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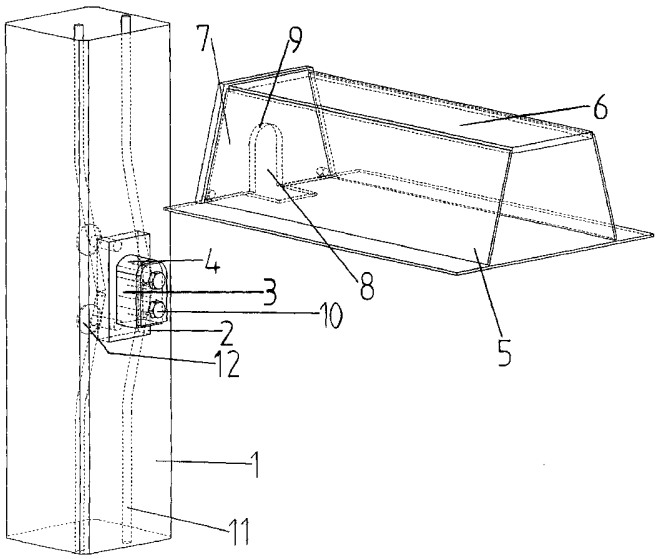
[Continued on next page]

(54) Title: ARRANGEMENT FOR FORMING A JOINT BETWEEN A BEAM AND A CONSOLE



(57) Abstract: The invention relates to a console for supporting a structural member, such as a concrete element, on a concrete column or a corresponding supporting structure (1) of a building. The console comprises a supporting member (2), which is at least partly cast in the concrete column or fastened to a corresponding supporting structure (1) of the building. The supporting member, in turn, comprises a console plate (3), on which the structural member can be supported in such a manner that the structural member is supported on the supporting structure (1), whereby the upper surface (4) of the console plate (3) has a substantially semi-circular shape.

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ARRANGEMENT FOR FORMING A JOINT BETWEEN A BEAM AND A CONSOLE

BACKGROUND OF THE INVENTION

[0001] The invention relates to an arrangement according to the preamble of claim 1 for forming a joint between a beam and a console for supporting a structural member, such as a concrete element, on a concrete column or a corresponding supporting structure of a building, whereby the beam, on which the structural members are mounted, comprises a supporting plate with a slot and the console comprises a supporting member, which is at least partly cast in the concrete column or fastened to a corresponding supporting structure of the building, the supporting member further comprising a console plate for receiving the beam in such a manner that the slot in the supporting plate of the beam is set onto the console plate to form the joint.

[0002] There are several known consoles for supporting a structural member, such as a concrete element, on a concrete column or a corresponding supporting structure of a building. One of them is disclosed in Finnish Patent 83358, for example.

[0003] According to the prior art consoles are used for transmitting support reactions of steel beams and steel joint beams to reinforced concrete columns, for instance. A console according to the prior art comprises a supporting member, which is at least partly cast in the concrete column or fastened to a corresponding supporting element of a building. The structural members of the building are mounted on the beams, which are mounted on console plates of the supporting members of the consoles fastened to the supporting structures in such a manner that the console plate of the supporting member is set into a slot in the beam, whereby the load caused by the structural members fastened to the beams is transmitted to the supporting structure through a joint formed between the supporting member and the beam.

[0004] When structural members are mounted on beams, the load on the beam becomes uneven, which causes torsional loading for the beam. The uneven load tends to turn the beam to the side where the load is greater. This turning must be restricted or prevented by transmitting the force couple caused by torsion from the beam to the bearing vertical supporting structures.

[0005] The supporting members of known consoles comprise console plates, which have a substantially rectangular shape so that their

upper surface, on which the beam is mounted, is even, triangular or slightly curved. The above-mentioned turning must in this case be restricted or prevented by inserting wedges between the console plate and the slot in the supporting plate of the beam, by welding or by a bolt fastening, whereby at least one of the components of the force couple is formed by means of a wedge, welding or bolts.

[0006] A problem with the above arrangement is that wedging, welding and providing of a bolt connection cause extra work, and thus the mounting at the construction site is slower. The above-mentioned procedures also cause dangerous situations, if the wedging, welding or tightening of the bolt connection is not carried out or if they fail.

BRIEF DESCRIPTION OF THE INVENTION

[0007] It is thus an object of the invention to provide a joint which is in accordance with the characterizing part of claim 1 and solves the above-mentioned problems. The object of the invention is achieved with a joint, which is characterized in that the upper edge of the slot in the supporting plate of the beam and the upper surface of the console plate in the supporting member of the console, which are set against each other at the joint, have a substantially semi-circular shape.

