

(19)



(11)

EP 4 317 045 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
25.12.2024 Bulletin 2024/52

(51) International Patent Classification (IPC):
B66C 23/16^(2006.01) B66C 23/20^(2006.01)

(21) Application number: **23189705.9**

(52) Cooperative Patent Classification (CPC):
B66C 23/166; B66C 23/202; B66C 23/208

(22) Date of filing: **04.08.2023**

(54) CRANE FOR CONFINED SPACES AND BASE FOR INSTALLING SUCH CRANE ON CORRESPONDING TARGET SURFACES OF BUILDING STRUCTURES OR SIMILAR SUPPORTING STRUCTURES

KRAN FÜR BEENGTE RÄUME UND BASIS ZUR INSTALLATION EINES SOLCHEN KRANS AUF ENTSPRECHENDEN ZIELFLÄCHEN VON GEBÄUDESTRUKTUREN ODER ÄHNLICHEN TRAGSTRUKTUREN

GRUE POUR ESPACES CONFINÉS ET BASE POUR L'INSTALLATION D'UNE TELLE GRUE SUR DES SURFACES CIBLES CORRESPONDANTES DE STRUCTURES DE CONSTRUCTION OU DE STRUCTURES DE SUPPORT SIMILAIRES

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR

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(30) Priority: **05.08.2022 IT 202200016905**

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(43) Date of publication of application:
07.02.2024 Bulletin 2024/06

(56) References cited:
EP-B1- 3 730 447 DE-A1- 10 319 856
US-A1- 2021 053 801

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Description

Field of technology

[0001] The present invention relates to a crane, in particular for lifting, handling and lowering loads in confined spaces.

[0002] It is also an object of the present invention to provide a base for the installation of the above-mentioned crane on corresponding target surfaces of building structures or similar supporting structures.

[0003] Also an object of the present invention is a method of assembling and installing a crane for confined spaces on corresponding target surfaces of building structures or similar supporting structures.

[0004] The object of the present invention is in the industrial field of equipment for lifting, handling and lowering loads in confined spaces, such as special recovery and rescue cranes that are used in confined spaces, such as tanks, silos, sewage pipes, shafts, manholes, culverts and/or the like.

State of the art

[0005] It is well known that there are different types of cranes or similar lifting arms designed for lifting, handling and lowering loads in confined spaces.

[0006] Generally, such cranes comprise a support post of elongated shape extending along a prevailing direction with a first end designed to attach the crane to a target surface of a building structure or similar support structure and a second end, facing away therefrom, designed to support a respective lifting arm, which may also be telescopic.

[0007] The lifting arm is fixed in relation to the support frame and its inclination in relation to the latter is determined during the design phase or during assembly.

[0008] Depending on the model and type of crane used, the lifting arm can be cantilevered on one side of the support post only or on both sides of the post.

[0009] Depending on the case, the lift arm is almost always supported and reinforced by an oblique support rod that connects a portion of the support post away from the corresponding second end to a portion of the lift arm that may also coincide with one of its ends.

[0010] These cranes are also equipped with corresponding lifting devices that are appropriately mounted on the support post or lifting arm.

[0011] The lifting devices fitted to such cranes comprise normally one or more hoisting mechanisms, such as a winch or other similar pull-back mechanism, equipped with a special drum on which a lifting cable is wound, the end portion of which runs along the lifting arm around at least one idler pulley located on the end of the lifting arm and from which it hangs vertically, terminating in a corresponding engagement hook. Activation of the lifting device in one direction or the other causes the engagement hook to be raised or lowered and, consequent-

ly, any load associated with it.

[0012] In order to enable the installation of the aforementioned cranes on corresponding horizontal target surfaces of building structures or similar supporting structures, it is known to provide support masts whose first end is shaped and configured in such a way as to allow it to be firmly bolted or screwed to the respective building structure or similar supporting structure.

[0013] An example of such a crane is shown and described in FR1557966 in which the first end of the support post has an attachment flange fitted with an attachment plate that is clamped against the horizontal target surface of the corresponding building structure or similar supporting structure by means of a plurality of threaded fasteners suitably screwed and cooperating with corresponding locking nuts.

[0014] Confined space cranes such as the one described in FR1557966 have objective limitations in terms of adaptability and flexibility of use with respect to the different types of target surfaces that may be encountered during installation and deployment.

[0015] In fact, in order to allow the installation of the same crane on different types of target surfaces, such as horizontal surfaces and/or vertical surfaces, the support post is generally manufactured in such a way as to present a first end with a cylindrical shape suitable for coupling to corresponding engagement housings, also with cylindrical shapes, manufactured on different types of installation bases, some configured for installations on horizontal target surfaces and others configured for installations on vertical target surfaces.

[0016] Going into detail, the installation bases configured for horizontal target surfaces are provided with a flat fixing plate from which a cylindrical body develops orthogonally, defining within it the cylindrical engagement seat designed to receive the first cylindrical end of the crane support post in coupling. The fixing plate can be bolted or screwed to the horizontal target surface, whereby the crane support post, the first end of which is inserted into the engagement seat of the installation base and locked therein by means of a special locking element, develops vertically from the fixing plate.

[0017] Installation bases configured for vertical target surfaces also have a flat fixing plate to which a cylindrical body is engaged. Unlike installation bases for horizontal target surfaces, the cylindrical body is not perpendicular to the fixing plate, but develops longitudinally parallel to it to provide a vertical engagement seat parallel to the vertical target surface of the respective building structure or the similar supporting structure.

[0018] An example of the solution just described can be found in document US5445487 which provides for the crane to be coupled to different types of installation bases, each of which is dedicated to a particular and specific target area of a corresponding building structure or similar support structure. However, this solution has certain disadvantages which will be listed and discussed below.

[0019] First of all, the need for two or more installation

bases to give the crane the flexibility to be installed on both a horizontal and a vertical target surface has a significant impact on the overall production and marketing costs of such cranes.

[0020] In addition, the presence of multiple components inevitably requires the manufacturer/seller as well the owner of such cranes to have extensive storage and warehousing facilities.

[0021] Last but not least, the use of different installation bases to be used in combination with the cranes to be installed further complicates the transport and installation operations, as the number of components to be handled and managed is significant.

[0022] Also known from documents US2021/053801, EP3730447 and DE10319856 are other confined space crane solutions using traditional bases or support plates.

[0023] In detail, document US2021/053801 discloses the features of the preamble of independent claims 1 and 14, and it describes a confined space crane comprising an elongated vertical post having at least one annular tube and a boom hinged to an upper portion of the post. There is also provided a base or installation plate provided with a flat support portion having a square shape from which a housing bushing vertically and centrally develops to vertically accommodate the crane post. A plurality of reinforcing flaps are arranged between the flat support portion and the housing bush.

[0024] Document EP3730447 concerns a transportable crane comprising a post, an arm that can be attached to the upper end of the post, and a diagonal rod that connects the arm to the post. Again there is an installation base or plate. The base has a flat, circular support portion from which a housing bushing receives the crane post vertically and centrally. A plurality of reinforcing flaps are arranged between the flat support portion and the housing bushing.

[0025] Document DE10319856 refers to a support base for a crane with a substantially box-like shape, which includes a housing for the vertical engagement of the crane mast. The support base can be bolted to various types of installation plates.

Aim of the invention

[0026] The aim of the present invention is therefore to substantially solve at least one of the drawbacks and/or limitations found in known solutions.

[0027] An object of the invention is to provide a confined space crane and a base for its installation that is easy and simple to install regardless of the intended target area.

[0028] An object of the present invention is to make the confined space crane suitable for installation on a target surface of a building structure or similar horizontal or vertical support structure without the need for specifically dedicated installation bases.

[0029] A further object of the present invention is to reduce the overall production and/or marketing costs of

such cranes.

[0030] A further aim of the present invention is to reduce the volumes required for the storage of cranes and their accessories in the relevant warehouses.

[0031] It is also an object of the present invention to simplify and improve the transport, assembly and installation of such cranes.

Summary of the invention

[0032] Aspects of the invention are described below.

[0033] In a 1st independent aspect of the invention, a crane (1) is provided for confined spaces comprising:

an installation base (2) having at least one fixing portion (3) arranged to be fixed to a target surface of a building structure or a similar supporting structure and at least one engagement seat (4) extending predominantly transversely, preferably perpendicularly, to a plane of the fixing portion (3);

a support post (5) which runs along a prevailing direction and has a first end (5a) arranged to engage the at least one engagement seat (4) of the installation base (2) and a second end (5b) facing away from the first end (5a);

a lifting arm (6) engaged to the support post (5), preferably at the second end (5b) of the support post (5), and having at least one cantilevered end (6a);

optionally at least one lifting device (7) that is removably attached to the support post (5) or the lifting arm (6), provided with at least one cable (8) with a hook (8a) for hooking a load to be lifted or lowered, the lifting device (7) comprising at least one winding mechanism (9) operable for lifting or lowering the hook (8a) and, consequently, the load associated with it;

characterized by the fact that the installation base (2) additionally includes at least one auxiliary engagement seat (10) arranged to receive in engagement the support post (5) which develops transversely, optionally perpendicularly, with respect to the engagement seat (4), the first end (5a) of the support post (5) of the crane (1) being coupled to the engagement seat (4) or to the auxiliary engagement seat (10) depending on the orientation of the target surface.

[0034] In a further independent aspect, there is provided an installation base (2) for a crane (1) for confined spaces, comprising at least one fixing portion (3) arranged to be fixed on a target surface of a building structure or a similar supporting structure and at least one engagement seat (4) developing predominantly transversely, preferably perpendicularly, with respect to a lying plane of the fixing portion (3) for receiving in engagement a first end (5a) of a support post (5) of a crane (1), characterized by further comprising at least one auxiliary engagement seat (10) developed transversely, optionally perpendicularly, with respect to the engagement seat (4)

and also arranged to receive in engagement the first end (5a) of the support post (5) of the crane (1), the presence of the engagement seat (4) and the auxiliary engagement seat (10) allowing, by means of the fixing portion (3), the installation of the crane (1) on different target surfaces, in particular orthogonal, even more particularly on a horizontal target surface or on a vertical target surface. In the following aspects, details are added regarding both the crane (1) for confined spaces and the installation base (2) of that crane (1). Each individual aspect relating to the installation base (2) is also clearly combinable with any aspect relating to the crane (1) for confined spaces and vice versa.

[0035] In a 2nd aspect in accordance with the 1st aspect or the further aspect relating to the installation base (2), the auxiliary engagement seat (10) of the installation base (2) predominantly runs substantially parallel to the lying plane of the fixing portion (3) of the base (2).

[0036] In a 3rd aspect in accordance with the 1st or 2nd aspect or the further aspect relating to the installation base (2), the fixing portion (3) of the installation base (2) comprises at least two support plates (3a) separated from each other and each lying on the same lying plane as the fixing portion (3).

[0037] In a 4th aspect in accordance with the preceding aspect, each support plate (3a) of the fixing portion (3) is provided with at least one through opening (3b) arranged to receive in engagement at least one bolt or similar threaded fastening element to the target surface of the building structure or similar support structure.

[0038] In a 5th aspect according to any one of the two preceding aspects, each support plate (3a) of the fixing portion (3) is provided with two through openings (3b) arranged on opposite sides of the respective support plate (3a), each through opening (3b) being arranged to receive in engagement at least one bolt or similar threaded element for fastening to the target surface of the respective building structure or the similar supporting structure.

