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(54) **Spacer for concrete shuttering**

(57) Cross strut (1) suitable for maintaining a distance between two facing panels (2) of a box caisson (3), the cross strut comprising a central body (5) which is suitable for being inserted inside a wall (6) realised for packing the box caisson (3) itself and two longitudinal peripheral sections (7) which are arranged on either side

of the central body (5) and which are each suitable for extending outside the relative panel (2); whereby the cross strut comprises barring means (11) which are arranged around and integral to the central body (5) between the peripheral sections (7) in order to block the movement of any kind of liquid along a longer longitudinal axis (A) of the cross strut (1).

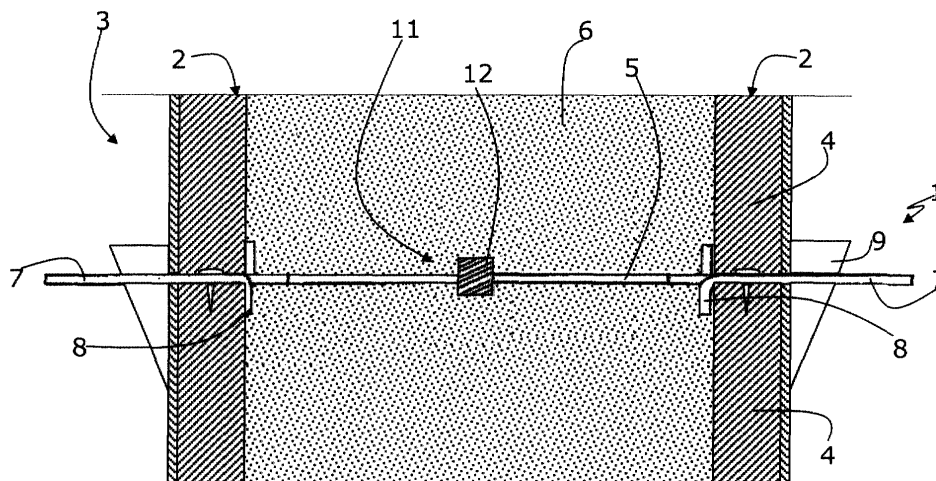


Fig. 1

Description

[0001] The present invention relates to a cross strut.

[0002] In general, box caissons used for the construction of plain concrete or reinforced concrete walls are defined by two facing panels which are each defined by a number of horizontal axes made of wood or metal, and a number of cross struts, which are assembled between the two panels in order to distance the panels themselves from each other and from one axis and another of the same panel, and comprising two longitudinal tongues which are opposite each other and which each extend outside the relative panel, and a central body which is suitable for being inserted inside the plain concrete wall.

[0003] The presence of cross struts inserted inside the wall, however, implies a great disadvantage - above all when the wall is realised underground. In fact, the mechanical operation necessary for shearing the tongues in order to exert a force such that the tongues themselves may be detached once the box caissons have been removed, and the different behaviour of the material of which the box caissons are made in relation to the material of which the wall is made causes the formation of a fissure around the central body of the cross strut itself. Particularly when the wall forms part of a tank, this fissure can permit liquid to pass from one part of the wall to another, and in the long term this makes it necessary to carry out time-consuming maintenance and restoration operations.

[0004] The aim of the present invention is to produce a cross strut, which will be free of the disadvantage described above.

[0005] According to the present invention, a cross strut will be produced, which is suitable for maintaining a distance between two facing panels of a box caisson, the cross strut comprising a central body which is suitable for being inserted inside a wall realised for packing the box caisson itself and two longitudinal peripheral sections which are arranged on either side of the central body and which are each suitable for extending under the relative panel, the cross strut being characterised by the fact that it comprises barring means which are arranged around and integral to the central body between the said peripheral sections in order to block the movement of any kind of liquid along a longer longitudinal axis of the cross strut.

[0006] The invention will now be described with reference to the attached drawings, which illustrate a non-limiting embodiment of the invention, in which;

FIGURE 1 is an elevated lateral view, with some parts in section and some removed for reasons of clarity, of a preferred form of embodiment of the cross strut realised according to the present invention; and

FIGURE 2 is a plan view of the cross strut illustrated in FIGURE 1.

