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(54) Beam or truss consisting of two or more reinforced concrete half-members with a new jointing device

(57) The invention is a new flat or trussed reinforced concrete beam comprising two or more half-members or pitched beams (A) and (B), joined together by means of a jointing block (Ka, Kb) comprising a main distribution plate (Da, Db), a guiding counterplate (Ga, Gb) lying flush with the coupling surface (Sa, Sb) and parallel to said main distribution plate (Da, Db), one or more pairs of through tubes (Ta, Tb) solidly attached orthogonally to said main distribution plate (Da, Db) and to said guiding counterplate (Ga, Gb), wherein the joint between consecutive half-members or pitched beams (A) and (B) is obtained by inserting ties (Z) in said through tubes (Ta, Tb), and stressing them and/or maintaining the stress therein by means of nuts or wedge-shaped clamps (Za, Zb) that come to bear on said main distribution plates (Da, Db).

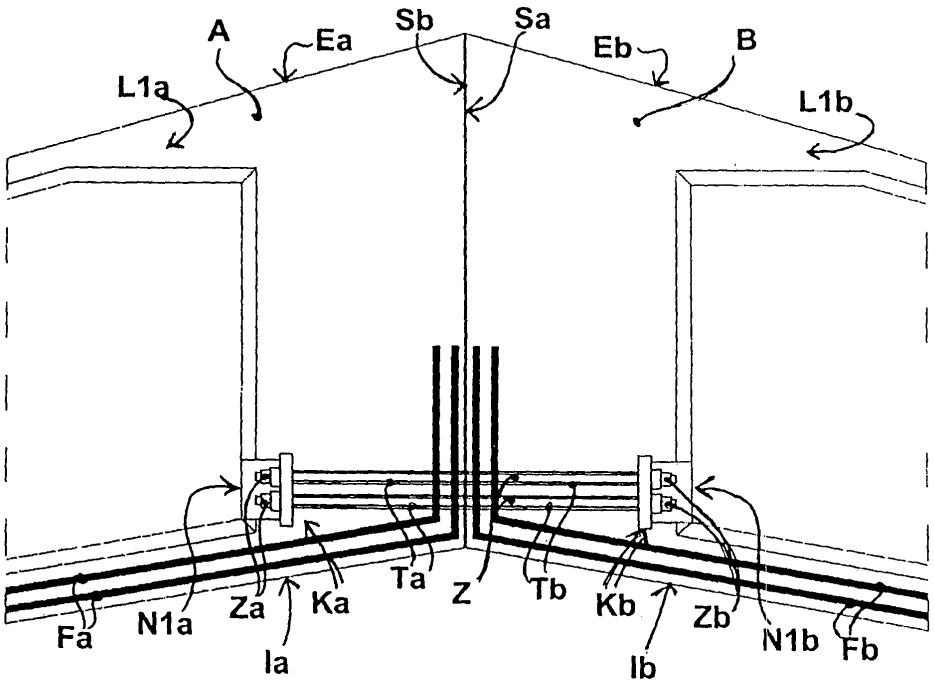

Fig. 1

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Description

[0001] The present patent relates to reinforced concrete members and particularly concerns a new reinforced concrete beam or truss consisting of two or more half-members or pitched beams, with jointing devices for the construction of roofing for civil, industrial or farming buildings, or for road or railway decks.

[0002] There are known precast enbloc reinforced concrete members consisting of a single continuous body in which reinforcement rods are buried, running the full length of the beam.

[0003] There are also known types of trussed beam, used to build duopitch roofs.

[0004] For the construction of roofs over large buildings, as in the case of industrial and farming sheds in particular, the truss for the roof can have a span of up to 20-30 meters.

[0005] The transportation of precast beams from the production site to the installation site is extremely difficult, however, particularly in the case of beams of considerable size.

[0006] The transportation of enbloc beams of this type requires the use of exceptional transport means because of the considerable overall dimensions of the beams in question.