[0039] In a 6th aspect in accordance with any one of the preceding two aspects, each through opening (3b) of each support plate (3a) of the fixing portion (3) has a substantially oval or elliptical shape to allow, during a crane installation operation (1) for confined spaces, the adjustment of the position of the installation base (2) along at least one direction parallel to the target surface of the respective building structure or the similar supporting structure.

[0040] In a 7th aspect in accordance with the 5th aspect, or the 6th aspect when dependent on the 5th aspect, each through opening (3b) of each support plate (3a) of the fixing portion (3) develops predominantly along a direction substantially orthogonal to the prevailing direction of development of the other through opening (3b) of the same support plate (3b) to allow, during a crane installation operation (1), adjustment of the position of the installation base (2) along two directions perpendicular to each other and parallel to the target surface of the re-

spective building structure or the similar supporting structure.

[0041] In an 8th aspect in accordance with any one of the preceding aspects, the engagement seat (4) of the installation base is defined, at least in part, by at least one first portion (4a), optionally cylindrical, made through a respective first central plate (2a) of the base (2), optionally the first central plate (2a) of the base (2) being substantially parallel to the plane of the lying plane of the fixing portion (3) of the installation base (2).

[0042] In a 9th aspect in accordance with the preceding aspect, the engagement seat (4) of the installation base (2) is defined, at least in part, by at least a second portion (4b), optionally cylindrical, respectively made through a respective second central plate (2b) of the installation base (2), optionally parallel to the first central plate (2a) of the installation base (2), in particular both central plates (2a, 2b) of the installation base (2) being substantially parallel to the lying plane of the engagement portion (3) of the installation base (2).

[0043] In a 10th aspect in accordance with the preceding aspect, the first central plate (2a) and the second central plate (2b) of the installation base (2) are spaced along the prevailing direction of development of the engagement seat (4) transversely, substantially perpendicular to the lying plane of the fixing portion (3) whereby the first portion (4a), optionally cylindrical, and the second portion (4b), optionally cylindrical, provide respective contact rings for the first end (5a) of the support post (5) of the crane (1) spaced apart from each other.

[0044] In an 11th aspect in accordance with the 9th aspect or the 10th aspect, the first portion (4a) and the second portion (4b), which at least partially define the seat of engagement (4) of the installation base (2), are identical.

[0045] In a 12th aspect in accordance with any one of aspects 9 to 11, the first portion (4a) and the second portion (4b) at least partially defining the engagement seat (4) of the installation base (2) are overlapped and aligned along a transverse direction, preferably substantially perpendicular, with respect to the plane of lay of the fixing portion (3) of the installation base (2).

[0046] In a 13th aspect in accordance with any one of the four preceding aspects, the engagement seat (4) of the installation base is defined, at least in part, by at least a third portion (4c), optionally cylindrical, respectively made through a respective third central plate (2c) of the installation base (2), optionally parallel to the first and second central plates (2a, 2b) of the installation base (2), in particular all of the central plates (2a, 2b, 2c) of the installation base (2) being substantially parallel to the lying plane of the fixing portion (3) of the installation base (2).

[0047] In a 14th aspect in accordance with the previous aspect, the third central plate (2a) and the second central plate (2b) of the installation base (2) are spaced along the prevailing direction of development of the transverse engagement seat (4), substantially perpendicular to the

lying plane of the fixing portion (3) wherein the third portion (4c) and the second portion (4b) provide respective closed-form, optionally ringshaped contact elements, spaced apart from each other, for receiving in engagement the first end (5a) of the support post (5) of the crane (1).

[0048] In a 15th aspect according to the 13th aspect or the 14th aspect, the portions (4a, 4b, 4c) defining at least partially the engagement seat (4) of the installation base (2) are identical.

[0049] In a 16th aspect in accordance with any one of aspects 13th to 15th, the portions (4a, 4b, 4c) defining the engagement seat (4) of the installation base (2) are superimposed and aligned along a transverse direction, preferably substantially perpendicular, with respect to the plane of the engagement seat (3) of the installation base (2).

[0050] In a 17th aspect in accordance with any one of the preceding aspects, the auxiliary engagement seat (10) is defined at least in part by a tang (10a), optionally cylindrical, which develops predominantly perpendicular to the prevailing development of the engagement seat (4) of the installation base (2), optionally substantially parallel to lying plane of the fixing portion (3).

[0051] In an 18th aspect in accordance with any one of the preceding aspects, the auxiliary engagement seat (10) is defined at least in part by two tangs (10a), optionally cylindrical, which develop predominantly perpendicular to the prevailing development of the engagement seat (4) of the installation base (2), optionally substantially parallel to lying plane of the fixing portion (3).

[0052] In a 19th aspect in accordance with the previous aspect, the tangs (10a) defining the auxiliary engagement seat (10) of the installation base (2) are specularly identical.

[0053] In a 20th aspect in accordance with the 18th or 19th aspect, the tangs (10a) are aligned along the prevailing direction of development.

[0054] In a 21st aspect in accordance with any of the preceding aspects, the engagement seat (4) of the installation base (2) passes centrally through the auxiliary engagement seat (10).

[0055] In a 22nd aspect in accordance with the preceding aspect when it depends on anyone of the 18th to 20th aspects, the engagement seat (4) of the installation base divides the auxiliary engagement seat (10) into the two tangs (10a).

[0056] In a 23rd aspect in accordance with any one of the preceding aspects 9 to 16, the auxiliary engagement seat (10) is defined at least in part by two tangs (10a), optionally cylindrical, which develop predominantly perpendicular to the prevailing development of the engagement seat (4) of the installation base (2), optionally substantially parallel with respect to lying plane of the fixing portion (3).

[0057] In a 24th aspect in accordance with the previous aspect, the tangs (10a) defining the auxiliary engagement seat (10) of the installation base (2) are specularly

identical.

[0058] In a 25th aspect in accordance with the 23rd or 24th aspect, the tangs (10a) are aligned along the prevailing direction of development.

5 **[0059]** In a 26th aspect in accordance with any of the three previous aspects, the engagement seat (4) of the installation base (2) passes centrally through the auxiliary engagement seat (10).

10 **[0060]** In a 27th aspect in accordance with any of the four previous aspects, the engagement seat (4) of the installation base (2) divides the auxiliary engagement seat (10) into the two tangs (10a).

15 **[0061]** In a 28th aspect in accordance with anyone of the five preceding aspects, the tangs (10a) at least partially defining the auxiliary engagement seat (10) of the installation base (2) are tangent to at least one of the central plates (2a, 2b) of the installation base (2), preferably they are tangent to the first central plate (2a) and the second central plate (2b) of the installation base (2).

20 **[0062]** In a 29th aspect in accordance with anyone of the six previous aspects, the tangs (10a) defining the auxiliary engagement seat (10) of the installation base (2) are interposed between the first central plate (2a) and the second central plate (2b) of the installation base (2).

25 **[0063]** In a 30th aspect in accordance with anyone of the seven preceding aspects when the 23rd aspect depends on anyone of the 13th to 16th aspects, the third central plate (2c) of the installation base (2) is interposed between the second central plate (2b) of the installation base (2) and the support plates (3a) of the fixing portion (3) of the latter.

30 **[0064]** In a 31st aspect in accordance with anyone of aspects 8th to 16th or 23th to 29th, the installation base (2) comprises two walls (11) substantially orthogonal with respect to the lying plane of the fixing portion (3) and substantially parallel to each other, each wall (11) extending between the first central plate (2a) of the base (2) and the respective support plate (3a) of the fixing portion (3) to define a substantially box-like or parallelepiped volume in which the engagement seat (4) and the auxiliary engagement seat (10) are defined.

35 **[0065]** In a 32nd aspect in accordance with the previous aspect, the tangs (10a) defining the auxiliary engagement seat (10) of the installation base (2) are tangent to the walls (11) of the latter.

40 **[0066]** In a 33rd aspect in accordance with any one of the preceding aspects, at least one coupling sleeve (12), optionally of cylindrical shape is interposable between at least one of the engagement seats (4, 10) of the installation base (2) and the first end (5a) of the support post (5) of the crane (1), preferably to allow coupling of different support posts (5) having first ends (5a) of different sizes with at least one of the engagement seats (4, 10) of the installation base (2).

45 **[0067]** In a 34th aspect in accordance with the preceding aspect, the coupling sleeve (12) comprises a first portion (12a), optionally cylindrical, insertable into at least one of the engagement seats (4, 10) of the installation

base (2), the first portion (12a) of the coupling sleeve (12) having at least one circular shoulder (12b) projecting transversely preferably perpendicularly, outwards from one end of the first portion (12a) itself so as to rest against a corresponding edge of the corresponding engagement seat (4, 10) of the installation base 2.

[0068] In a 35th aspect in accordance with the preceding aspect, the coupling sleeve (12) comprises a second portion (12c), optionally cylindrical, which can be fitted on the first end (5a) of the support post (5) of the crane (1) and can be inserted into the first portion (12a) to ensure proper coupling between the crane (1) and the installation base (2), the first and second portions (12a, 12c), of the coupling sleeve (12) allowing the coupling of different support posts (5), having first ends (5a) of different sizes, with at least one of the engagement seats (4, 10) of the installation base (2).

[0069] In a 36th aspect in accordance with anyone of the three preceding aspects, the first end (5a) of the support post (5) is arranged to engage at least one of the engagement seats (4, 10) or the respective coupling sleeve (12) associated with it by interference.

[0070] In a 37th aspect according to anyone of the aspects 8th to 16th, the first portion (4a) of the engagement seat (4) of the installation base (2) has a substantially cylindrical profile.

[0071] In a 38th aspect according to anyone of the aspects 9th to 16th, the first portion (4a) and the second portion (4b) of the engagement seat (4) of the installation base (2) each has a substantially cylindrical profile.

[0072] In a 39th aspect according to anyone of the aspects 13th to 16th, the first portion (4a), the second portion (4b) and the third portion (4c) of the engagement seat (4) of the installation base (2) each has a substantially cylindrical profile.

[0073] In a 40th aspect according to anyone of the aspects 17th to 32nd, the tang (10a) of the auxiliary engagement seat (10) of the installation base (2) has a substantially cylindrical profile.

[0074] In a 41st aspect according to anyone of the aspects 18th to 32nd, each tang (10a) of the auxiliary engagement seat (10) of the installation base (2) has a substantially cylindrical profile.

[0075] In a 42nd aspect according to anyone of the 33rd to 36th aspects, the coupling sleeve (12) has a substantially cylindrical profile.

[0076] In a 43rd aspect according to anyone of the 34th to 36th aspects, the first portion (12a) of the coupling sleeve (12) has a substantially cylindrical profile.

[0077] In a 44th aspect according to anyone of the 34th to 36th aspects or the preceding aspect, the shoulder (12b) of the first portion (12a) of the coupling sleeve (12) is substantially circular.

[0078] In a 45th aspect according to anyone of the aspects 35th to 36th, the second portion (12c) of the coupling sleeve (12) has a substantially cylindrical profile.

[0079] In a 46th aspect according to anyone of the nine preceding aspects, the first end (5a) of the support post

(5) of the crane (1) has a substantially cylindrical profile.

[0080] In a 47th aspect according to anyone of the aspects 8th to 16th, the first portion (4a) of the engagement seat (4) of the installation base (2) does not have a cylindrical profile, optionally the profile of the first portion (4a) of the engagement seat (4) of the installation base (2) is polygonal.