[0007] With reference to the numbers shown in the attached drawings, the number 1 refers to a cross strut in its entirety, which is suitable for distancing two facing panels 2 of a box caisson from each other, in which each panel 2 is defined by a number of axes 4 made of wood which are arranged horizontally one on top of the other.

[0008] The cross strut 1 presents a longitudinal axis A and comprises a central body 5 which is suitable for being inserted inside a concrete wall 6 which is realised for packing the box caisson 3 itself and two longitudinal peripheral tongues 7 which are arranged on either side of the body 5 and which are each suitable for extending outside the relative panel 2.

[0009] The cross strut 1 also comprises, for each tongue 7, two locators 8 which are arranged transverse to the body 5 on either side of the body 5 itself, and which are suitable for being arranged below the relative panel 2 in order to counteract the action of a respective wedge 9 inside a slot 10, with which each tongue 7 is provided.

[0010] Finally, the cross strut 1 comprises a barring device 11 which is arranged around and integral to the body 5 between the tongues 7 in order to prevent the movement of any kind of liquid along the axis A of the cross strut 1 itself.

[0011] The device 11 comprises a determined number of annular elements 12 (only one of which is illustrated) which are arranged in close contact with the body 5, and which are realised in hydro-expansive material which is suitable for increasing its own volume when it comes into contact with liquids and which may be made of natural or synthetic material.

[0012] The elements 12 are distributed along the body 5, and are realised by coating the material onto the central body 5, or by means of sticking, clinching or binding the material onto the body 5, or by means of vulcanising or extruding the material in direct contact with the body 5.

[0013] Each element 12 may be realised according to the method described above directly during the manufacturing phase of the cross strut 1, or may be subsequently applied to the cross strut 1, and according to the kind of material used for the realisation of the element 12, it may have different dimensions and a different expansion capacity.

[0014] In use, once the cross strut 1 has been positioned in such a way that the relative tongues 7 are arranged between the two axes 4 of the same panel 2, and in such a way that the central body 5 is arranged so as to bridge the gap between the two panels 2 themselves, the box caisson 3 is packed with concrete so that the bodies 5 of each cross strut 1 are contained inside the future wall together with the relative elements 12.

[0015] Once the concrete has hardened, the eventual shrinkage of the material and the inevitable oxidation of the cross strut 1 may cause the formation of a fissure along an external surface of the cross strut 1, which, if it were not for the presence of the barring device

11, would permit the passage of any kind of liquid from one part of the wall 6 to another. Furthermore, it is the presence of fluids which causes the expansion of the material of which each element 12 is made and, thus, the subsequent sealing of the fissure.

[0016] The varieties of realisation presented by the element 12 mean that the element 12 can adapt to any of the sections in the central body 5 and that the element 12 is capable of immediately, gradually and constantly closing or blocking the passage of any kind of liquid along the axis A in two possible directions: from the inside to the outside and vice versa.

[0017] The cross strut 1 described above does not involve any changes or modifications in terms of size concerning the structures to be constructed, or any form of maintenance or particular care when it is in use, and it is capable of tolerating different flows of liquid.

[0018] In the embodiment herein illustrated, the cross strut 1 is defined by a blade, but it may be implicitly and easily deduced from the above description that the cross strut 1 may also be defined by a concrete rod or other elements which have the function of maintaining the panels 2 in position. For example, the cross strut 1 may be defined by a single tubular body, in which the tongues 7 are defined by two tubular end sections of the body itself, and which are assembled under the panels 2.

[0019] It is intended that the invention should not be limited to the form of embodiment herein described and illustrated, which is to be considered as a preferred form of embodiment of the cross strut 1, which may be subject to further modifications in terms the shape and arrangement of the parts, and details pertaining to construction and assembly.

creasing its own volume when it comes into contact with the said liquids.

3. Cross strut according to Claim 2, **characterised by** the fact that the said hydro-expansive material is either natural or synthetic and the said annular element (12) is realised by coating the material onto the central body (5) or by vulcanising or extruding the material in direct contact with the central body (5).
4. Cross strut according to Claim 3, **characterised by** the fact that the barraging means (11) comprised a determined number of annular elements (12) which are distributed along the central body (5).

