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LIFTING BEAM FOR A COFFER DAM OR THE LIKE

The invention relates to a lifting beam, viz. for a coffer dam, comprising a beam on which are pivotingly mounted hooking-in means, such as ears or hooks, aimed at co-operating with complementary hooking-in means, such as hooks or ears, respectively, integral with the coffer dams to be raised, said hooking-in means being fixed to a balance-beam with counterweights capable of being displaced with a view to change the position of the centre of gravity of these hooking-in means with respect to the vertical median plane passing through their axis of rotation, in order to achieve, as the case may be, the automatic engagement of said hooking-in means with said complementary hooking-in means when they meet same or, on the contrary, to allow their automatic withdrawal in the presence of these complementary hooking-in means upon their release from said hooking-in means.

This invention relates to the field of the maintenance tools and will find its application viz. at the level of the watercourse barrages using coffer-dam-type movable doors.

As a matter of fact, numerous difficulties nowadays arise for the installation and, in particular, the placing of coffer dams serving as a barrage for a watercourse. In this respect, some watercourses are particularly deep, so that it is necessary to install several coffer dams on top of each other to obtain the complete barrage. Wel now, under such circumstances, only the upper coffer dam is easily accessible, the other ones being necessarily under water. It is then difficult to hook in same with simple lifting means. In addition, one cannot imagine this hooking-in to be carried out by an operator having direct access to the coffer dam under water.

In order to cope with this problem, there has been imagined a lifting beam for coffer dams as more in particular described in FR-A-2,723,114. Such a lifting beam includes, as described above, an eventually length-adjustable beam so that the ends be capable of moving along profile bars forming the stiles of the sash-frame installed in an apron of a watercourse and inside which slide the coffer dam or dams of a movable door.

As a matter of fact, this lifting beam includes, in this case, two pairs of hooks symmetrically arranged with respect to the vertical median plane of said lifting beam, the hooks corresponding to a pair being fitted on both sides on the beam, while keeping between them a distance at least equal to the

thickness of a coffer dam. These features are mainly so determined as to allow these hooks to co-operate with complementary hooking-in means a coffer dam is laterally provided with at its upper edge. In particular, these complementary hooking-in means are in the shape of a tubular tip protruding, at the upper edge of the lateral sides, thus on both the upstream and the downstream-oriented face of these coffer dams.

In addition, these hooks are fixed to a balance-beam with counterweights which can be displaced with a view to change the position of the centre of gravity of the hooks with respect to the vertical median plane passing through their axis of rotation. This allows to achieve, as the case may be, the automatic engagement of said hooks with the complementary hooking-in means in the shape of tubular tips the coffer dams are provided with or, to the contrary, to ensure their automatic withdrawal in the presence of these complementary hooking-in means upon their release from the curved portion of these hooks.

Thus, if one wants to remove a coffer dam arranged on the bottom of a watercourse, one therefore acts on the counterweights of the hooks, so that, during the lowering of the lifting beam and when same meets the coffer dam under water, the hooks arranged on both sides of the beam automatically hook in on the tubular tips sidely protruding at the level of said coffer dam. It is then possible to raise same.

Conversely, if one wants to place a coffer dam on the bottom of a watercourse, this coffer dam is first of all hooked in on the lifting beam, then the position of the counterweights is changed. Thus, once the coffer dam has arrived at the end of its travel on the bottom of the watercourse, the hooks automatically tilt into a withdrawn position. It is then possible to raise only the lifting beam.

Finally, it should be noticed that, though the lifting beam as described in this prior document perfectly meets the needs for the installation and the placing of coffer dams serving as a barrage for a continuous watercourse, i.e. when these coffer dams are accessible on both their downstream and their upstream side of this watercourse, there exists no valid solution when these coffer dams are, instead, immediately applied, at their upstream side or at their downstream side, against a wall, so that these coffer dams are as a matter of fact accessible at this upstream or downstream side, as the case may be.

This case may arise when the watercourse communicates with an underground ducting and the coffer dam barrage is necessarily installed at the ending of this ducting.