[0081] In a 48th aspect according to anyone of aspects 9th to 16th, the first portion (4a) and the second portion (4b) of the installation base (2) each does not have a cylindrical profile, optionally the profile of each of the first portion (4a) and the second portion (4b) of the engagement seat (4) of the installation base (2) is polygonal.

[0082] In a 49th aspect according to anyone of the aspects 13th to 16th, the first portion (4a), the second portion (4b) and the third portion (4c) of the engagement seat (4) of the installation base (2) each does not have a cylindrical profile, optionally the profile of each of the first portion (4a), the second portion (4b) and the third portion (4c) of the engagement seat (4) of the installation base (2) is polygonal.

[0083] In a 50th aspect according to anyone of the aspects 17th to 32nd, the tang (10a) of the auxiliary engagement seat (10) of the installation base (2) does not have a cylindrical profile, optionally the profile of the tang (10a) of the auxiliary engagement seat (10) of the installation base (2) is polygonal.

[0084] In a 51st aspect according to anyone of the aspects 18th to 32nd, each tang (10a) of the auxiliary engagement seat (10) of the installation base (2) does not have a cylindrical profile, optionally the profile of each tang (10a) of the auxiliary engagement seat (10) is polygonal.

[0085] In a 52nd aspect according to anyone of the 33rd to 36th aspects, the coupling sleeve (12) does not have a cylindrical profile, optionally the profile of the coupling sleeve (12) is polygonal.

[0086] In a 53rd aspect according to anyone of the aspects 34th to 36th, the first portion (12a) of the coupling sleeve (12) does not have a cylindrical profile, optionally the profile of the first portion (12a) of the coupling sleeve (12) is polygonal.

[0087] In a 54th aspect according to anyone of aspects 34th to 36th or the preceding aspect, the shoulder (12b) of the first portion (12a) of the coupling sleeve (12) is not circular, optionally the profile of the shoulder (12b) of the first portion (12a) of the coupling sleeve (12) has a polygonal profile, preferably the same profile as the first portion (12a) of the coupling sleeve (12).

[0088] In a 55th aspect according to anyone of aspects 35th to 36th, the second portion (12c) of the coupling sleeve (12) does not have a cylindrical profile, optionally the profile of the second portion (12c) of the coupling sleeve (12) is polygonal.

[0089] In a 56th aspect according to anyone of the nine preceding aspects, the first end (5a) of the support post (5) of the crane (1) does not have a cylindrical shape profile, optionally the profile of the first end (5a) of the

support post (5) of the crane (1) is polygonal.

[0090] In a 57th aspect according to the preceding aspect, the profile of the first end (5a) of the support post (5) of the crane (1) recalls the polygonal shape of the polygonal profile of the portions (4a, 4b, 4c) of the engagement seat (4) of the installation base (2) and/or of the tangs (10a) of the auxiliary engagement seat (10) of the installation base (2).

[0091] In a 58th aspect according to anyone of the preceding two aspects, the profile of the first end (5a) of the support post (5) of the crane (1) is at least partially counter shaped to the polygonal shape of the portions (4a, 4b, 4c) of the engagement seat (4) of the installation base (2) and/or of the tangs (10a) of the auxiliary engagement seat (10) of the installation base (2).

[0092] In a 59th aspect in accordance with anyone of the preceding aspects, the support post and/or the lifting arm (6) of the crane (1) has/present a profile, in cross-section, substantially octagonal.

[0093] In a 60th aspect in accordance with anyone of the preceding aspects, the lifting arm (6) of the crane (1) can be extended and shortened.

[0094] In a 61st aspect in accordance with anyone of the preceding aspects, the lifting arm (6) of the crane (1) is telescopic.

[0095] In an independent 62nd aspect, there is a method for assembling and installing a crane (1) for confined spaces that includes:

an installation base (2) having at least one fixing portion (3) arranged to be fixed to a target surface of a building structure or similar support structure and at least one engagement seat (4) developing predominantly transversely, preferably perpendicularly, to a lying plane of the fixing portion (3);

a support post (5) which runs along a prevailing direction and has a first end (5a) arranged to engage the at least one engagement seat (4) of the installation base (2) and a second end (5b) facing away from the first end (5a);

a lifting arm (6) engaged at the support post (5), preferably at the second end (5b) of the support post (5), and having at least one cantilevered end (6a);

optionally at least one lifting device (7) that is removably attached to the support post (5) or the lifting arm (6), provided with at least one cable (8) with a hook (8a) for hooking a load to be lifted or lowered, the lifting device (7) comprising at least one winding mechanism (9) that can be operated for lifting or lowering the hook (8a) and, consequently, the load associated with it;

wherein the installation base (2) further comprises at least one auxiliary engagement seat (10) arranged to receive in engagement the support post (5) developing transversely, optionally perpendicularly, with respect to the engagement seat (4), the first end (5a) of the support post (5) of the crane (1) being coupled to the engagement seat (4) or to the auxiliary en-

gagement seat (10) depending on the orientation of the target surface,
the crane assembly and installation method (1) including the steps of:

positioning the installation base (2) of the crane (1) on a target surface of a building structure or a similar supporting structure in such a way that the fixing portion (3) of the installation base (2) is in contact with that target surface;

fixing, optionally by means of a plurality of bolts or similar threaded fastening elements, the fixing portion (3) of the installation base (2) of the crane (1) to the target surface of the respective building structure or the similar supporting structure;

engaging the first end (5a) of the support post (5) of the crane (1) in one of the engagement seats (4, 10) of the installation base (2) of the crane (1).

[0096] In a 63rd aspect dependent on the previous aspect, the step of engaging the first end (5a) of the support post (5) of the crane (1) in one of the engagement seats (4, 10) of the installation base (2) of the crane (2) is performed either by inserting the first end (5a) of the support post (5) of the crane (1) into the engagement seat (4) which is substantially perpendicular to the plane of the laying plane of the fixing portion (3) of the base (2) when the target surface of the building structure or the similar supporting structure is substantially horizontal, or by inserting the first end (5a) of the crane support post (5) of the crane (1) into the auxiliary engagement seat (10) which develops substantially parallel to the lying plane of the fixing portion (3) of the base (2) when the target surface of the building structure or similar support structure is substantially vertical.

In an independent 64th aspect, there is a method for assembling and installing a crane (1) for confined spaces that includes:

an installation base (2) having at least one fixing portion (3) arranged to be fixed to a target surface of a building structure or a similar supporting structure and at least one engagement seat (4) developing predominantly transversely, preferably perpendicularly, to a lying plane of the fixing portion (3);

a support post (5) which runs along a prevailing direction and has a first end (5a) arranged to engage the at least one engagement seat (4) of the installation base (2) and a second end (5b) facing away from the first end (5a);

a lifting arm (6) engaged at the support post (5), preferably at the second end (5b) of the support post (5), and having at least one cantilevered end (6a);

optionally at least one lifting device (7) that is removably attached to the support post (5) or the lifting arm (6), provided with at least one cable (8) with a hook

(8a) for hooking a load to be lifted or lowered, the lifting device (7) comprising at least one winding mechanism (9) that can be operated for lifting or lowering the hook (8a) and, consequently, the load associated with it;

wherein the installation base (2) further comprises at least one auxiliary engagement seat (10) arranged to receive in engagement the support post (5) developing transversely, optionally perpendicularly, with respect to the engagement seat (4), the first end (5a) of the support post (5) of the crane (1) being coupled to the engagement seat (4) or to the auxiliary engagement seat (10) depending on the orientation of the target surface,

the crane assembly and installation method (1) including the steps of:

identifying a target area of a building structure or a similar supporting structure on which to install the crane (1);

recognizing whether the target surface of the building structure or the similar supporting structure is horizontal or vertical;

positioning the installation base (2) of the crane (1) on the target surface of the building structure or the similar supporting structure in such a way that the fixing portion (3) of the installation base (2) is in contact with this target surface and at least one of the engagement seats (4, 10) can be engaged vertically, in particular from above, from the first end (5a) of the support post (5);

fixing, optionally by means of a plurality of bolts or similar threaded fastening elements, the fixing portion (3) of the installation base (2) of the crane (1) to the target surface of the respective building structure or the similar supporting structure;

engaging the first end (5a) of the support post (5) of the crane (1) in the engagement seat (4, 10) of the installation base (2) of the crane (1) which can be engaged vertically, particularly from above.

[0097] In a 65th aspect dependent on the preceding aspect, the step of engaging the first end (5a) of the support post (5) of the crane (1) into the engagement seat (4, 10) of the installation base (2) of the crane (1) is carried out by engaging the first end (5a) of the support post (5) into the engagement seat (4) of the installation base (2) when the target surface of the building structure or the similar supporting structure is substantially horizontal.

[0098] In a 66th aspect dependent on the 64th or 65th aspect, the step of engaging the first end (5a) of the support post (5) of the crane (1) in the engagement seat (4, 10) of the installation base (2) of the crane (1) is carried out by engaging the first end (5a) of the support post (5) in the auxiliary engagement seat (10) of the installation base (2) when the target surface of the building structure

or the similar supporting structure is substantially vertical.

[0099] Further features and advantages will be more apparent from the detailed description of a preferred, but not exclusive, form of execution of a confined space crane, as well as a basis for the installation of the above-mentioned crane on corresponding target areas of building structures or similar supporting structures.

Brief description and drawings

[0100] This description is given below with reference to the accompanying drawings, which are provided for illustrative purposes only and are therefore not limiting in scope:

- Figure 1 is a partially exploded perspective view of a first design solution for a confined space crane in accordance with the present invention;
- Figure 2 is a partially exploded perspective view of a second design solution of a confined space crane in accordance with the present invention;
- Figure 3 is a perspective view from above of an installation base for the crane in the previous figures;
- Figure 4 is a perspective view from below of the installation base in the previous figures;
- Figure 5 is a perspective sectional view of the installation base in the previous figures, the section being carried out along a symmetrical plane median to the installation base;
- Figure 6 is a perspective view from above of an installation base, in accordance with a further embodiment of the present invention;
- Figure 7 is a perspective view in longitudinal section of the installation base shown in Figure 6.

Detailed description

[0101] With reference to Figures 1 and 2, a confined space crane according to the present invention is collectively referred to as 1.

[0102] As can be seen in Figures 1 and 2, the crane 1 comprises a support post 5 extending along a prevailing direction having a first end 5a, optionally of cylindrical shape, arranged to engage an installation base 2 which will be described in detail below, and a second end 5b, opposite to the first end 5a, arranged to engage and support a lifting arm 6 having a cantilevered end 6a cantilevered from the support post 5.

[0103] In accordance with the design solution shown in Figure 1, on the opposite side to the cantilevered end 6a, the lifting arm 6 has a bottom end 6b which is also cantilevered from the support post 5.

[0104] At an intermediate point at the free and bottom ends 6a, 6b, the lifting arm 6 is fixedly engaged with the second end 5b of the support frame 5 according to a predetermined orientation which is determined during the design phase or during assembly.

[0105] As an alternative, it is also possible to envisage

a constructional solution, not shown in the accompanying figures, in which the lifting arm 6 is hinged to the second end 5b of the support post 5, being able to rotate with respect to the latter so as to assume different angles in the plane of rotation according to contingent needs.

