of the invention are advantageous. A yet further advantage is that the beam of the invention, especially a beam intended for edge structures, can be manufactured in the same manufacturing line as the conventional, symmetrical steel-concrete composite beam. The above-

mentioned matter makes the steel beam of the invention advantageous to manufacture.

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

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

Figure 2 is a perspective view of the steel beam of Figure 1,

Figure 3 is a perspective view of the steel beam of Figures 1 and 2 from another direction.

[0007] Figure 1 shows a general view of the steel beam of the invention that is intended to serve together with concrete as a bearing composite structure for various slab systems. The beam comprises a base plate 1 and two web parts 2, 3. The web parts 2, 3 are arranged side by side 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 web parts 2, 3 and horizontal top part 4 are arranged to form a space that can be filled with concrete. The web part 2 has openings 6, through which concrete can be fed into the space formed by the base plate 1, web parts 2, 3 and top part 4. The beam also has a corbel flange 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 detain 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, the second web part 2 is made in a manner known per se into a part that is equipped with openings and slanted relative to the base plate 1 and the corbel flange 5 extending from it. The second web part 3 is, in turn, made into an opening-free part substantially perpendicular to the base plate 1. The above-mentioned matters are shown not only in Figure 1, but also especially well in Figures 2 and 3.

[0010] The above-mentioned solution provides an asymmetric beam that is especially suitable for 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 plate 3 forms the edge surface of the plane.

[0011] An especially advantageous solution is to have side supports 7 and centre supports 8 arranged on the base plate 1 at regular intervals in the longitudinal direction of the beam. The side supports 7 are arranged to determine the position of the web plate 2 equipped with openings 6 in relation to the base plate 1 and the centre parts 8 are, in turn, arranged to determine the location of the bottom surface of the top plate forming the top part 4. The side supports 7 and centre supports 8 can in principle be made in any shape. It has, however, been proven especially advantageous to have substantially L-shaped side supports 7 with first free ends 7a arranged to determine the location of the lower edge of the web plate 2 equipped with openings 6 and second free ends 7b correspondingly arranged to determine the location of the top edge of the web plate 2 equipped with openings 6. This type of solution is shown in Figures 1 to 3.

[0012] It has been found advantageous that the above-mentioned centre supports 8 be substantially elongated parts with one end arranged to support itself on the top surface of the base plate 1 and the other end correspondingly to the bottom surface of the top plate 4 of the finished beam.

[0013] The side supports 7 and centre supports 8 can be fastened to the base plate 1 in any suitable manner. Welding has been found especially advantageous.

[0014] The side supports 7 and centre supports 8 support the web parts and the plate forming the top part 4 during manufacturing preferably in such a manner that manufacture can take place without a costly jig, whereby the costs can be reduced in comparison with the prior art.

[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 supports 7 and centre supports 8 is especially advantageous, since the side supports 7 and centre supports 8 support and guide the web parts 2, 3 and the plate forming the top part 4 very effectively during the stage, in which the base plate 1 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 8 to the correct curvature.

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

are fastened by welding to the ends of the beam.

[0017] The above embodiment of the invention is not intended to restrict the invention in any way, but the invention can be modified freely within the scope of the claims. Thus, it is clear that the steel beam of the invention or its details need not be exactly as shown in the figures, and solutions of a different kind are also possible. For instance, the side and centre supports need not be exactly parts cut from a planar material as shown in the figures, but can also be made from a rod material. The side and centre supports also need not be separate parts, as shown in the figures, but they can be made into a uniform part, if such a solution is deemed necessary.

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 one web part (2) is in a manner known per se made slanted relative to the base plate (1) and a corbel flange (5) extending from it and equipped with openings (6), and that the other web part (3) is made substantially perpendicular to the base plate (1) and has no openings.

2. A steel beam as claimed in claim 1, **characterized** in that side supports (7) and centre supports (8) are arranged on the base plate (1) at regular intervals in the longitudinal direction of the beam, whereby the side supports (7) are arranged to determine the position of the web plate (2) equipped with openings (6) in relation to the base plate (1) and the centre parts (8) are arranged to determine the location of the bottom surface of the top plate forming the top part (4).

3. A steel beam as claimed in claim 2, **characterized** in that the side supports (7) are substantially L-shaped parts with one end (7a) arranged to determine the location of the lower edge of the web plate (2) equipped with openings (6) and the other end (7b) correspondingly arranged to determine the location of the top edge of the web plate (2) equipped with openings (6).

4. A steel beam as claimed in claim 3, **characterized** in that the centre supports (8) are substantially elongated parts with one end arranged to support itself on the top surface of the base plate (1) and the other end correspondingly to the bottom surface of the top plate forming the top surface (4) of the finished beam.

5. A steel beam as claimed in any one of the preceding claims 1 to 4, **characterized** in that the web plates (2, 3) are cut to a curved shape according to the pre-cambering of the beam.