[0007] The length of the beams poses severe problems in terms of road circulation, particularly when the beams have to be taken to places in the mountains or through towns, or wherever the conditions of the road network make it difficult for the transport vehicles to manoeuver.

[0008] The transportation also requires exceptional means of transport because of the considerable weight of such beams.

[0009] As a result, the economic burden involved in the transportation of the known beams is extremely heavy.

[0010] There are known types of beam composed of two half-members and this facilitates their transportation because it halves their length and weight, but this solution entails numerous problems at the time of assembly.

[0011] In fact, the joint between two such half-members must guarantee exactly the same characteristics of strength and stiffness as those of an enbloc beam.

[0012] Said half-members are complementary and symmetrical, and are joined together at the time of their installation at the jobsite.

[0013] Both half-members are made of reinforced concrete and each comprises a vertical coupling surface lying substantially orthogonal to the axis of the half-member.

[0014] There are known half-members comprising one or more connector plates positioned in line with said coupling surface and particular in the lower part of the beam, which is submitted to tensile stress, and in the upper part, submitted to compressive stress.

[0015] Said connector plates are permanently anchored to the corresponding half-members by means of ties solidly attached to the reinforcement.

[0016] The joint between the two half-members is obtained by juxtaposing the coupling surfaces and aligning said connector plates.

[0017] Said connector plates are then engaged and fixed to one another by means of bolts.

[0018] There are also known types of beam or truss consisting of a first half-member fitted with a set of steel bars solidly attached to the corresponding reinforcement and threaded at one end, whereon an internally-threaded sleeve is screwed so that it projects partially from the coupling surface of said half-member.

[0019] The second half-member is fitted with through tubes lying orthogonal to the coupling surface and with their opening positioned flush with said coupling surface.

[0020] The half-members are joined together by inserting the sleeves projecting from the first half-member in the openings in said through tubes in the second half-member.

[0021] The joint is completed by inserting in said through tubes on the second half-member threaded metal bars which screw into the inside of said sleeves, achieving the connection between the two half-members.

[0022] The object of the present patent is a new beam or truss, consisting of two or more half-members or pitched beams with a new jointing device, for the construction of flat roofs or trussed roofs for civil, industrial or farming buildings, or for road or railway decks.

[0023] The main purpose of the present invention is to create a beam consisting of two or more half-members joined so as to produce a beam with characteristics of stiffness and strength comparable to those of enbloc beams.

[0024] Another object of the present invention is to facilitate the transportation of said beams, since the length and weight of the elements to carry are halved, with a considerable reduction in the related costs.

[0025] Another object of the present invention is to enable a straightforward and rapid assembly of the beam at the time of its installation at the jobsite.

[0026] Another object of the present invention is to use jointing devices that ensure the utmost stiffness and strength.

[0027] A further advantage of the present intervention lies in that it accelerates the transport procedures.

[0028] These and other direct and complementary objects have been achieved through the construction of the new beam or truss consisting of two or more half-members or pitched beams, with the corresponding new jointing device.

[0029] The present invention fundamentally comprises two or more elements or members that may be flat or have complementary sloping pitches, suitable for combining to form a flat beam or duopitch or boomerang-shaped trussed beam by means of suitable jointing devices as described below.

[0030] Said half-members are made of concrete rein-

forced with metal bars with or without pre- or post-stressing arranged longitudinally in the vicinity of the intrados with vertical side links.

[0031] Each of said half-members comprises at least one vertical concrete coupling surface orthogonal to the axis of said half-member.

[0032] Said device for joining two consecutive half-members together comprises at least one pair of jointing blocks, each of which is solidly attached to the corresponding half-member.

[0033] Each of said jointing blocks comprises two metal plates, hereinafter respectively called the main distribution plate and the guiding counterplate, connected to one another by tubular metal elements, hereinafter called through tubes, distributed preferably in a symmetrical arrangement.