[0106] It is advantageous that the lifting arm is telescopic so that it can be lengthened or shortened.

[0107] Referring again to Figure 1, the crane 1 is provided with an oblique support rod 13 connecting a portion of the support post 5, intermediate to the first end 5a and the second end 5b of the latter, to the bottom end 6b of the lifting arm 6.

[0108] In detail, the oblique support rod 13 has a first end 13a bolted to the support post 5 and a second end 13b bolted to the bottom end 6b of the lifting arm 6.

[0109] Optionally, the crane 1 can also provide for the use of at least one lifting device 7 (suitably schematized) which is removable from the support post 5 or the lifting arm 6.

[0110] In the specific case of the embodiment shown in Figure 1, the lifting device 7 can be mounted on the lifting arm 6 by means of a corresponding attachment portion 6c which is arranged between the cantilevered end 6a and the bottom end 6b.

[0111] Referring again to the embodiment shown in Figure 1, the lifting arm 6 can be provided with two or more attachment portions 6c which allow the lifting device 7 to be mounted, according to different positions, along the lifting arm 6, or different lifting devices 7 to be mounted on the same lifting arm 6.

[0112] Generally, the lifting device 7 is provided with at least one cable 8 having a hook 8a for hooking a load to be raised or lowered. The cable 8 is at least partially wound on a corresponding winding mechanism 9 of the lifting device 7, operable for lifting or lowering the hook 8a and, consequently, any load associated therewith.

[0113] In order to support the cable 8 in movement along the lifting arm 6, the cantilevered end 6a of the latter is provided with one or more idler pulleys 6d on which the cable 8 changes its orientation to hang vertically from the cantilevered end 6a.

[0114] In the event that two lifting devices 7 mounted on the lifting arm 6 of the crane 1 are provided, it is advantageous to have a minimum of two idler pulleys 6d operatively located at the cantilevered end 6a of the lifting arm 6, each dedicated to a corresponding cable.

[0115] In accordance with the construction solution illustrated in figure 2, there are some differences to crane 1 illustrated in figure 1.

[0116] First of all, the lifting arm 6 has a bottom end 6b solidly connected to the second end 5b of the support post 5 to form a fixed inverted 'L' structure with the latter.

[0117] The lifting arm is not telescopic and maintains a fixed length so it cannot be extended or shortened.

[0118] In addition, crane 1 has no oblique support rods or similar structural support elements between support arm 5 and lifting arm 6.

[0119] The attachment portion 6c of the lifting device

7 is positioned on the support post 5, in proximity to the second end 5b of the latter, and an auxiliary idler pulley 6e is located at the connection area between the lifting arm 6 and the support post 5. The cable 8 then runs from the winding mechanism 9 of the lifting device 7 via the auxiliary deflection sheave 6e located at the bottom end 6b of the lifting arm 6 and the idler pulley 6d of the cantilevered end 6a of the latter, from which it hangs vertically terminating with the corresponding hook 8a.

[0120] An additional attachment portion 6c is provided along support post 5 at a position further away from the second end 5b.

[0121] Again, different portions of attachment 6c allow for different engagement positions of lifting device 7 to support post 5, or the simultaneous engagement of different lifting devices 7 or otherwise to support post 5.

[0122] In the case where two lifting devices 7 are provided mounted on the same support post 5 of the crane 1, it is advantageous to have both two auxiliary idler pulleys 6e operatively located in the connection region between the lifting arm 6 and the support post 5, and two idler pulleys 6d operatively located at the cantilevered end 6a of the lifting arm 6, each dedicated to a corresponding cable 8.

[0123] Both construction solutions have, in cross-section, an external profile, of the support post 5 and/or lifting arm 6, which is substantially polygonal, preferably octagonal.

[0124] In both design solutions, the first end 5a of the support post 5 of the crane 1 is substantially cylindrical in shape.

[0125] Again with reference to the design solutions illustrated in Figures 1 and 2, crane 1 is advantageously equipped with an installation base 2 which allows it to be installed on a target surface of a respective building structure or similar substantially horizontal (as illustrated in Figure 1) or substantially vertical (as illustrated in Figure 2) support structure.

[0126] Taking the embodiments shown in Figures 3 to 7 as a reference, the installation base 2 has a single body, preferably made of a single material.

[0127] More specifically, the installation base 2 comprises at least one fixing portion 3 prepared to be fixed on a target surface of a building structure or a similar supporting structure.

[0128] The fixing portion 3 of the installation base 2 comprises at least two support plates 3a separated from each other and each lying on the same lying plane as the fixing portion 3.

[0129] Each support plate 3a of the fixing portion 3 has a substantially rectangular shape and develops with its long sides substantially parallel to the long sides of the other support plate 3a.

[0130] Each support plate 3a of the fixing portion 3 has two through openings 3b arranged on opposite sides of it.

[0131] The through openings 3b of each support plate 3a of the fixing portion 3 each has a substantially oval or elliptical shape to permit adjustment of the installation

position of the installation base 2 along at least one direction parallel to the target surface of the respective building structure or the similar supporting structure.

[0132] Preferably, a through opening 3b of the support plate 3a of the fixing portion 3 develops predominantly along a direction substantially orthogonal to the prevailing development of the other through opening 3b of the same support plate 3a, in order to allow an adjustment of the installation position of the installation base 2 along two directions orthogonal to each other and substantially parallel to the target surface of the respective building structure or the respective supporting structure.

[0133] As shown in Figures 3 to 7, the installation base 2 comprises at least one engagement seat 4 arranged to receive in engagement, preferably by insertion, the first end 5a of the support post 5 of the crane 1.

[0134] In particular, the engagement seat 4 of the installation base 2 runs predominantly transverse, preferably perpendicular, to a lying plane of the fixing portion 3, so that when it is engaged by the support post 5, the latter is perpendicular to the lying plane of the fixing portion 3 of the installation base 2.

[0135] In order to clearly show the direction of development of the engagement seat 4 of the installation base 2 in relation to the lying plane of the fixing portion 3, the longitudinal axis of prevailing development X of the same which in the condition of attachment to a target surface of a respective building structure or similar support structure is perpendicular to it, is shown in Figures 3 to 7.

[0136] Going into more detail, the engagement seat 4 of the installation base 2 is defined at least in part by three cylindrical portions 4a, 4b, 4c, each made through a respective central plate 2a, 2b, 2c, of the installation base 2, preferably substantially parallel to each other and substantially parallel to the lying plane of the fixing portion 3.

[0137] The central plates 2a, 2b, 2c, of the installation base 2 are spaced apart from each other along the prevailing development axis X in such a way that the cylindrical portions 4a, 4b, 4c provide the first end 5a of the support post 5 of the crane 1 with corresponding spaced contact rings intended to engage different zones of the first end 5a of the support post itself.

[0138] As can be seen in Figures 3 to 7, the cylindrical portions 4a, 4b, 4c, which at least partially define the engagement seat 4 of the installation base 2, are identical.

[0139] In addition, the cylindrical portions 4a, 4b, 4c, which at least partially define the engagement seat 4 of the installation base 2, are superimposed and aligned along the longitudinal axis of prevailing development X, namely along a transverse direction substantially perpendicular to the plane of engagement of the fixing portion 3.

[0140] As an alternative to what is shown in Figures 3 to 7, it is not excluded that the engagement seat 4 is defined by two cylindrical portions 4a, 4b each made by means of a respective central plate 2a, 2b of the instal-

lation base 2, parallel to each other and substantially parallel to the plane of the lying plane of the fixing portion 3. Also in this case, the cylindrical portions 4a, 4b are identical and preferably overlapping and aligned along the longitudinal axis of prevailing development X.

[0141] It is also possible to envisage that the engagement seat 4 of the installation base 2 is defined by a single cylindrical portion 4a, 4b, 4c which develops along the longitudinal axis of prevailing development X. In this case, the cylindrical portion 4a, 4b, 4c must have dimensions such as to ensure the stability of the coupling with the first portion 5a of the support post 5.

[0142] Advantageously, the installation base 2 further comprises at least one auxiliary engagement seat 10 arranged to receive in engagement the first end 5a of the support post 5. The auxiliary engagement seat 10 develops transversely, optionally perpendicularly, with respect to the engagement seat 4, so that when it is engaged by the support post 5 the latter is substantially parallel to the lying plane of the fixing portion 3 of the installation base 2.

[0143] In order to clearly show the prevailing direction of development of the auxiliary engagement seat 10 of the installation base 2 in relation to the lying plane of the engagement portion 3, the longitudinal axis of prevailing development Y of the same, which in the condition of attachment to a target surface of a respective building structure or a similar supporting structure, and substantially parallel to it, is shown in Figures 3 to 5.

[0144] Advantageously, the first end 5a of the support post 5 of crane 1 can be coupled to either the engagement seat 4 or the auxiliary engagement seat 10 depending on the orientation of the target surface of the respective building structure or the similar supporting structure.

[0145] Preferably, the auxiliary engagement seat 10 is defined at least in part by two cylindrical tangs 10a which develop predominantly perpendicular to the prevailing development of the engagement seat 4 of the installation base 2, optionally substantially parallel with respect to lying plane of the fixing portion 3.

[0146] The cylindrical tangs 10a defining the auxiliary engagement seat 10 of installation base 2 are specularly identical and are aligned along the longitudinal axis of prevailing development Y.

[0147] Alternatively, the auxiliary engagement seat 10 can be defined by a single cylindrical tang whose dimensions are such as to ensure the stability of the engagement of the first portion 5a of the support post 5.

[0148] Again referring to figures 3 to 7, the engagement seat 4 of the installation base 2 passes centrally, substantially perpendicularly, through auxiliary engagement seat 10.

[0149] In detail, the engagement seat 4 of the installation base 2 divides the auxiliary engagement seat 10 into the two cylindrical tangs 10a mentioned above that define it.

[0150] As can be seen in Figures 3 to 7, the cylindrical tangs 10a which at least partially define the auxiliary engagement seat 10 of the installation base 2 are tangential

to the first central plate 2a and the second central plate 2b of the installation base 2.

[0151] Again referring to Figures 3 to 7, it can be seen that the third central plate 2c of the installation base 2 is interposed between the second central plate 2b of the installation base 2 and the support plates 3a of the fixing portion 3 of the latter.

[0152] In addition, the installation base 2 comprises two walls 11 substantially orthogonal to the lying plane of the fixing portion 3 and substantially parallel to each other. Each wall 11 develops between the first central plate 2a of the installation base 2 and the respective support plate 3a of the fixing portion 3 to define a substantially box-like or parallelepiped volume in which the engagement seat 4 and the auxiliary engagement seat 10 are defined.

[0153] The cylindrical tangs 10a defining the auxiliary engagement seat 10 of the installation base 2 are tangent to the walls 11 of the latter, so that each cylindrical tang is inscribed in a substantially parallelepiped or cubic solid, however substantially box-shaped.

[0154] Unlike the embodiment shown in Figures 3 to 5, the embodiment shown in Figures 6 and 7 provides for two auxiliary walls 11a, which are substantially orthogonal to the walls 11 and the auxiliary engagement seat 10, to close, at least in part, the installation base 2 at the front and rear, leaving the auxiliary engagement seat 10 free to accommodate the support post 5 in engagement.

[0155] As can be seen in Figure 6, each auxiliary wall 11a has a substantially trapezoidal shape with a major base developing from one end to the other of the support plates 3a of the fixing portion 3 and a minor base coinciding, approximately, with the first central plate 2a of the installation base 2.