The solution according to the invention consists in arranging the hooking-in means, such as hooks, not on both sides of the beam corresponding to the lifting beam, but substantially in the median plane of this beam, these hooks co-operating with complementary hooking-in means located, in turn, on the upper edge of a coffer dam.

In this way, the lifting beam does not exceed the space delimited by the vertical stiles in the shape of profiles with a U-shaped cross-section defining the sash-frame of the movable door. Thus, this latter may directly be applied, upstream or downstream, against any wall whatsoever.

Finally, the lifting beam according to the invention allows to very accurately solve the problem of the installation and the placing of the coffer dams a movable door is comprised of, irrespective of the conditions of installation of this latter.

For this purpose, the invention relates to a lifting beam, viz. for a coffer dam, comprising a beam on which are pivotingly mounted hooking-in means, such as ears or hooks, aimed at co-operating with complementary hooking-in means, such as hooks or ears, respectively, integral with the coffer dams or the like to be raised, said hooking-in means being fixed to a balance-beam with counterweights capable of being displaced with a view to change the position of the centre of gravity of these hooking-in means with respect to the vertical median plane passing through their axis of rotation in order to achieve, as the case may be, the automatic engagement of said hooking-in means with said complementary hooking-in means when they meet same or, on the contrary, to allow their automatic withdrawal in the presence of these complementary hooking-in means upon their release from said hooking-in means, characterized in that these hooking-in means are pivotingly mounted in one or several openings provided for in the beam.

According to the invention, the complementary hooking-in means of a coffer dam or the like are located on the upper edge of this latter and are either in the shape of hooks or in the shape of ears, whereby it should be known that the hooking-in means associated with the lifting beam are configurated in the shape of ears or in the shape of hooks, respectively.

Further aims and advantages of this invention will become clear when reading the description which follows and relates to an embodiment which is given only by way of an indicative and non-exhaustive example.

This description will be better understood with reference to the attached drawings, in which:

- Figure 1 is a schematical elevational view of a lifting beam according to the invention, showing the case in which the counterweights of the hooking-in means are so arranged that these latter be capable of automatically co-operating with the complementary hooking-in means of a coffer dam arranged on the bottom of a watercourse,

- figure 2 is a view similar to figure 1, the counterweights being tilted into their second position leading to the automatic release of the hooking-in means of the lifting beam from the complementary hooking-in means of a coffer dam during the placing of this latter on the bottom of a watercourse,

- figure 3 is a schematical view of the lifting beam shown in figure 1,

- figure 4 is a schematical cross-sectional view along IV-IV of figure 3.

As shown in the various figures of the attached drawings, this invention relates to a lifting beam 1 viz. serving for placing and removing coffer dams 2 forming a movable door corresponding to a barrage of a watercourse, such as a channel or the like. It is clearly stated that, though the lifting beam is described, in the following description, within the framework of its application for handling coffer dams, such a lifting beam can also serve for hoisting and handling other elements, such as grids, panels, etc...

In particular, in the apron of a watercourse is installed the sash-frame 3 corresponding to said movable door. It is mainly comprised of two vertical stiles 4, 5 formed of profiles with a U-shaped cross-section between the parallel wings of which slide the side edges of the various coffer dams 2.

The lifting beam 1 has a structure in the shape of a horizontal beam 6, eventually of a varying length thanks to ends 7, 8 of a telescopic kind.

In particular at the level of these ends 7, 8, this beam 6 includes, in addition, guiding means 9 aimed at co-operating with said U-shaped profiles of the sash-frame 3, this in order to ensure the guiding of the lifting beam 1 along these latter. It should be noted that it is advantageous to also ensure, through these guiding means 9, the maintaining of the lifting beam 1 in a substantially horizontal plane, in order to avoid any jamming during the op-

erations of raising and lowering coffer dams 2.

Thus, these guiding means 9 are comprised, within the framework of the embodiment shown, of slides 10 the ends 7, 8 of the beam 6 are provided with, each including vertically offset rolling means, such as railwheels 11, 12, in order to maintain the square angle between the lifting beam 1 and the vertical stiles 4, 5 of the sash-frame 3.