[0034] Said jointing blocks lie over the main reinforcing rods coming between the links in the corresponding half-member and are positioned in the vicinity of the intrados of the beam, i.e. in the lower part.

[0035] Said guiding counterplate is positioned flush with the coupling surface, while said through tubes lie orthogonal to said coupling surface.

[0036] Said main distribution plate is consequently positioned parallel to said coupling surface.

[0037] The joint between two consecutive half-members is obtained by juxtaposing the corresponding coupling surfaces, aligning the guiding counterplates and inserting a mild steel wire, hereinafter called a tie, inside each of said through tubes; this tie is subsequently stressed by fixing it to nuts or wedge-shaped clamps coming to bear on said main distribution plates.

[0038] The characteristics of the new beam or truss consisting of two or more complementary half-members with a new jointing device will be highlighted in greater detail in the following description, with reference to the drawings attached hereto as nonrestrictive examples.

[0039] Figure 1 schematically illustrates a vertical section of the central area of a truss composed of two juxtaposed half-members or pitched beams.

[0040] Figure 1a shows a boomerang-shaped truss composed of two half-members or pitched beams.

[0041] Figure 1b shows a truss consisting of two half-members or pitched beams with a flat intrados.

[0042] Figure 1c shows a flat beam consisting of three members.

[0043] Figure 2 shows a vertical cross-section of the terminal part of a half-member or pitched beam in detail, while Figure 2a-a shows a vertical cross-section along a-a of the pitched beam with the main distribution plate.

[0044] Figure 3 shows a horizontal cross-section of the terminal part of a half-member or pitched beam.

[0045] Figures 4a and 4b respectively show a horizontal section and a vertical section of a jointing block.

[0046] The following description refers to an embodiment involving the jointing of two pitched beams (A) and (B) to achieve a trussed beam.

[0047] Said pitched beams (A) and (B) are symmetrical and complementary.

[0048] Each of said pitched beams (A) and (B) is also symmetrical with respect to a vertical plane of symmetry (P) and comprises an intrados (Ia, Ib) that is either substantially horizontal or sloping and an extrados (Ea, Eb) that is substantially sloping.

[0049] Each pitched beam (A) and (B) comprises a vertical concrete coupling surface (Sa, Sb) orthogonal to the corresponding vertical plane of symmetry (P).

[0050] Each of said pitched beams (A) and (B) is made of reinforced concrete, wherein the main reinforcing rods (Fa, Fb) in each of said half-members (A) and (B) lie parallel to the corresponding intrados (Ia, Ib) and are bent at the ends in the vicinity of said coupling surface (Sa, Sb).

[0051] The reinforcement of each pitched beam (A) and (B) is completed with vertical side links designed to create a stiffening cage in the vicinity of the coupling surface (Sa, Sb).

[0052] Each of said pitched beams (A) and (B) comprises at least one jointing block (Ka, Kb) consisting of at least one main distribution plate (Da, Db) and at least one guiding counterplate (Ga, Gb), connected together by one, two or more pairs of through tubes (Ta, Tb) arranged orthogonally to said main distribution plate (Da, Db) and to said guiding counterplate (Ga, Gb).

[0053] Said jointing block (Ka, Kb) is preferably symmetrical with respect to a vertical plane of symmetry (K1) parallel to said through tubes (Ta, Tb), wherein said through tubes (Ta, Tb) are arranged symmetrically with respect to said vertical plane of symmetry (K1) of the pitched beam (A, B).

[0054] Said distribution plate (Da, Db) is complete with holes (Xa, Xb) coinciding with the openings in said through tubes (Ta, Tb).

[0055] Said guiding counterplate (Ga, Gb) is likewise complete with holes (Ya, Yb), which also coincide with the openings in said through tubes (Ta, Tb).

[0056] Said jointing block (Ka, Kb) is situated in the vicinity of said main reinforcing rods (Fa, Fb) and comes in between said reinforcement links in the corresponding pitched beam (A) and (B).