[0156] According to this configuration, the installation base 2 has a corresponding lateral concavity 14 at each support plate 3a of the fixing portion 3.

[0157] Each lateral concavity 14 is, at least in part, delimited by a respective fixing plate 3a of the fixing portion 3, a respective wall 11 of the installation base 2 and two triangular portions 11b, opposite and facing each other, each afferent to a respective auxiliary wall 11a of the installation base 2.

[0158] According to an embodiment of the present invention, it is possible to provide for the installation base 2 to be carried out by welding together different tile components, such as the embodiment shown in Figures 3 to 5.

[0159] Instead, according to another embodiment of the present invention, it is possible to provide for the installation base 2 to be made by casting and/or moulding, such as the embodiment shown in Figures 6 and 7.

[0160] In order to ensure the coupling between the first end 5a of the support post 5 of crane 1 and one of the engagement seats 4, 10 of the installation base 2, crane 1 may be provided with at least one coupling sleeve 12 (Figures 1 and 2), preferably of cylindrical shape.

[0161] The coupling sleeve 12 comprises a first cylindrical portion 12a insertable in at least one of the engagement seats 4, 10 of the installation base 2 and has at least one circular shoulder 12b which protrudes transversely, preferably perpendicularly, outwards from one end of the first cylindrical portion 12a itself so as to rest supported against a corresponding edge of the corresponding engagement seat 4, 10 of the installation base 2.

[0162] The coupling sleeve 12 comprises a second cylindrical portion 12c that can be fitted to the first end 5a of the support post 5 of crane 1 and inserted into the first cylindrical portion 12a to ensure correct coupling between crane 1 and installation base 2.

[0163] The coupling sleeve 12 allows coupling between support posts 5 of crane 1 having first ends 5a of different dimensions than the dimensions of the corresponding engagement housings 4, 10 of installation base 2.

[0164] In other words, the coupling sleeve 12 acts as an intermediate adapter between the engagement seats 4, 10 of the installation base 2 and the first end 5a of the support post 5 of the crane 1.

[0165] Different sized coupling sleeves 12 allow the engagement seats 4, 10 of the installation base 2 to accommodate in engagement first ends 5a of different sizes of corresponding support posts 5 of different sizes.

[0166] It should also be noted that shapes other than cylindrical can be considered both with regard to the external shape of the first ends 5a of the support posts 5 of the cranes 1 and with regard to the inner profile of the engagement seats 4, 10 of the installation base 2. Of course, in order to ensure the coupling between the first end 5a of the support post 5 of the crane 1 and at least one of the engagement seats 4, 10 of the installation base 2, the external shape of the first end 5a which differs from the cylindrical shape will have to be reproduced in negative by the shape of the engagement seats 4, 10 of the installation base 2.

[0167] In other words, the first end 5a of the support post 5 is externally counter shaped to, or closely resembles the shape of, the inner profile of the engagement seats 4, 10 of the installation base 2. Accordingly, the inner profile of each engagement seat 4, 10 of the installation base 2 is counter shaped to, or closely resembles the external shape of, the first end 5a of the support post 5.

[0168] According to this aspect, it is possible to provide a first end 5a of the support post 5 of crane 1 having an elliptical or polygonal profile and engagement seats 4, 10 of the installation base 2, also having an elliptical or polygonal internal profile that recalls in negative the profile of the first end 5a of the support post 5.

[0169] In this way, profiles other than the cylindrical one avoid any possibility of relative rotation between the support post 5 of the crane 1 and the installation base 2 at the first end 5a and at the engagement seat 4, 10 occupied.

[0170] Of course, the coupling sleeve 12 must also have the same profile as the engagement housings 4, 10 of the installation base 2 and the first ends 5a of the support posts 5 of the cranes 1 in order to allow the coupling between these elements.

[0171] Regardless of the shape of the first ends 5a of the support posts 5 of the cranes 1 and the engagement seats 4, 10 of the installation base 2, the locking of one element in the other is ensured by an interference engagement of the first end 5a of the respective support post 5 of the crane in the corresponding engagement seat 4, 10 of the installation base 2.

[0172] A method of assembling and installing the confined space crane 1 described above is also an object of the present invention.

[0173] The assembly and installation method includes the steps of:

identifying a target area of a building structure or a similar supporting structure on which to install the crane 1;

recognizing whether the target surface of the building structure or the similar supporting structure is substantially horizontal or substantially vertical;

positioning the installation base 2 of the crane 1 on the target surface of the building structure or similar support structure in such a manner that the support plates 3 of the fixing portion 3 of the installation base 2 are in contact with this target surface and at least one of the engagement seats 4, 10 is vertically engageable, in particular from above, by the first end 5a of the support post 5 of the crane 1;

optionally attaching, by means of a plurality of bolts or similar threaded fastening elements, the support plates 3a of the fixing portion 3 of the installation base 2 of the crane 1 to the target surface of the respective building structure or similar supporting structure;

engaging the first end 5a of the support post 5 of crane 1 in the engagement seat 4, 10 of the installation base 2 of crane 1, which can be engaged vertically, particularly from above;

clamping the first end 5a of support post 5 of crane 1 into engagement seat 4, 10 engaged by the first portion 5a of support post 5 of crane 1.

[0174] More specifically, the engagement of the first end 5a of the support post 5 of the crane 1 in the engagement seat 4, 10 of the installation base 2 of the crane 1 is carried out by engaging the first end 5a of the support post 5 in the engagement seat 4 of the installation base 2 when the target surface of the building structure or the similar supporting structure is substantially horizontal.

[0175] Conversely, when the target surface of the building structure or the similar supporting structure is substantially vertical, the engagement of the first end 5a of the support post 5 of the crane 1 into the engagement seat 4, 10 of the installation base 2 of the crane 1 is

carried out by engaging the first end 5a of the support post 5 into the auxiliary engagement seat 10 of the installation base 2.

[0176] If necessary, the insertion of the first end 5 of the support post 5 into the respective engagement seat 4, 10 is carried out after the interposition of a respective coupling sleeve 12, as described above and illustrated in Figures 1 and 2.

10 Advantages

[0177] The installation base 2 provided with an engagement seat 4 orthogonal to the locating plane of the fixing portion 3 and an auxiliary engagement seat 10 orthogonal to the engagement seat 4 and parallel to the locating plane of the fixing portion 3 gives the crane the flexibility to be installed on both a horizontal and a vertical target surface.

[0178] The presence of an installation base as described above significantly reduces the production and marketing costs of such cranes since two or more installation bases, each dedicated to a specific target area, no longer have to be provided.

[0179] It should also be pointed out that the presence of a single installation base 2 capable of allowing the crane to be installed on different target areas makes it possible to reduce the storage and warehousing volumes of both manufacturers/sellers and owners of such cranes normally dedicated to these products and objects.

[0180] Finally, the reduction of accessories and components, such as several installation bases each dedicated to a specific target area, allows the cranes to be transported more easily and smoothly, and also simplifies assembly and installation operations considerably.

35 Numerical list of elements

[0181]

- | | | |
|----|----|--|
| 40 | 1 | Confined Space Crane; |
| | 2 | Installation base; |
| | 2a | First central plate of the installation base; |
| | 2b | Second central plate of the installation base; |
| | 2c | Third central plate of the installation base; |
| 45 | 3 | Fixing portion of the installation base; |
| | 3a | Support plates of the fixing portion; |
| | 3b | Through openings of the support plates; |
| | 4 | Engagement seat of the installation base; |
| | 4a | First cylindrical portion of the engagement seat; |
| 50 | 4b | Second cylindrical portion of the engagement seat; |
| | 4c | Third cylindrical portion of the engagement seat; |
| | 5 | Support post of the crane; |
| | 5a | First end of the support post; |
| 55 | 5b | Second end of the support post; |
| | 6 | Lifting arm of the crane; |
| | 6a | Cantilever end of the lifting arm; |
| | 6b | Bottom end of the lifting arm; |

6c	Attachment portion of the lifting arm;	
6d	Idler pulley;	
6e	Auxiliary idler pulley;	
7	Lifting device;	
8	Lifting device cable;	5
8a	Hook;	
9	Winding mechanism of the lifting device;	
10	Auxiliary engagement seat of the installation base;	
10a	Tangs of the auxiliary engagement seat;	10
11	Walls of the installation base at right angles to the plane of the fixing portion;	
11a	Auxiliary walls of the installation base orthogonal to the walls of the installation base;	
11b	Triangular portions of the auxiliary walls of the installation base;	15
12	Coupling sleeve;	
12a	First cylindrical portion of the coupling sleeve;	
12b	Circular shoulder of the first cylindrical portion;	
12c	Second cylindrical portion of the coupling sleeve;	20
13	Oblique support rod;	
13a	First end of oblique support rod;	
13b	Second end of the oblique support rod;	
14	Lateral concavities.	25

Claims

1. Crane (1) for confined spaces comprising:

an installation base (2) having at least one fixing portion (3) arranged to be fixed on a target surface of a building structure or similar support structure and at least one engagement seat (4) that runs predominantly transversely, preferably perpendicularly, to a plane of the fixing portion (3);

a support post (5) which runs along a prevailing direction and has a first end (5a) arranged to engage the at least one engagement seat (4) of the installation base (2) and a second end (5b) facing away from the first end (5a);

a lifting arm (6) engaged to the support post (5), preferably at the second end (5b) of the support post (5), and having at least one cantilevered end (6a);

optionally, at least one lifting device (7) removably attached to the support post (5) or lifting arm (6), equipped with at least one cable (8) having a hook (8a) for hooking a load to be lifted or lowered, the lifting device (7) comprising at least one winding mechanism (9) operable for lifting or lowering the hook (8a) and, consequently, the load associated with it;

characterized by the fact that the installation base (2) additionally includes at least one auxiliary engagement seat (10) arranged to receive in engage-

ment the support post (5) which develops transversely, optionally perpendicularly, with respect to the engagement seat (4), the first end (5a) of the support post (5) of the crane (1) being coupled to the engagement seat (4) or to the auxiliary engagement seat (10) depending on the orientation of the target surface.

2. Crane (1) for confined spaces according to the preceding claim, wherein the auxiliary engagement seat (10) of the installation base (2) predominantly develops substantially parallel to the lying plane of the fixing portion (3) of the base (2).

3. Crane (1) for confined spaces according to claim 1 or 2, wherein the fixing portion (3) of the installation base (2) comprises at least two support plates (3a) separated from each other and each lying on the same plane of lying as the fixing portion (3), optionally each support plate (3a) is provided with a through opening (3b), preferably two through openings (3b) arranged on opposite sides of the respective support plate (3a), arranged to receive in engagement at least one bolt or similar threaded element for fastening to the target surface of the building structure or similar support structure.

4. Crane (1) for confined spaces according to any preceding claim, wherein each through opening (3b) of each support plate (3a) of the fixing portion (3) has a substantially oval or elliptical shape to allow, during an installation operation of the crane (1), adjustment of the position of the installation base (2) along at least one direction parallel to the target surface of the respective building structure or similar support structure, optionally, each through opening (3b) of each support plate (3a) of the fixing portion (3) developing predominantly along a direction substantially orthogonal to the prevailing direction of development of the other through opening (3b) of the same support plate (3b) to allow, during a crane installation operation (1), adjustment of the position of the installation base (2), along two directions perpendicular to each other and parallel to the target surface of the respective building structure or similar support structure.