The lifting beam 1 in addition includes hooking-in means 13 arranged in one or several openings 14, 15 provided for in the beam 6, these hooking-in means 13 being, in addition, tiltingly mounted about horizontal axes of rotation 16, 17 preferably oriented transversally to the longitudinal median plane 18 of said beam 6.

As a matter of fact, these hooking-in means 13 are formed, at their free end 19, either in the shape of ears, as shown in the attached drawings, or in the shape of hooks and are aimed at co-operating with complementary hooking-in means 20 in the shape of either hooks or ears, respectively, the upper end 21 of a coffer dam 2 is provided with.

One obviously understands that the hooking-in means 13 are so arranged in the opening or openings 14, 15 of the beam 6 that they coincide with these complementary hooking-in means 20 of a coffer dam 2 when both are inserted into the sash-frame 3.

According to an embodiment of the invention, the beam 9 is defined by two lateral side plates 22, 23 separated from each other by a distance piece and delimiting between them a space 24 defining the opening or openings 14, 15 inside which are pivotingly mounted the hooking-in means 13.

It should be noted that these lateral side plates 22, 23 may be separated from each other by the slides the ends 7, 8 of the beam 6 are provided with. Such lateral side plates 22, 23 may also be separated from each other by spindle lengths substantially forming the horizontal axes of rotation 16, 17 of the hooking-in means 13. Of course, a combination of both above-mentioned solutions is possible. This latter may also have a U-shaped configuration, the lateral side plates 22, 23 being connected, under these circumstances and in their upper and/or lower portion, by means of a cross-wall 25 interrupted from time to time in order to define the openings 14, 15.

Each ear- or hook-shaped hooking-in means 13 includes a balance-beam 26 with counterweights 27 capable of being displaced with a view to change

the position of the centre of gravity of this ear or this hook with respect to the vertical plane 28 passing through its axis of rotation 16, 17. The aim looked at consists, as the case may be, in achieving the automatic engagement of these hooking-in means 13 with the complementary hooking-in means 20 when they meet same, in particular when a coffer dam 2 has to be looked for in a watercourse 4 or, on the contrary, in allowing the automatic withdrawal of these hooking-in means 13 in the presence of said complementary hooking-in means 20 when there is no longer any co-operation between them.

According to a preferred embodiment, a balance-beam 26 is hingedly mounted on a lever arm 29 extending the hooking-in means 13 beyond their axis of pivoting 16, 17. As a matter of fact, the axis of hinging 30 of this balance-beam 31 is parallel to the axis 16, 17 of rotation of the hooking-in means 13. In addition, these hooking-in means 13, in particular the lever arm 29, are provided with not shown thrust means, so as to limit the amplitude of rotation of this balance-beam 26 about this axis of hinging 30. Thus, these thrust means are aimed at immobilizing the balance-beam 26 in at least two positions 31, 32 which allow to achieve the result looked for, i.e. a change of the position of the centre of gravity of the hooking-in means 13 with respect to the vertical plane 28 passing through its axis of rotation 16, 17.

Accordingly, when one wants to hook in a coffer dam 2 with a view to raise same from the bottom of a watercourse, the operator tilts the balance-beams 26 into their position 31, before lowering the lifting beam 1 into this watercourse, along the vertical stiles of the sash-frame 3. Under the action of these balance-beams 26, the ears defining the hooking-in means 13 are pushed back through rotation about their axis 16, 17 against a thrust 33, designated by 33 in the drawings, so that these ears position themselves in the same vertical extension as the hooks forming the complementary hooking-in means 21 the upper edge of the coffer dam 2 is provided with.

Thus, when these ears 13 meet said hooks 21, they are pushed back by these latter under the action of their bevelled end 34, which is foreseen for this purpose, in the opposite direction 35 to the one 36 which is imparted to same by the balance-beams 26. Upon passing beyond the curved portion of the hooks 20, the ears 13 are automatically inserted under these latter, under the impulsion of said balance-beams 26. It is then possible to raise the lifting beam 1 which is connected, through lifting rings 37 and a chain not shown, to

a lifting device or simply to a overhead crane.