[0057] The guiding counterplate (Ga, Gb) on each of said jointing blocks (Ka, Kb) is positioned flush with the corresponding concrete coupling surface (Sa, Sb) in the lower part of the pitched beam (A, B), i.e. in the vicinity of the intrados (Ia, Ib).

[0058] Each jointing block (Ka, Kb) is thus arranged so that the main distribution plate (Da, Db) lies parallel to the coupling surface (Sa, Sb), while said through tubes (Ta, Tb) are orthogonal to said coupling surface (Sa, Sb).

[0059] Said plane of symmetry (K1) of each jointing block (Ka, Kb) coincides with the vertical plane of symmetry (P) of the half-member (A, B).

[0060] Each jointing block (Ka, Kb) is placed inside the corresponding pitched beam (A) and (B), above said reinforcing rods (Fa, Fb).

[0061] Said pitched beams (A) and (B) preferably have a T or double-T cross-section.

[0062] Said pitched beams (A) and (B) are approximately 50 cm wide at the intrados (Ia, Ib) and extrados (Ea, Eb), while they are narrower, i.e. 10 cm, in the central part or core.

[0063] In the vicinity of the coupling surface (Sa, Sb), the width of the pitched beams (A) and (B) is approximately 50 cm, so that the jointing block (Ka, Kb) does not protrude therefrom.

[0064] The lateral surfaces (L1a, L1b) and (L2a, L2b) of each pitched beam (A) and (B) also comprise at least one niche or cavity (N1a, N1b) and (N2a, N2b) created in the vicinity of said main distribution plate (Da, Db) to provide access to said holes (Xa, Xb).

[0065] In the construction of each of said pitched beams (A) and (B), it is advisable to connect said jointing block (Ka, Kb) to the reinforcing rods (Fa, Fb) or to the formwork in which the concrete is subsequently cast.

[0066] Moreover, each of said main distribution plates (Da, Db) preferably comprises two vertical side plates (D1a) and (D2a) to facilitate the insertion and fastening of the jointing block (Ka, Kb) to the reinforcing rods (Fa, Fb) and/or links in the corresponding pitched beam (A) and (B).

[0067] The joint between the two pitched beams (A) and (B) is completed by juxtaposing the corresponding contact surfaces (Sa) and (Sb) and aligning the holes (Ya, Yb) on the guiding counterplates (Ga, Gb).

[0068] In this way the corresponding through tubes (Ta) and (Tb) also come into line, thereby creating continuous ducts.

[0069] A tie (Z) is inserted in each of said through tubes (Ta, Tb) and passes through both of said tubes (Ta) and (Tb) aligned with each other, both of said main distribution plates, (Da) and (Db), and both of said guiding counterplates (Ga, Gb).

[0070] The joint is completed by permanently stressing the ties (Z), which are attached to said main distribution plates (Da, Db) with the aid of nuts or wedge-shaped clamps (Za, Zb).

[0071] The two pitched beams (A) and (B) are thus connected together and the compressive forces due to the stressing of the ties (Z) are evenly distributed by means of said main distribution plate (Da, Db).

[0072] The resulting truss is ready for installation.

[0073] In the embodiment illustrated in Figure 1c, the beam consists of three elements (A), (B), (C), where the consecutive elements (A) - (C) and (C) - (B) are joined to each other by means of jointing devices, as previously described.

[0074] Therefore, with reference to the previous description and to the attached drawings, the following claims are expressed.