[0008] Preferred embodiments of the invention are disclosed in the dependent claims.

[0009] The invention is based on forming the console plate in the supporting member of the console in such a manner that its upper surface has a substantially semi-circular shape. Also the slot in the supporting plates of the beams, on which the structural members are mounted, is formed similarly to have a substantially semi-circular shape at its upper edge so that it can receive the console plate in order to form a tight connection between them. Thus, when the beam is mounted on the console plate, curved, substantially semi-circular surfaces are against each other and can transmit both vertical and torsion-induced, horizontal forces immediately after the mounting of the beam.

[0010] The method and system of the invention provide the advantage that the upper surface of the console plate and the upper edge of the slot in the supporting plate of the beam, which have a substantially semi-circular shape, can, when set against each other, transmit both vertical and torsion-induced, horizontal forces immediately after the mounting of the beam

so that no above-mentioned extra work, such as wedging, welding or a bolt connection, is required.

[0011] In a preferred embodiment of the console according to the invention, the substantially semi-circular upper surface of the console plate is convex, whereby the upper edge of the slot in the supporting plate of the beam is concave so that it tightly receives the substantially semi-circular, convex upper surface of the console plate.

[0012] In another preferred embodiment of the console according to the invention, the substantially semi-circular upper surface of the console plate is concave, whereby the upper edge of the slot in the supporting plate of the beam is convex so that it tightly receives the substantially semi-circular, concave upper surface of the console plate.

[0013] Furthermore, in a preferred embodiment of the console according to the invention, the radius of curvature of the substantially semi-circular upper surface of the console plate and that of the substantially semi-circular upper edge of the slot in the supporting plate of the beam section are substantially the same.

BRIEF DESCRIPTION OF THE FIGURES

[0014] The invention will now be described in greater detail in connection with preferred embodiments, with reference to the attached drawings, in which:

Figure 1 shows a preferred embodiment of the present invention.

Figure 2 shows another preferred embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0015] Figure 1 shows a console and a beam 5 for supporting a structural member (not shown), such as a concrete element, on a concrete column or a corresponding supporting structure 1 of a building. The structural member and the supporting structure can also be made of a material other than concrete, such as steel.

[0016] In Figure 1, the console according to the present invention comprises a supporting member 2, which is at least partly cast in the concrete column 1. The supporting member 2 is provided with bonds 11 and 12 for anchoring it to the vertical concrete column 1. In Figure 1, the bonds are steel bars 11 and upsetting bars 12, which are set the concrete column 1. The

supporting member 2 is to be cast in concrete according to the figure so that it forms part of the outer surface of the concrete column.

[0017] A console plate 3 is arranged movably at the supporting member 2 so that the position of the console plate 3 with respect to the concrete column can be changed. In Figure 1, the console plate 3 is also attached detachably to the supporting member 2 by using fastening means 10, in this embodiment bolts and a flange. The console plate 3 has a rectangular shape and comprises through-holes, through which the bolts are inserted, and the supporting member 2 comprises threaded holes, to which the bolts are secured.

[0018] According to the present invention and Figure 1, the upper surface 4 of the console plate 3 is formed to have a substantially semi-circular shape. Consequently, the upper edge of a flange, which can be a part of the fastening means 10, has a shape which corresponds at least partly to the shape of the upper surface 4 of the console plate 3. In this embodiment, the substantially semi-circular upper surface 4 of the console plate 3 is convex, as in Figure 1.

[0019] Figure 1 also shows a beam 5, which receives the structural members (not shown). The beam 5 comprises a casing part 6 and a supporting plate 7, which comprises a slot 8 for receiving the console plate 3 of the supporting member 2. The structural members of a building are mounted on these beams 5, which, in turn, are mounted on the console plates 3 of the supporting members 2 of the consoles fastened to the supporting structures 1 so that the console plate in the supporting member is set into the slot in the beam 5, whereby the load caused by the structural members fastened to the beams 5 is transmitted to the supporting structure 1 through a joint formed between the supporting member 2 and the beam 5.

[0020] To provide this joint, the slot 8 in the supporting plate 7 of the beam 5 is formed to substantially correspond to the shape of the console plate 3 so that the slot 8 of this embodiment has a rectangular shape and its upper edge 9 has a substantially semi-circular shape, as in Figure 1. The console plate 3 and the slot 8 are dimensioned so that they correspond to each other as accurately as possible in order to prevent torsional loading produced during mounting from turning the beam 5, which also helps to keep the structural members straight and transmit the load caused by them to the vertical supporting structures 1.