Then, once the lifting beam 1 has become accessible for an operator, above the watercourse, said operator tilts the balance-beam 26 of the various ears 13 into their second position, designated by 32. Under these circumstances, these ears tend, because of the displacement of their centre of gravity, to tilt in the opposite direction 36. This is however impossible as long as they support the weight of the coffer dam 2. To the contrary, once these ears 13 have been released from the curved portion of the hooks 20, they can indeed freely tilt in their direction designated by 32, under the action of the balance-beam 26, so that these hooking-in means 13 withdraw in the presence of said complementary hooking-in means 20, thus releasing the coffer dam 2.

Accordingly, the lifting beam 1 according to the invention allows to achieve, without any difficulty and without constraining control organs, its hooking-in onto a coffer dam 2 which would e.g. be buried in a watercourse, or also to place such a coffer dam 2 on the bottom of this watercourse.

As shown in the figures of the attached drawings, the hooking-in means 13 adopt a symmetrical arrangement with respect to the vertical median plane 38 of the lifting beam 1.

This configuration has the advantage of considerably limiting the tilting of a coffer dam 2 in the plane of the lifting beam 1, under the action of the thrust 33 limiting the displacement of the hooking-in means 13 in a given direction. However, this invention is in no way limited to such an arrangement.

From the preceding description, one obviously understands that by acting exclusively within the space delimited by the stiles of the sash-frame 2, the use of the lifting beam 1 proves possible under all circumstances, irrespective of the kind of installation of the barrage with a movable door. Therefore, the lifting beam according to the invention allows some standardization at the level of the tools used for handling the coffer dams a movable door of a watercourse barrage is comprised of.

It is once again recalled that this invention is in no way limited, within the framework of its application, to the handling of coffer dams for watercourse barrages.

What is claimed:

1. Lifting beam, viz. for a coffer dam (2), comprising a beam (6) on which are pivotingly mounted hooking-in means (13), such as ears or hooks, aimed at co-operating with complementary hooking-in means (20), such as hooks or ears, respectively, integral with the coffer dams (2) or the like to be raised, said hooking-in means (13) being fixed to a balance-beam (26) with counter-weights (27) capable of being displaced with a view to change the position of the centre of gravity of these hooking-in means (13) with respect to the vertical median plane passing through their axis of rotation (16, 17) in order to achieve, as the case may be, the automatic engagement of said hooking-in means (13) with said complementary hooking-in means (20) when they meet same or, on the contrary, to allow their automatic withdrawal in the presence of these complementary hooking-in means (20) upon their release from said hooking-in means (13), characterized in that these hooking-in means (13) are pivotingly mounted in one or several openings (14, 15) provided for in the beam (6).

2. Lifting beam according to claim 1, characterized in that the complementary hooking-in means (20) of a coffer dam (2) or the like are located on the upper edge (21) of this latter and are either in the shape of hooks or in the shape of ears, the hooking-in means (13) associated with the lifting beam (1) being configurated in the shape of ears or in the shape of hooks, respectively.

3. Lifting beam according to any of the preceding claims, characterized in that the beam (6) is defined by two lateral side plates (22, 23) separated from each other by a distance piece and delimiting between them a space (24) defining the opening or openings (14, 15) inside which are pivotingly mounted the hooking-in means (13).

4. Lifting beam according to claim 3, characterized in that the lateral side plates (22, 23) corresponding to the beam (6) are separated from each other by slides (10) the ends (7, 8) of said beam (6) are provided with.

5. Lifting beam according to any of claims 3 and 4, characterized in that the lateral side plates (22, 23) are separated from each other by transversally arranged spindle lengths embodying the axes of rotation (16, 17) of the hooking-in means (13).

6. Lifting beam according to any of claims 4 and 5, characterized in that the beam (6) adopts a U-shape, the lateral side plates (22, 23) being connected,

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in their upper and/or lower portion, by means of a cross-wall (25) interrupted from time to time in order to define the openings (14, 15).

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