Claims

1. Flat or trussed reinforced concrete beam comprising two or more half-members or pitched beams (A) and (B), each with its corresponding reinforcement and at least one vertical concrete coupling surface (Sa, Sb), **characterized in that** each of said half-members or pitched beams (A) and (B) comprises at least one jointing block (Ka, Kb) which in turn consists of:

   - at least one main distribution plate (Da, Db) parallel to said coupling surface (Sa, Sb) and complete with one or more holes (Xa, Xb);
   - at least one guiding counterplate (Ga, Gb), flush with said coupling surface (Sa, Sb), complete with one or more holes (Ya, Yb) and parallel to said main distribution plate (Da, Db);
   - one, two or more pairs of through tubes (Ta, Tb) solidly attached orthogonally to said main distribution plate (Da, Db) and to said guiding counterplate (Ga, Gb), and positioned in line with said holes (Xa, Xb) and (Ya, Tb);

   and wherein the joint between consecutive half-members or pitched beams (A) and (B) is obtained by means of the insertion of ties (Z) in said through tubes (Ta, Tb), which are stressed and/or maintained under tensile stress by means of nuts or wedge-shaped clamps (Za, Zb) coming to bear on said main distribution plates (Da, Db).

2. Beam or truss according to claim 1, **characterized in that** said jointing blocks (Ka) and (Kb) are positioned in the vicinity of the intrados (Ia, Ib) of the corresponding half-member or pitched beam (A, B).

3. Beam or truss according to claims 1, 2, **characterized in that** the half-members or pitched beams (A) and (B) are joined together by juxtaposing said coupling surfaces (Sa) and (Sb), and said guiding counterplates (Ga, Gb) on the jointing blocks (Ka, Kb) so as to bring into alignment said through tubes (Ta) and (Tb) of each jointing block (Ka) and (Kb).

4. Beam or truss according to claims 1, 2, 3, **characterized in that** said jointing blocks (Ka) and (Kb) are complete with side plates (D1a, D2a, D1b, D2b).