[0021] In the preferred embodiment of Figure 1, the console plate of the supporting member 2 of the console has a rectangular shape and its upper edge 4 is formed to be semi-circular and convex, and, correspondingly, the slot 8 in the supporting plate 7 of the beam 5 has a similar rectangular shape and the shape of its upper edge is concave. Thus, the beam 5 comprising the structural members can be set onto the console plate of the supporting plate 2 of the console so that a joint according to the invention is provided, transmitting both vertical and torsion-induced horizontal forces so that no extra work, such as wedging, welding or a bolt connection, is required. When the beam 5 is set in its place, the substantially semi-circular, convex upper surface 4 of the console plate 3 of the supporting member 2 is set against the similar, substantially semi-circular, concave upper edge of the slot 8 in the supporting plate of the beam 5.

[0022] Figure 2 shows another preferred embodiment of the present invention. The solution of this embodiment corresponds to the console structure described above, but the substantially semi-circular upper surface 4 of the console plate 3 and the upper edge 9 of the slot 8 are shaped in a different manner.

[0023] According to Figure 2, the console plate 3 of the supporting member 2 of the console fastened to the supporting structure has a rectangular shape and the shape of its upper edge 4 is substantially semi-circular and concave. Correspondingly, the slot 8 in the supporting plate 7 of the beam 5 is also rectangular and its upper edge 9 convex, as in Figure 2. This provides a joint according to the present invention, as the beam 5 comprising structural members is supported on the supporting member 2 of the console in such a manner that the console plate 3 of the supporting member 2 is set into the slot 8 in the supporting plate 7 of the beam 5, whereby the concave upper surface 4 of the console plate 3 and the convex upper edge 9 of the slot 8 are set against each other.

[0024] The embodiment of the invention according to Figure 2 and formed in the above manner has the same effect as the joint according to the embodiment of Figure 1, provided between the supporting member 2 of the console and the beam 5.

[0025] Essential in the present invention is that the shape and dimensions of the upper surface 4 of the console plate 3 of the supporting member 2 and those of the upper edge of the slot 8 in the supporting plate 7 of

the beam 5 are substantially semi-circular and thus the beam 5 bearing the structural members can be firmly supported on the console plate 3 of the supporting member 2 of the console fastened to the supporting structure 1. Thus, the vertical load caused by the structural members and the horizontal load caused by torsion are transmitted efficiently to the vertical supporting structures.

[0026] Essential in the present invention is also that the manufacturing tolerances of the console plate 3 and those of the slot 8 in the supporting plate 7 of the beam 5 are restricted to be as small as possible to reduce the turning caused by torsional loading sufficiently or to prevent it completely. In the preferred embodiment, the radius of curvature of the substantially semi-circular upper edge 9 of the slot 8 and that of the substantially semi-circular upper surface 4 of the console plate 3 are the same.

[0027] Both the console parts which are to be fastened to the supporting structures and the beam can be implemented in several ways without departing from the scope defined in the claims of the present invention. For example, the console plate and thus the slot in the supporting plate of the beam can be formed in different ways, yet in such a manner that the upper surface of the console plate and the upper edge of the slot substantially maintain their semi-circular shape.

[0028] It is obvious to a person skilled in the art that as technology advances, the basic idea of the invention can be implemented in a variety of ways. The invention and its embodiments are thus not restricted to the above examples but they may be modified within the scope of the claims.

CLAIMS

1. An arrangement for forming a joint between a beam (5) and a console for supporting a structural member, such as a concrete element, on a concrete column or a corresponding supporting structure (1) of a building,

whereby the beam (5), on which the structural members are mounted, comprises a supporting plate (7) with a slot (8) and

the console comprises a supporting member (2), which is at least partly cast in the concrete column or fastened to a corresponding supporting structure (1) of the building, the supporting member (2) further comprising a console plate (3) for receiving the beam (5) in such a manner that the slot (8) in the supporting plate (7) of the beam (5) is set onto the console plate (3) to form the joint,

characterized in that

the upper edge of the slot (8) in the supporting plate (7) of the beam (5) and the upper surface of the console plate (3) in the supporting member (2) of the console, which are set against each other at the joint, have a substantially semi-circular shape.

2. A console as claimed in claim 1, **characterized** in that the upper edge (9) of the slot (8) in the supporting plate (7) of the beam (5) is concave so that it receives the substantially semi-circular, convex upper surface (4) of the console plate (3).