5. Crane (1) for confined spaces according to any one of the preceding claims, wherein the engagement location (4) of the installation base (2) is defined, at least in part, by:

at least a first portion (4a), optionally cylindrical, made through a respective first central plate (2a) of the base (2), optionally the first central plate (2a) of the base (2) being substantially parallel to the lying plane of the fixing portion (3) of the installation base (2);

- by at least a second portion (4b), optionally cylindrical, respectively made through a respective second central plate (2b) of the installation base (2), optionally parallel to the first central plate (2a) of the installation base (2), in particular both central plates (2a, 2b) of the installation base (2) being substantially parallel to the plane of the engagement portion (3) of the installation base (2).
6. Cranes (1) for confined spaces according to any preceding claim, wherein the engagement seat (4) of the installation base is defined, at least in part, by at least a third portion (4c), optionally cylindrical, respectively made through a respective third central plate (2c) of the installation base (2), optionally parallel to the first and second central plates (2a, 2b) of the installation base (2), in particular all of the central plates (2a, 2b, 2c) of the installation base (2) being substantially parallel to the plane of lay of the fixing portion (3) of the installation base (2).
7. Crane (1) for confined spaces according to any preceding claim, wherein the portions (4a, 4b, 4c), optionally cylindrical, at least partially defining the engagement seat (4) of the installation base (2) are substantially identical, optionally the portions (4a, 4b, 4c) at least partially defining the engagement seat (4) of the installation base (2) are overlapping and aligned along a transverse direction, preferably substantially perpendicular, with respect to the plane of lay of the fixing portion (3) of the installation base (2).
8. Cranes (1) for confined spaces according to any one of the preceding claims, wherein the auxiliary engagement seat (10) is defined at least in part by two tangs (10a), optionally cylindrical, which develop predominantly perpendicularly to the prevailing development of the engagement seat (4) of the installation base (2), optionally substantially parallel with respect to the plane of the lying plane of the fixing portion (3).
9. Crane (1) for confined spaces according to claim 8, wherein the tangs (10a), optionally cylindrical, defining the auxiliary engagement seat (10) of the installation base (2) are specularly identical, optionally the tangs (10a) being aligned along the prevailing direction of development.
10. A crane (1) for confined spaces according to claim 8 or 9, wherein the engagement seat (4) of the installation base (2) centrally crosses the auxiliary engagement seat (10), optionally the engagement seat (4) of the installation base (2) dividing the auxiliary engagement seat (10) into the two tangs (10a), optionally cylindrical.
11. Cranes (1) for confined spaces according to any one of the three preceding claims, wherein the tangs (10a), optionally cylindrical, at least partially defining the auxiliary engagement seat (10) of the installation base (2) are tangential to at least one of the central plates (2a, 2b) of the installation base (2), preferably they are tangential to the first central plate (2a) and the second central plate (2b) of the installation base (2), optionally, the tangs (10a) being interposed between the first central plate (2a) and the second central plate (2b) of the installation base (2), even more optionally the third central plate (2c) of the installation base (2) being interposed between the second central plate (2b) of the installation base (2) and the support plates (3a) of the fixing portion (3) of the latter.
12. Crane (1) for confined spaces according to any one of the preceding five claims, wherein the installation base (2) comprises two walls (11) substantially orthogonal with respect to the lying plane of the fixing portion (3) and substantially parallel to each other, each wall (11) extending between the first central plate (2a) of the base (2) and the respective support plate (3a) of the fixing portion (3) to define a substantially box-like or parallelepiped volume in which the engagement seat (4) and the auxiliary engagement seat (10) are defined, preferably the tangs (10a), optionally cylindrical, defining the auxiliary engagement seat (10) of the installation base (2) being tangent to the walls (11) thereof.
13. Crane (1) for confined spaces according to any one of the preceding claims, wherein the at least one coupling sleeve (12), optionally of cylindrical shape is interposable between at least one of the engagement seats (4, 10) of the installation base (2) and the first end (5a) of the support post (5) of the crane (1), optionally the coupling sleeve (12) comprising:
a first portion (12a), optionally cylindrical, which can be inserted into at least one of the engagement seats (4, 10) of the installation base (2), the first portion (12a) of the coupling sleeve (12) having at least one shoulder (12b), optionally circular, projecting transversely, preferably perpendicularly, outwards from one end of the first portion (12a) itself so as to rest against a corresponding edge of the corresponding engagement seat (4, 10) of the installation base (2);
a second portion (12c), optionally cylindrical, which can be fitted on the first end (5a) of the support post (5) of the crane (1) and inserted into the first portion (12a) to ensure correct coupling between the crane (1) and the installation base (2).
14. Installation base (2) for crane (1) for confined spaces comprising:

at least one fixing portion (3) adapted to be fixed to a target surface of a building structure or similar support structure, and at least one engagement seat (4) extending predominantly transversely, preferably perpendicularly, with respect to a lying plane of the fixing portion (3) to receive in engagement a first end (5a) of a support post (5) of a crane (1),

characterized by the fact that it also comprises: at least one auxiliary engagement seat (10) developing transversally, optionally perpendicularly, with respect to the engagement seat (4) and also arranged to receive in engagement the first end (5a) of the support post (5) of the crane (1), the presence of the engagement seat (4) and of the auxiliary engagement seat (10) permitting, by means of the fixing portion (3), the crane (1) to be installed on different destination surfaces, in particular orthogonal, even more particularly on a horizontal target surface or on a vertical target surface.

15. Method of assembling and installing a crane (1) for confined spaces including:

an installation base (2) having at least one fixing portion (3) adapted to be fixed to a target surface of a building structure or similar support structure and at least one engagement seat (4) that develops predominantly transversely, preferably perpendicularly, to a lying plane of the fixing portion (3);

a support post (5) that develops along a prevailing direction and has a first end (5a) arranged to engage the at least one engagement seat (4) of the installation base (2) and a second end (5b) facing away from the first end (5a);

a lifting arm (6) engaged at the support post (5), preferably at the second end (5b) of the support post (5), and having at least one cantilevered end (6a);

optionally at least one lifting device (7) removably engaged at the support post (5) or the lifting arm (6), provided with at least one cable (8) with a hook (8a) for hooking a load to be lifted or lowered, the lifting device (7) comprising at least one winding mechanism (9) operable to raise or lower the hook (8a) and, accordingly, the load associated with it;

wherein the installation base (2) additionally comprises at least one auxiliary engagement seat (10) arranged to receive in engagement the support post (5) extending transversely, optionally perpendicularly, with respect to the engagement seat (4), the first end (5a) of the support post (5) of the crane (1) being coupled to the engagement seat (4) or to the auxiliary engagement seat (10) depending on the orientation of

the target surface,
the crane assembly and installation method (1) including the steps of:

identifying a target area of a building structure or similar support structure on which to install the crane (1);

recognizing whether the target surface of the building structure or the similar support structure is horizontal or vertical;

positioning the installation base (2) of the crane (1) on the target surface of the building structure or similar support structure in such a way that the fixing portion (3) of the installation base (2) is in contact with such target surface and at least one of the engagement seats (4, 10) can be engaged vertically, in particular from above;

fixing, optionally by means of a plurality of bolts or similar threaded fastening elements, the fixing portion (3) of the installation base (2) of the crane (1) to the target surface of the respective building structure or similar support structure;

engaging the first end (5a) of the support post (5) of the crane (1) in the engagement seat (4) of the installation base (2) of the crane (1) if the target surface of the building structure or similar support structure substantially is horizontal, or engaging the first end (5a) of the support post (5) of the crane (1) in the auxiliary engagement seat (10) of the installation base (2) of the crane (1) if the target surface of the building structure or the similar support structure substantially is vertical.

Patentansprüche

1. Kran (1) für beengte Räume, umfassend:

eine Installationsbasis (2), welche wenigstens einen Befestigungsabschnitt (3), welcher dazu eingerichtet ist, an einer Zielfläche einer Gebäudestruktur oder einer ähnlichen Tragestruktur befestigt zu sein, und wenigstens einen Eingriffssitz (4) aufweist, welcher vorwiegend transversal, vorzugsweise senkrecht, zu einer Ebene des Befestigungsabschnitts (3) verläuft;
einen Tragepfosten (5), welcher entlang einer vorherrschenden Richtung verläuft und ein erstes Ende (5a), welches dazu eingerichtet ist, mit dem wenigstens einen Eingriffssitz (4) der Installationsbasis (2) einzugreifen, und ein zweites Ende (5b) aufweist, welches von dem ersten Ende (5a) weg weist;
einen Hebearm (6), welcher mit dem Tragepfos-