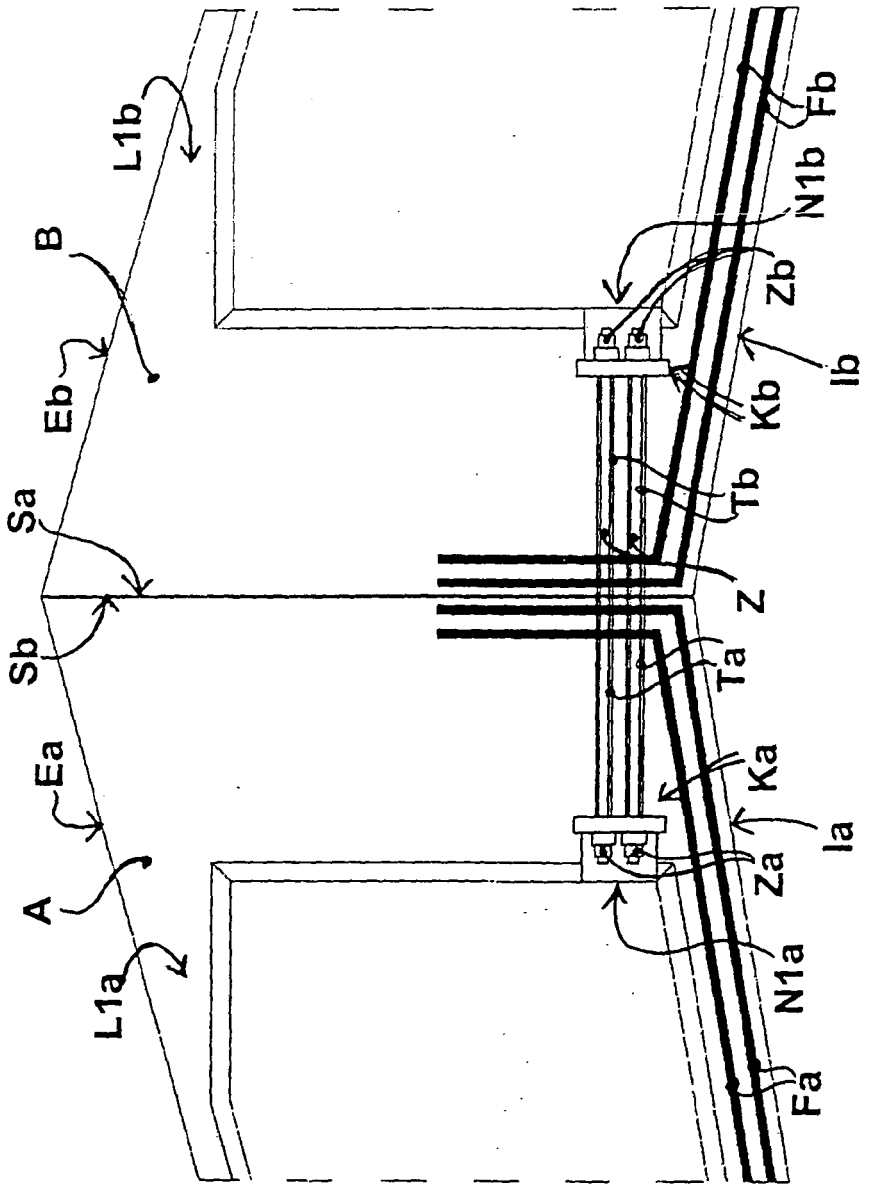

Fig. 1

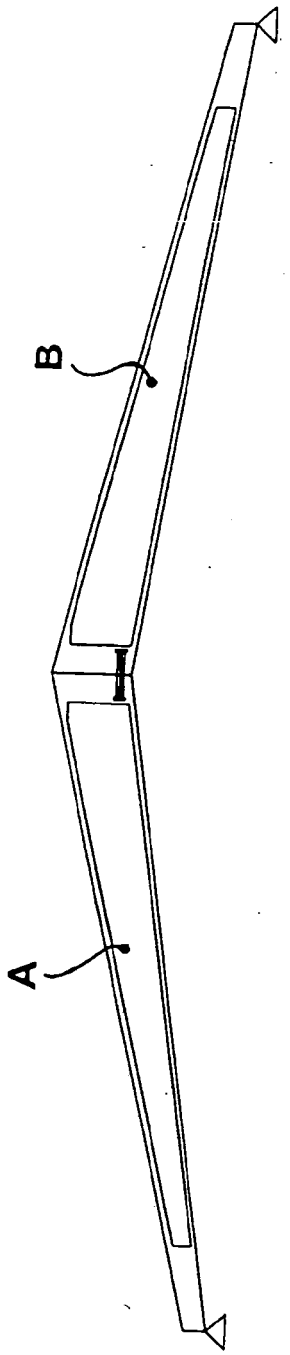

Fig. 1a

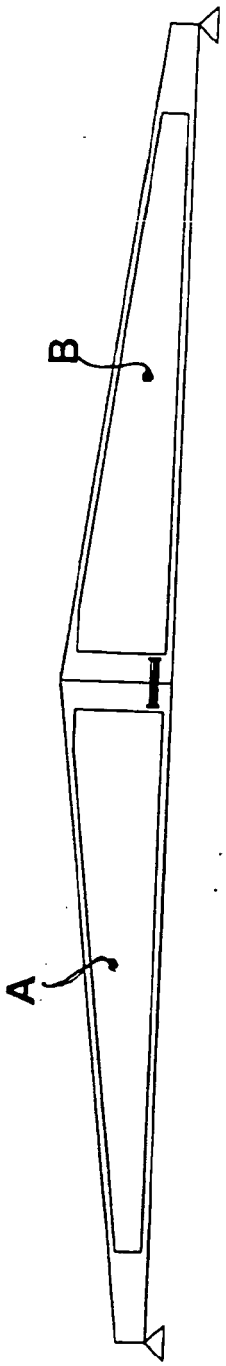