Claims

1. Cross strut (1) suitable for maintaining a distance between two facing panels (2) of a box caisson (3), the cross strut comprising a central body (5) which is suitable for being inserted inside a wall (6) realised for packing the box caisson (3) itself and two longitudinal peripheral sections (7) which are arranged on either side of the central body (5) and which are each suitable for extending under the relative panel (2), the cross strut (1) being **characterised by** the fact that it comprises barraging means (11) which are arranged around and integral to the central body (5) between the said peripheral sections (7) in order to block the movement of any kind of liquid along a longer longitudinal axis (A) of the cross strut (1).
2. Cross strut according to Claim 1, **characterised by** the fact that said barraging means (11) comprise at least one annular element (12) which is arranged in close contact with the central body (5) and which is made of hydro-expansive material suitable for in-

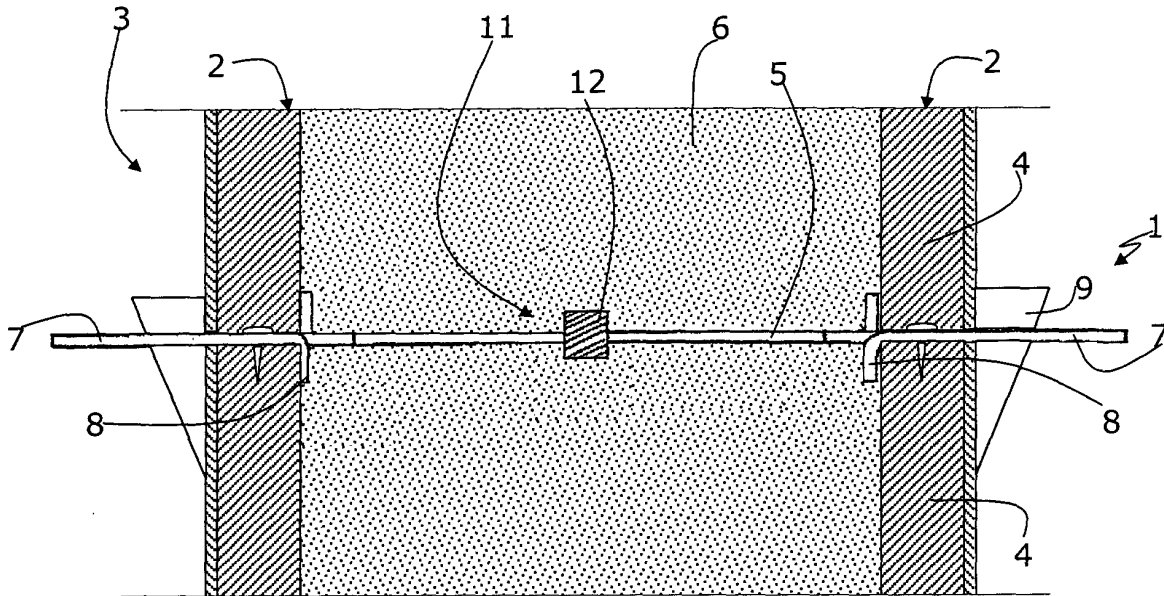


Fig. 1

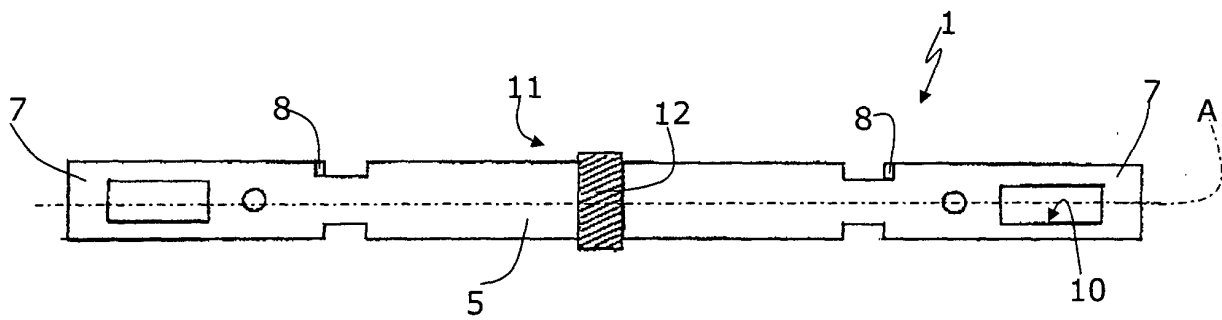


Fig. 2