- ten (5) in Eingriff steht, vorzugsweise an dem zweiten Ende (5b) des Tragepfostens (5), und wenigstens ein auskragendes Ende (6a) aufweist;
- optional wenigstens eine Hebevorrichtung (7), welche lösbar an dem Tragepfosten (5) oder Hebearm (6) angebracht ist, ausgerüstet mit wenigstens einem Kabel (8), welches einen Haken (8a) zum Einhängen einer anzuhebenden oder abzusenkenden Last aufweist, wobei die Hebevorrichtung (7) wenigstens einen Windenmechanismus (9) umfasst, welcher dazu betreibbar ist, den Haken (8a) und folglich die ihm zugeordnete Last anzuheben oder abzusenken;
- dadurch gekennzeichnet, dass** die Installationsbasis (2) zusätzlich wenigstens einen Hilfs-Eingriffssitz (10) umfasst, welcher dazu eingerichtet ist, in Eingriff den Tragepfosten (5) aufzunehmen, welcher sich transversal, optional senkrecht, bezüglich des Eingriffssitzes (4) erstreckt, wobei das erste Ende (5a) des Tragepfostens (5) des Krans (1) mit dem Eingriffssitz (4) oder dem Hilfs-Eingriffssitz (10) gekoppelt ist, abhängig von der Orientierung der Zielfläche.
2. Kran (1) für beengte Räume nach dem vorhergehenden Anspruch, wobei sich der Hilfs-Eingriffssitz (10) der Installationsbasis (2) vorwiegend im Wesentlichen parallel zu der Liegeebene des Befestigungsabschnitts (3) der Basis (2) erstreckt.
 3. Kran (1) für beengte Räume nach Anspruch 1 oder 2, wobei der Befestigungsabschnitt (3) der Installationsbasis (2) wenigstens zwei Trageplatten (3a) umfasst, welche voneinander getrennt sind und jeweils an derselben Liegeebene wie der Befestigungsabschnitt (3) liegen, wobei optional jede Trageplatte (3a) mit einer Durchgangsöffnung (3b) bereitgestellt ist, vorzugsweise zwei Durchgangsöffnungen (3b), welche an gegenüberliegenden Seiten der entsprechenden Trageplatte (3a) angeordnet sind, welche dazu eingerichtet ist, in Eingriff wenigstens einen Bolzen oder ein ähnliches mit einem Gewinde versehenes Element zum Befestigen an der Zielfläche der Gebäudestruktur oder ähnlichen Tragstruktur aufzunehmen.
 4. Kran (1) für beengte Räume nach einem vorhergehenden Anspruch, wobei jede Durchgangsöffnung (3b) von jeder Trageplatte (3a) des Befestigungsabschnitts (3) eine im Wesentlichen ovale oder elliptische Form aufweist, um während eines Installationsvorgangs des Krans (1) eine Anpassung der Position der Installationsbasis (2) entlang wenigstens einer Richtung parallel zu der Zielfläche der entsprechenden Gebäudestruktur oder ähnlichen Tragstruktur zu erlauben, wobei sich optional jede Durchgangs-
- öffnung (3b) von jeder Trageplatte (3a) des Befestigungsabschnitts (3) vorwiegend entlang einer Richtung im Wesentlichen orthogonal zu der vorherrschenden Erstreckungsrichtung der anderen Durchgangsöffnung (3b) derselben Trageplatte (3b) erstreckt, um während eines Kran-Installationsvorgangs (1) eine Anpassung der Position der Installationsbasis (2) entlang zweier Richtungen senkrecht zueinander und parallel zu der Zielfläche der entsprechenden Gebäudestruktur oder ähnlichen Tragstruktur zu erlauben.
5. Kran (1) für beengte Räume nach einem der vorhergehenden Ansprüche, wobei der Eingriffsort (4) der Installationsbasis (2) wenigstens teilweise definiert ist durch:
 - wenigstens einen ersten Abschnitt (4a), optional zylindrisch, welcher durch eine entsprechende erste zentrale Platte (2a) der Basis (2) hergestellt ist, wobei optional die erste zentrale Platte (2a) der Basis (2) im Wesentlichen parallel zu der Liegeebene des Befestigungsabschnitts (3) der Installationsbasis (2) ist;
 - durch wenigstens einen zweiten Abschnitt (4b), optional zylindrisch, welcher entsprechend durch eine entsprechende zweite zentrale Platte (2b) der Installationsbasis (2) hergestellt ist, optional parallel zu der ersten zentralen Platte (2a) der Installationsbasis (2), wobei insbesondere beide zentrale Platten (2a, 2b) der Installationsbasis (2) im Wesentlichen parallel zu der Ebene des Eingriffsabschnitts (3) der Installationsbasis (2) sind.
 6. Kräne (1) für beengte Räume nach einem vorhergehenden Anspruch, wobei der Eingriffssitz (4) der Installationsbasis wenigstens teilweise durch wenigstens einen dritten Abschnitt (4c) definiert ist, optional zylindrisch, welcher entsprechend durch eine entsprechende dritte zentrale Platte (2c) der Installationsbasis (2) hergestellt ist, optional parallel zu den ersten und zweiten zentralen Platten (2a, 2b) der Installationsbasis (2), wobei insbesondere alle der zentralen Platten (2a, 2b, 2c) der Installationsbasis (2) im Wesentlichen parallel zu der Liegeebene des Befestigungsabschnitts (3) der Installationsbasis (2) sind.
 7. Kran (1) für beengte Räume nach einem vorhergehenden Anspruch, wobei die Abschnitte (4a, 4b, 4c), optional zylindrisch, welche wenigstens teilweise den Eingriffssitz (4) der Installationsbasis (2) definieren, im Wesentlichen identisch sind, wobei optional die Abschnitte (4a, 4b, 4c), welche wenigstens teilweise den Eingriffssitz (4) der Installationsbasis (2) definieren, überlappend und entlang einer transversalen Richtung ausgerichtet sind, vorzugsweise

- im Wesentlichen senkrecht bezüglich der Liegeebene des Befestigungsabschnitts (3) der Installationsbasis (2).
8. Kräne (1) für beengte Räume nach einem der vorhergehenden Ansprüche, wobei der Hilfs-Eingriffssitz (10) wenigstens teilweise durch zwei Zapfen (10a), optional zylindrisch, definiert ist, welche sich vorwiegend senkrecht zu der vorherrschenden Erstreckung des Eingriffssitzes (4) der Installationsbasis (2) erstrecken, optional im Wesentlichen parallel bezüglich der Ebene der Liegeebene des Befestigungsabschnitts (3).
9. Kran (1) für beengte Räume nach Anspruch 8, wobei die Zapfen (10a), optional zylindrisch, welche den Hilfs-Eingriffssitz (10) der Installationsbasis (2) definieren, spiegelidentisch sind, wobei optional die Zapfen (10a) entlang der vorherrschenden Erstreckungsrichtung ausgerichtet sind.
10. Kran (1) für beengte Räume nach Anspruch 8 oder 9, wobei der Eingriffssitz (4) der Installationsbasis (2) den Hilfs-Eingriffssitz (10) zentral kreuzt, wobei optional der Eingriffssitz (4) der Installationsbasis (2) den Hilfs-Eingriffssitz (10) in die beiden Zapfen (10a) unterteilt, optional zylindrisch.
11. Kräne (1) für beengte Räume nach einem der drei vorhergehenden Ansprüche, wobei die Zapfen (10a), optional zylindrisch, welche wenigstens teilweise den Hilfs-Eingriffssitz (10) der Installationsbasis (2) definieren, tangential zu wenigstens einer der zentralen Platten (2a, 2b) der Installationsbasis (2) sind, wobei sie vorzugsweise tangential zu der ersten zentralen Platte (2a) und der zweiten zentralen Platte (2b) der Installationsbasis (2) sind, wobei optional die Zapfen (10a) zwischen der ersten zentralen Platte (2a) und der zweiten zentralen Platte (2b) der Installationsbasis (2) eingefügt sind, wobei weiter optional die dritte zentrale Platte (2c) der Installationsbasis (2) zwischen der zweiten zentralen Platte (2b) der Installationsbasis (2) und den Trageplatten (3a) des Befestigungsabschnitts (3) des letzteren eingefügt sind.
12. Kran (1) für beengte Räume nach einem der vorhergehenden fünf Ansprüche, wobei die Installationsbasis (2) zwei Wände (11) umfasst, welche im Wesentlichen orthogonal bezüglich der Liegeebene des Befestigungsabschnitts (3) und im Wesentlichen parallel zueinander sind, wobei sich jede Wand (11) zwischen der ersten zentralen Platte (2a) der Basis (2) und der entsprechenden Trageplatte (3a) des Befestigungsabschnitts (3) erstreckt, um ein im Wesentlichen kistenartiges oder parallelepipedes Volumen zu definieren, in welchem der Eingriffssitz (4) und der Hilfs-Eingriffssitz (10) definiert sind, wobei vorzugsweise die Zapfen (10a), optional zylindrisch, welche den Hilfs-Eingriffssitz (10) der Installationsbasis (2) definieren, tangential zu den Wänden (11) davon sind.
13. Kran (1) für beengte Räume nach einem der vorhergehenden Ansprüche, wobei die wenigstens eine Kopplungshülse (12), optional von zylindrischer Form, zwischen wenigstens einem der Eingriffssitze (4, 10) der Installationsbasis (2) und dem ersten Ende (5a) des Tragepfostens (5) des Krans (1) einfügbar ist, wobei optional die Kopplungshülse (12) umfasst:
- einen ersten Abschnitt (12a), optional zylindrisch, welcher in wenigstens einen der Eingriffssitze (4, 10) der Installationsbasis (2) eingesetzt werden kann, wobei der erste Abschnitt (12a) der Kopplungshülse (12) wenigstens eine Schulter (12b) aufweist, optional kreisförmig, welche transversal vorsteht, vorzugsweise senkrecht, nach außen von einem Ende des ersten Abschnitts (12a) selbst, um so gegen einen entsprechenden Rand des entsprechenden Eingriffssitzes (4, 10) der Installationsbasis (2) zu ruhen;
- einen zweiten Abschnitt (12c), optional zylindrisch, welcher an das erste Ende (5a) des Tragepfostens (5) des Krans (1) angepasst und in den ersten Abschnitt (12a) eingesetzt werden kann, um eine korrekte Kopplung zwischen dem Kran (1) und der Installationsbasis (2) sicherzustellen.
14. Installationsbasis (2) für einen Kran (1) für beengte Räume, umfassend:
- wenigstens einen Befestigungsabschnitt (3), welcher dazu eingerichtet ist, an einer Zielfläche einer Gebäudestruktur oder ähnlichen Tragestruktur befestigt zu sein, und wenigstens einen Eingriffssitz (4), welcher sich vorwiegend transversal erstreckt, vorzugsweise senkrecht, bezüglich einer Liegeebene des Befestigungsabschnitts (3), um in Eingriff ein erstes Ende (5a) eines Tragepfostens (5) eines Krans (1) aufzunehmen,
- dadurch gekennzeichnet, dass** sie ebenfalls umfasst:
- wenigstens einen Hilfs-Eingriffssitz (10), welcher sich transversal, optional senkrecht, bezüglich des Eingriffssitzes (4) erstreckt und ebenfalls dazu eingerichtet ist, in Eingriff das erste Ende (5a) des Tragepfostens (5) des Krans (1) aufzunehmen, wobei es das Vorliegen des Eingriffssitzes (4) und des Hilfs-Eingriffssitzes (10) erlaubt, mittels des Befestigungsabschnitts (3) den Kran (1) an unterschiedlichen

Zielflächen zu installieren, insbesondere orthogonal, weiter insbesondere an einer horizontalen Zielfläche oder an einer vertikalen Zielfläche.

15. Verfahren zum Montieren und Installieren eines Krans (1) für beengte Räume, umfassend:

eine Installationsbasis (2), welche wenigstens einen Befestigungsabschnitt (3), welcher dazu eingerichtet ist, an einer Zielfläche einer Gebäudestruktur oder einer ähnlichen Tragestruktur befestigt zu werden, und wenigstens einen Eingriffssitz (4) aufweist, welcher sich vorwiegend transversal, vorzugsweise senkrecht, zu einer Liegeebene des Befestigungsabschnitts (3) erstreckt;

einen Tragepfosten (5), welcher sich entlang einer vorherrschenden Richtung erstreckt und ein erstes Ende (5a), welches dazu eingerichtet ist, mit dem wenigstens einen Eingriffssitz (4) der Installationsbasis (2) einzugreifen, und ein zweites Ende (5b) aufweist, welches weg von dem ersten Ende (5a) weist;

einen Hebearm (6), welcher mit dem Tragepfosten (5) in Eingriff steht, vorzugsweise an dem zweiten Ende (5b) des Tragepfostens (5), und wenigstens ein auskragendes Ende (6a) aufweist;

optional wenigstens eine Hebevorrichtung (7), welche lösbar an dem Tragepfosten (5) oder Hebearm (6) angebracht ist, ausgerüstet mit wenigstens einem Kabel (8) mit einem Haken (8a) zum Einhängen einer anzuhebenden oder abzusenkenden Last, wobei die Hebevorrichtung (7) wenigstens einen Windenmechanismus (9) umfasst, welcher dazu betreibbar ist, den Haken (8a) und dementsprechend die ihm zugeordnete Last anzuheben oder abzusenken;

wobei die Installationsbasis (2) zusätzlich wenigstens einen Hilfs-Eingriffssitz (10) umfasst, welcher dazu eingerichtet ist, in Eingriff den Tragepfosten (5) aufzunehmen, welcher sich transversal erstreckt, optional senkrecht, bezüglich des Eingriffssitzes (4), wobei das erste Ende (5a) des Tragepfostens (5) des Krans (1) mit dem Eingriffssitz (4) oder mit dem Hilfs-Eingriffssitz (10) gekoppelt wird, abhängig von der Orientierung der Zielfläche,

wobei das Kran-Montage- und Installationsverfahren (1) die Schritte umfasst:

Identifizieren einer Zielfläche einer Gebäudestruktur oder ähnlichen Tragestruktur, an welcher der Kran (1) zu installieren ist;

Erkennen, ob die Zielfläche der Gebäudestruktur oder der ähnlichen Tragestruktur horizontal oder vertikal ist;

Positionieren der Installationsbasis (2) des

Krans (1) an der Zielfläche der Gebäudestruktur oder ähnlichen Tragestruktur in einer derartigen Weise, dass der Befestigungsabschnitt (3) der Installationsbasis (2) in Kontakt mit dieser Zielfläche steht und wenigstens einer der Eingriffssitze (4, 10) vertikal, insbesondere von oben, eingegriffen werden kann;

Befestigen, optional mittels einer Mehrzahl von Bolzen oder ähnlichen mit einem Gewinde versehenen Elementen, des Befestigungsabschnitts (3) der Installationsbasis (2) des Krans (1) an der Zielfläche der entsprechenden Gebäudestruktur oder ähnlichen Tragestruktur;

Eingreifen des ersten Endes (5a) des Tragepfostens (5) des Krans (1) in dem Eingriffssitz (4) der Installationsbasis (2) des Krans (1), wenn die Zielfläche der Gebäudestruktur oder ähnlichen Tragestruktur im Wesentlichen horizontal ist, oder Eingreifen des ersten Endes (5a) des Tragepfostens (5) des Krans (1) in dem Hilfs-Eingriffssitz (10) der Installationsbasis (2) des Krans (1), wenn die Zielfläche der Gebäudestruktur oder der ähnlichen Tragestruktur im Wesentlichen vertikal ist.