Fig. 1b

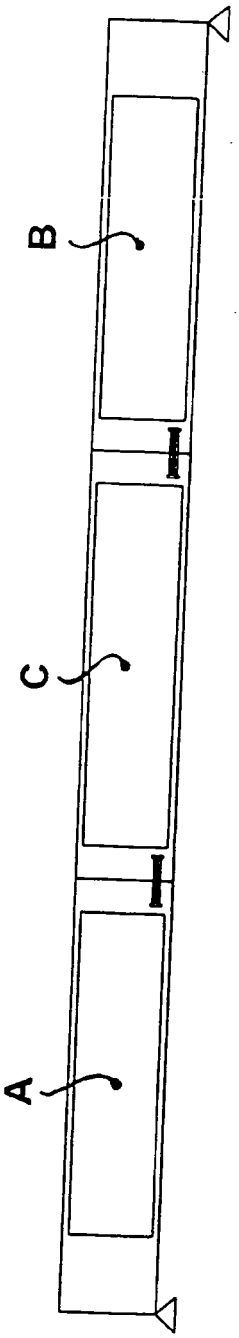

Fig. 1c

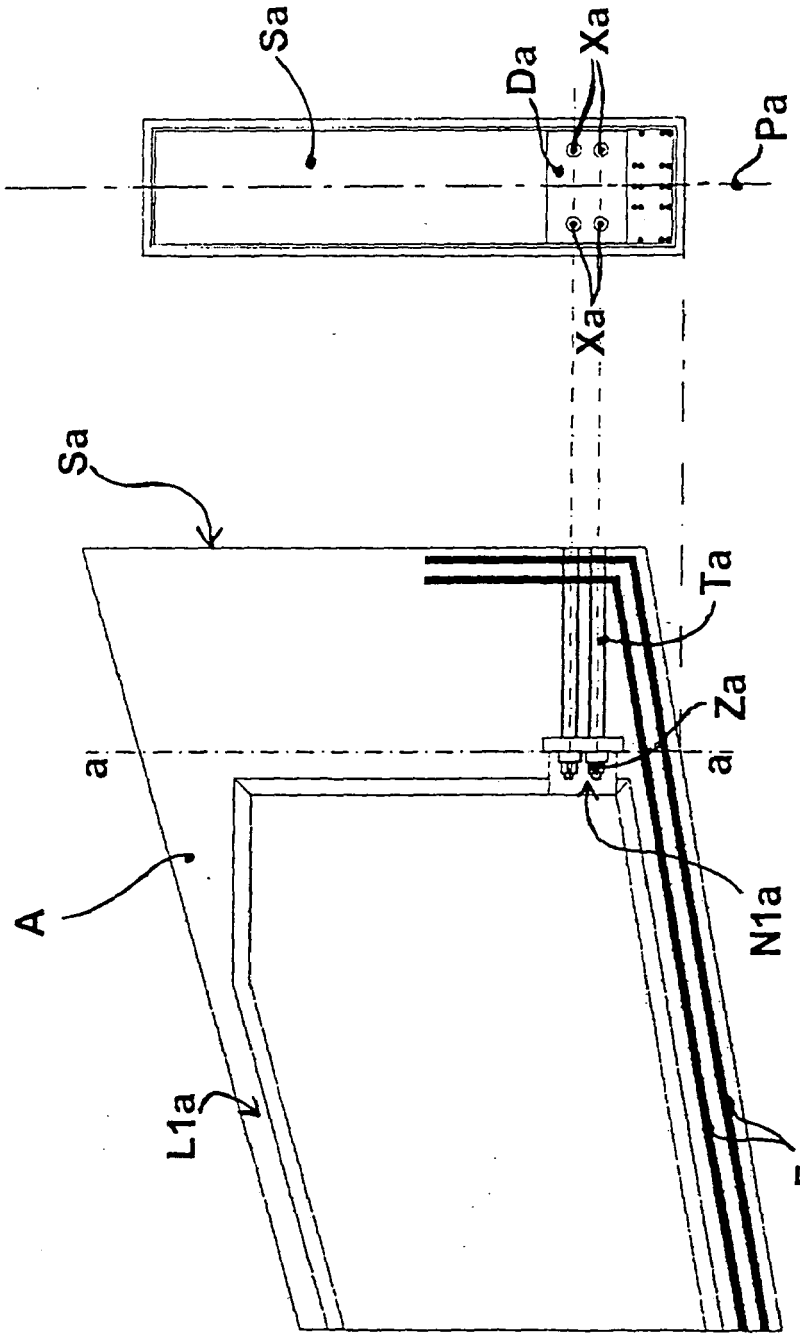

Fig. 2a-a

Fig. 2