3. A console as claimed in claim 1, **characterized** in that the upper edge (9) of the slot (8) in the supporting plate (7) of the beam is convex so that it receives the substantially semi-circular, concave upper surface (4) of the console plate (3).

4. A console as claimed in any one of claims 1 to 7, **characterized** in that the radius of curvature of the substantially semi-circular upper surface (4) of the console plate (3) and that of the substantially semi-circular upper edge (9) of the slot (8) in the supporting plate (7) of the beam section (5) are substantially the same.

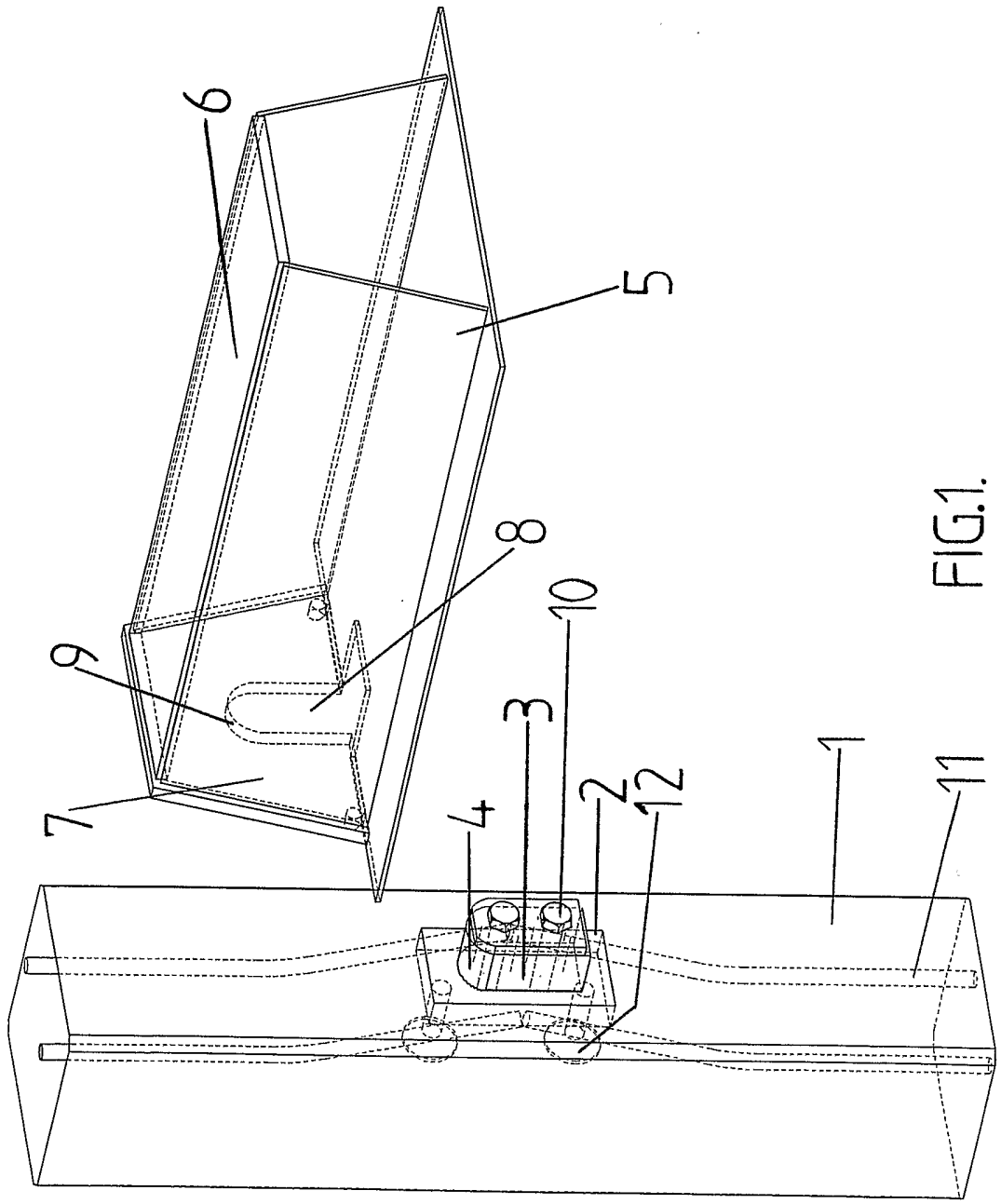

FIG.1.