Fig. 1

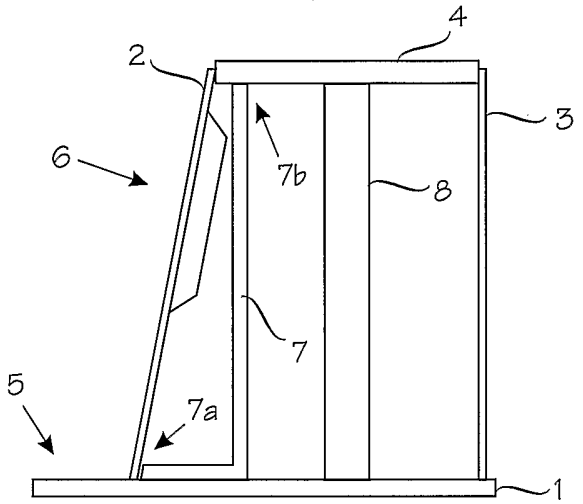


Fig. 2

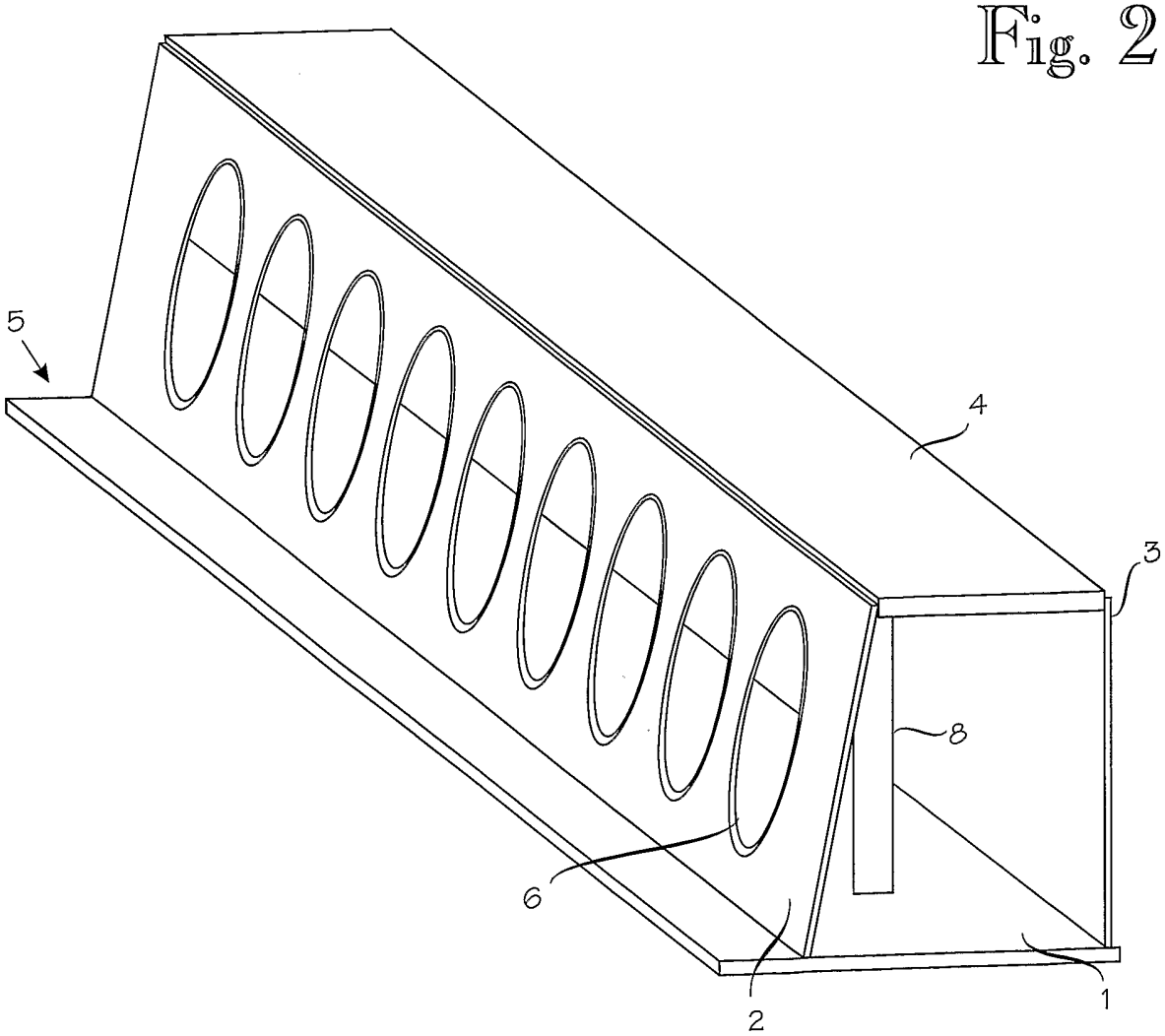
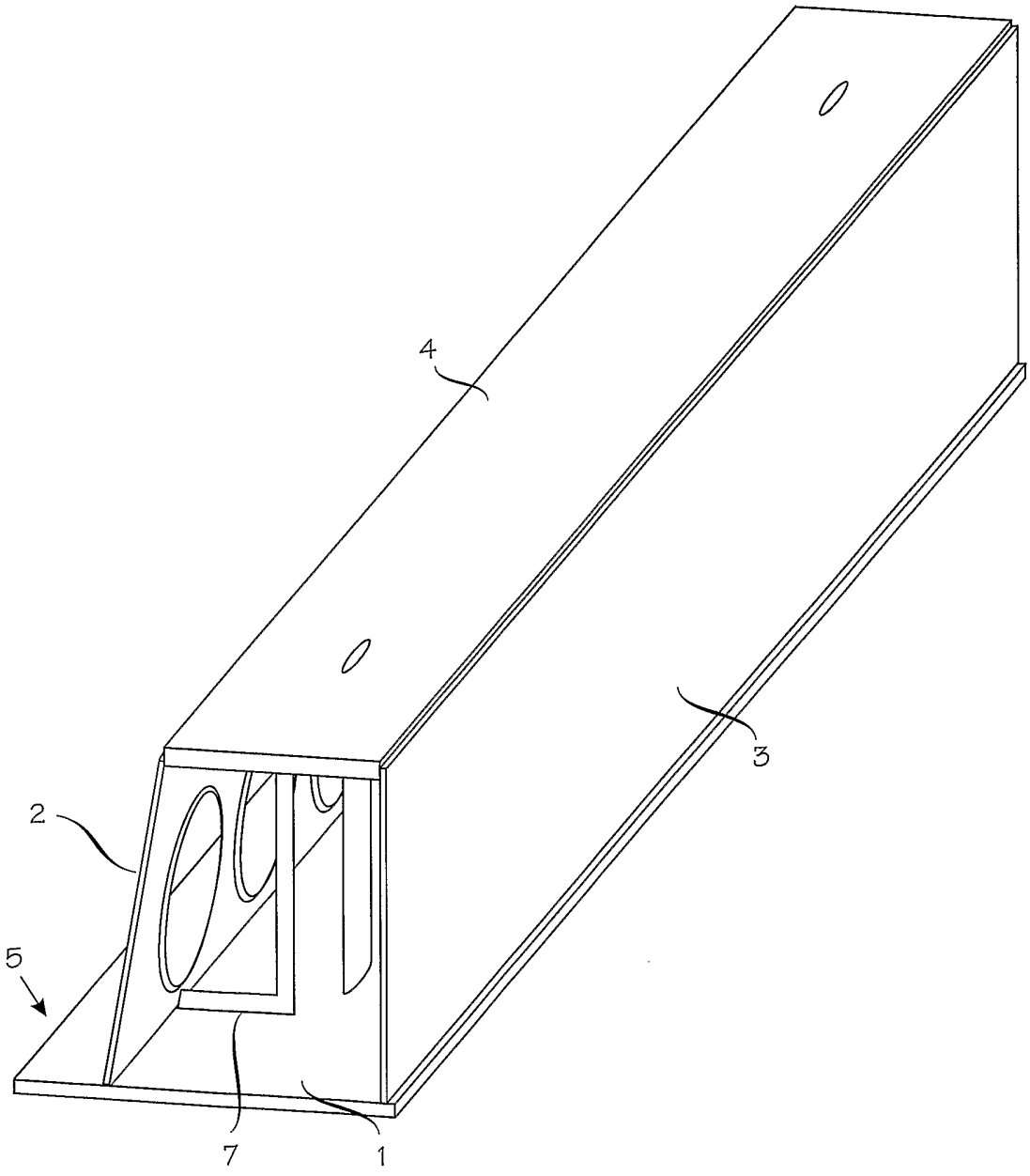


Fig. 3



INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 03/00399

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E04C 3/293, E04C 3/07, E04B 5/29
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: E04C, E04B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1551031 A (CATNIC COMPONENTS LIMITED), 22 August 1979 (22.08.79), page 1, line 31 - line 67, figures 1-7 --	1-5
A	GB 2027784 A (NORCROS INVESTMENTS LIMITED), 27 February 1980 (27.02.80), page 1, line 46 - line 100, figure 4 --	1-5
A	US 3967560 A (M. SIMON), 6 July 1976 (06.07.76), column 6, line 49 - column 7, line 31, figures 8-11 -- --------	1-5

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"E" earlier application or patent but published on or after the international filing date
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Date of the actual completion of the international search	Date of mailing of the international search report
17 July 2003	18 -07- 2003
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Ingemar Hedlund / MRo Telephone No. +46 8 782 25 00

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INTERNATIONAL SEARCH REPORT

Information on patent family members

29/06/03

International application No.
PCT/FI 03/00399

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