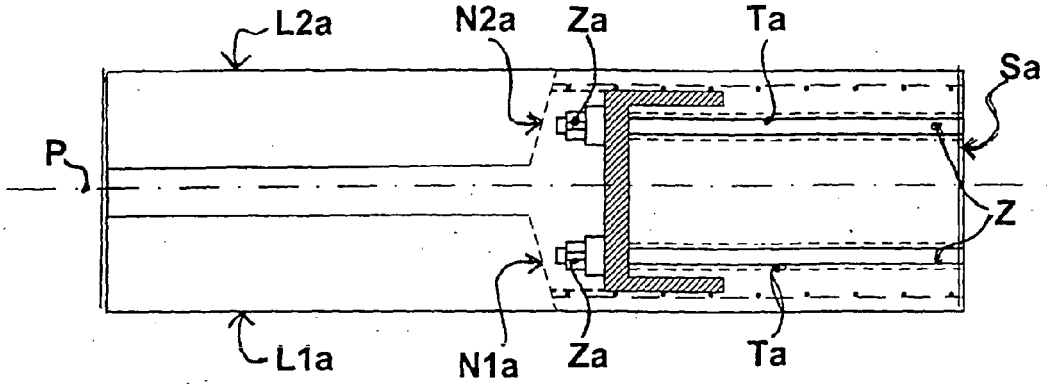

Fig. 3

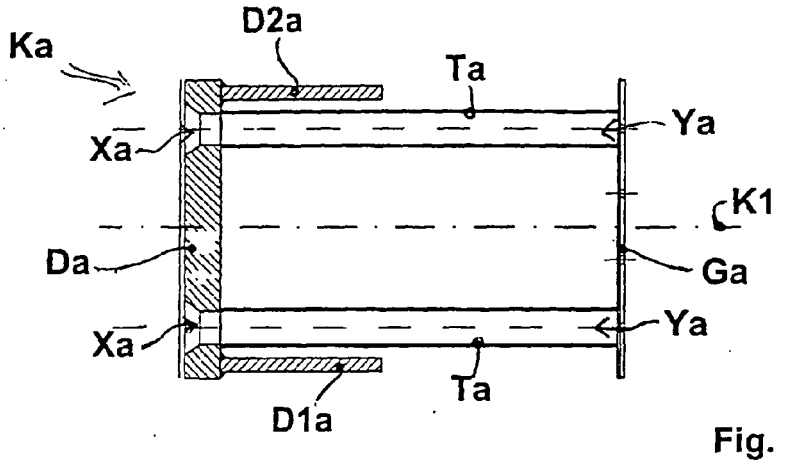

Fig. 4a

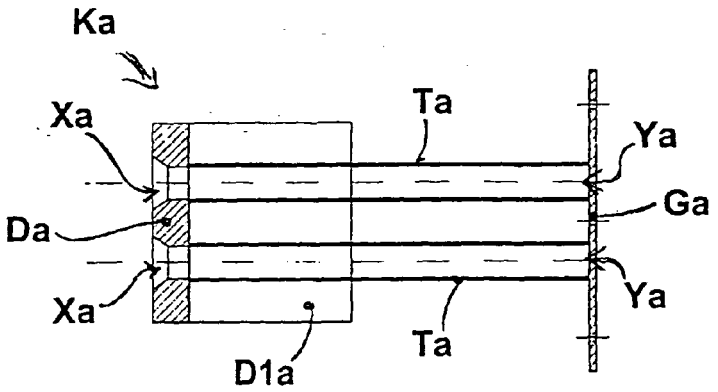

Fig. 4b