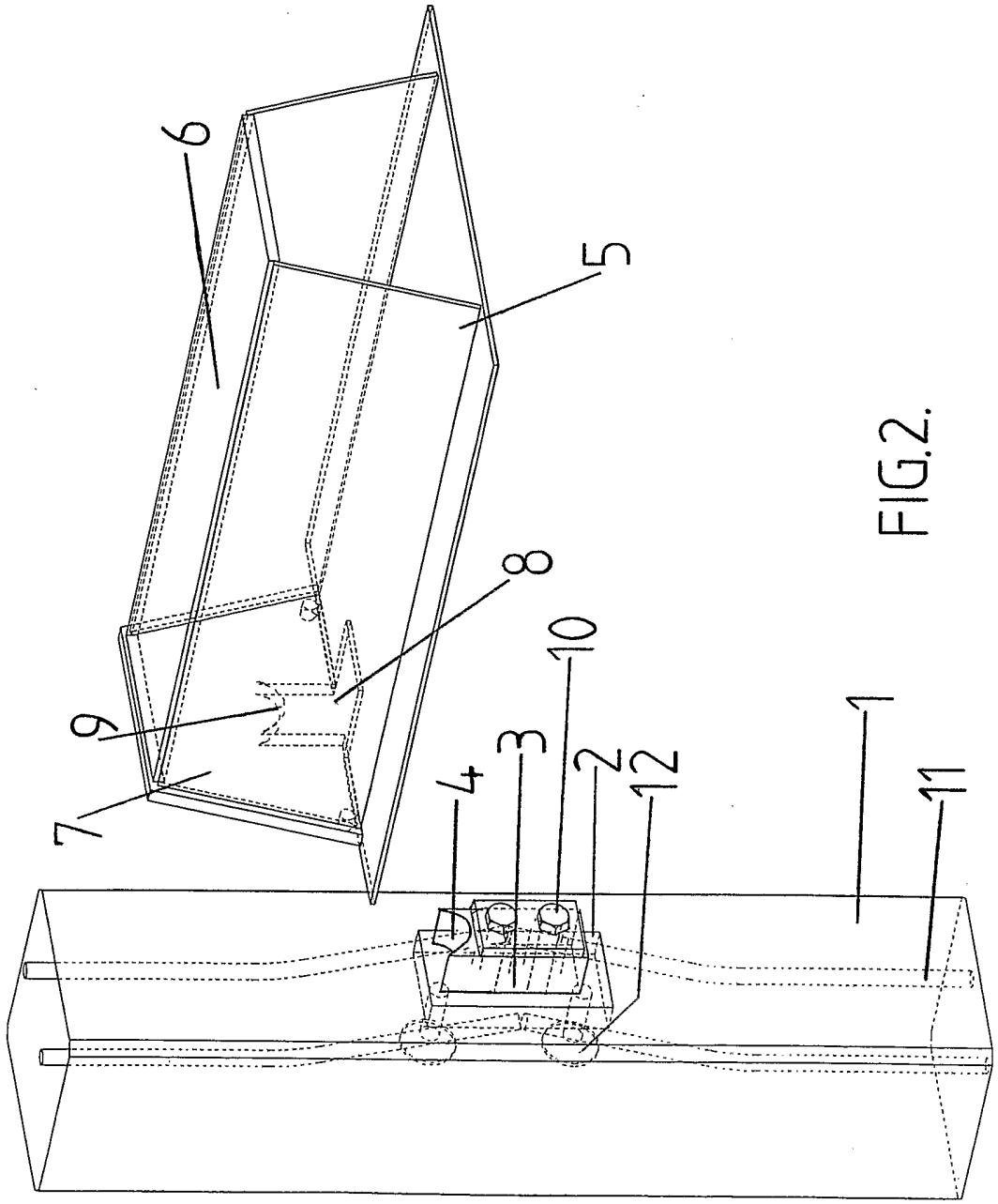

FIG.2.

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: E04B 1/21
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: 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)

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CA 2291330 A1 (NORTH, G.), 30 May 2001 (30.05.01)	1-4
A	GB 1025614 A (JOHN LAING CONSTRUCTION LIMITED ET AL), 14 April 1966 (14.04.66)	
A	DE 2732183 A1 (DOBLIN, R.), 18 January 1979 (18.01.79)	
A	GB 808977 A (S. REVESZ), 18 February 1959 (18.02.59)	

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

* Special categories of cited documents:
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INTERNATIONAL SEARCH REPORT

Information on patent family members

31/10/03

International application No.
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
CA 2291330 A1	30/05/01	NONE	
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