Revendications

1. Grue (1) pour espaces confinés comprenant :

une base d'installation (2) ayant au moins une portion de fixation (3) agencée pour être fixée sur une surface cible d'une structure de construction ou d'une structure de support similaire et au moins un siège d'engagement (4) qui se développe de manière prédominante transversalement, préférentiellement perpendiculairement, à un plan de la portion de fixation (3) ;

un montant de support (5) qui se développe le long d'un sens dominant et qui présente une première extrémité (5a) agencée pour engager le au moins un siège d'engagement (4) de la base d'installation (2) et une seconde extrémité (5b) faisant face à l'opposé de la première extrémité (5a) ;

un bras de levage (6) engagé au niveau du montant de support (5), préférentiellement au niveau de la seconde extrémité (5b) du montant de support (5), et ayant au moins une extrémité en porte-à-faux (6a) ;

éventuellement, au moins un dispositif de levage (7) fixé de manière amovible au montant de support (5) ou au bras de levage (6), équipé d'au moins un câble (8) ayant un crochet (8a) pour accrocher une charge à lever ou à abaisser, le

- dispositif de levage (7) comprenant au moins un mécanisme d'enroulement (9) pouvant fonctionner pour lever ou abaisser le crochet (8a) et, en conséquence, la charge qui lui est associée ; **caractérisée par le fait que** la base d'installation (2) inclut additionnellement au moins un siège d'engagement auxiliaire (10) agencé pour recevoir en engagement le montant de support (5) qui se développe transversalement, éventuellement perpendiculairement, par rapport au siège d'engagement (4), la première extrémité (5a) du montant de support (5) de la grue (1) étant accouplée au siège d'engagement (4) ou au siège d'engagement auxiliaire (10) en fonction de l'orientation de la surface cible.
2. Grue (1) pour espaces confinés selon la revendication précédente, dans laquelle le siège d'engagement auxiliaire (10) de la base d'installation (2) se développe de manière prédominante sensiblement parallèle au plan de repos de la portion de fixation (3) de la base (2).
 3. Grue (1) pour espaces confinés selon la revendication 1 ou 2, dans laquelle la portion de fixation (3) de la base d'installation (2) comprend au moins deux plaques de support (3a) séparées l'une de l'autre et reposant chacune sur le même plan de repos que la portion de fixation (3), éventuellement chaque plaque de support (3a) est pourvue d'une ouverture traversante (3b), préférablement de deux ouvertures traversantes (3b) agencées sur des côtés opposés de la plaque de support (3a) respective, agencées pour recevoir en engagement au moins un boulon ou un élément fileté similaire pour la fixation à la surface cible de la structure de construction ou d'une structure de support similaire.
 4. Grue (1) pour espaces confinés selon l'une quelconque des revendications précédentes, dans laquelle chaque ouverture traversante (3b) de chaque plaque de support (3a) de la portion de fixation (3) présente une forme sensiblement ovale ou elliptique pour permettre, durant une opération d'installation de la grue (1), un ajustement de la position de la base d'installation (2) le long d'au moins un sens parallèle à la surface cible de la structure de construction respective ou d'une structure de support similaire, éventuellement, chaque ouverture traversante (3b) de chaque plaque de support (3a) de la portion de fixation (3) se développant de manière prédominante le long d'un sens sensiblement orthogonal au sens dominant de développement de l'autre ouverture traversante (3b) de la même plaque de support (3a) pour permettre, durant une opération d'installation de grue (1), un ajustement de la position de la base d'installation (2), le long de deux sens perpendiculaires l'un à l'autre et parallèles à la surface cible de la structure de construction respective ou de la structure de support similaire.
 5. Grue (1) pour espaces confinés selon l'une quelconque des revendications précédentes, dans laquelle la localisation d'engagement (4) de la base d'installation (2) est définie, au moins en partie, par :
 - au moins une première portion (4a), éventuellement cylindrique, fabriquée à travers une première plaque centrale (2a) respective de la base (2), éventuellement, la première plaque centrale (2a) de la base (2) étant sensiblement parallèle au plan de repos de la portion de fixation (3) de la base d'installation (2) ;
 - par au moins une seconde portion (4b), éventuellement cylindrique, respectivement fabriquée à travers une seconde plaque centrale (2b) respective de la base d'installation (2), éventuellement parallèle à la première plaque centrale (2a) de la base d'installation (2), en particulier les deux plaques centrales (2a, 2b) de la base d'installation (2) étant sensiblement parallèles au plan de la portion de fixation (3) de la base d'installation (2).
 6. Grue (1) pour espaces confinés selon l'une quelconque des revendications précédentes, dans lesquelles le siège d'engagement (4) de la base d'installation est défini, au moins en partie, par au moins une troisième portion (4c), éventuellement cylindrique, respectivement fabriquée à travers une troisième plaque centrale (2c) respective de la base d'installation (2), éventuellement parallèle à la première et à la seconde plaque centrale (2a, 2b) de la base d'installation (2), en particulier toutes les plaques centrales (2a, 2b, 2c) de la base d'installation (2) étant sensiblement parallèles au plan de repos de la portion de fixation (3) de la base d'installation (2).
 7. Grue (1) pour espaces confinés selon l'une quelconque des revendications précédentes, dans laquelle les portions (4a, 4b, 4c), éventuellement cylindriques, définissant au moins partiellement le siège d'engagement (4) de la base d'installation (2) sont sensiblement identiques, éventuellement les portions (4a, 4b, 4c) définissant au moins partiellement le siège d'engagement (4) de la base d'installation (2) se chevauchent et sont alignées le long d'un sens transversal, préférablement sensiblement perpendiculaire, par rapport au plan de repos de la portion de fixation (3) de la base d'installation (2).
 8. Grue (1) pour espaces confinés selon l'une quelconque des revendications précédentes, dans lesquelles le siège d'engagement auxiliaire (10) est défini au moins en partie par deux tenons (10a), éventuellement cylindriques, qui se développent de manière

prédominante perpendiculairement au développement dominant du siège d'engagement (4) de la base d'installation (2), éventuellement sensiblement parallèles, par rapport au plan, du plan de repos de la portion de fixation (3).

9. Grue (1) pour espaces confinés selon la revendication 8, dans laquelle les tenons (10a), éventuellement cylindriques, définissant le siège d'engagement auxiliaire (10) de la base d'installation (2) sont spéculairement identiques, éventuellement les tenons (10a) étant alignés le long du sens de développement dominant.

10. Grue (1) pour espaces confinés selon la revendication 8 ou 9, dans laquelle le siège d'engagement (4) de la base d'installation (2) traverse centralement le siège d'engagement auxiliaire (10), éventuellement le siège d'engagement (4) de la base d'installation (2) divisant le siège d'engagement auxiliaire (10) en deux tenons (10a), éventuellement cylindriques.

11. Grue (1) pour espaces confinés selon l'une quelconque des trois revendications précédentes, dans lesquelles les tenons (10a), éventuellement cylindriques, définissant au moins partiellement le siège d'engagement auxiliaire (10) de la base d'installation (2) sont tangentiels à au moins l'une des plaques centrales (2a, 2b) de la base d'installation (2), préférablement ils sont tangentiels à la première plaque centrale (2a) et à la seconde plaque centrale (2b) de la base d'installation (2), éventuellement, les tenons (10a) étant interposés entre la première plaque centrale (2a) et la seconde plaque centrale (2b) de la base d'installation (2), même plus facultativement la troisième plaque centrale (2c) de la base d'installation (2) étant interposée entre la seconde plaque centrale (2b) de la base d'installation (2) et les plaques de support (3a) de la portion de fixation (3) de cette dernière.

12. Grue (1) pour espaces confinés selon l'une quelconque des cinq revendications précédentes, dans laquelle la base d'installation (2) comprend deux parois (11) sensiblement orthogonales par rapport au plan de repos de la portion de fixation (3) et sensiblement parallèles l'une à l'autre, chaque paroi (11) s'étendant entre la première plaque centrale (2a) de la base (2) et la plaque de support (3a) respective de la portion de fixation (3) pour définir un volume parallélépipédique ou sensiblement en forme de boîte dans lequel le siège d'engagement (4) et le siège d'engagement auxiliaire (10) sont définis, préférablement les tenons (10a), éventuellement cylindriques, définissant le siège d'engagement auxiliaire (10) de la base d'installation (2) étant tangents aux parois (11) elles-mêmes.

13. Grue (1) pour espaces confinés selon l'une quelconque des revendications précédentes, dans laquelle le au moins un manchon d'accouplement (12), éventuellement de forme cylindrique est interposable entre au moins l'un des sièges d'engagement (4, 10) de la base d'installation (2) et la première extrémité (5a) du montant de support (5) de la grue (1), éventuellement le manchon d'accouplement (12) comprenant :

une première portion (12a), éventuellement cylindrique, qui peut être insérée dans au moins l'un des sièges d'engagement (4, 10) de la base d'installation (2), la première portion (12a) du manchon d'accouplement (12) ayant au moins un épaulement (12b), éventuellement circulaire, se projetant transversalement, préférablement perpendiculairement, vers l'extérieur depuis une extrémité de la première portion (12a) elle-même afin de reposer contre un bord correspondant du siège d'engagement (4, 10) correspondant de la base d'installation (2) ;
une seconde portion (12c), éventuellement cylindrique, qui peut être ajustée sur la première extrémité (5a) du montant de support (5) de la grue (1) et insérée dans la première portion (12a) pour garantir un accouplement correct entre la grue (1) et la base d'installation (2).

14. Base d'installation (2) de grue (1) pour espaces confinés comprenant :

au moins une portion de fixation (3) adaptée pour être fixée à une surface cible d'une structure de construction ou d'une structure de support similaire, et au moins un siège d'engagement (4) s'étendant de manière prédominante transversalement, préférablement perpendiculairement, par rapport à un plan de repos de la portion de fixation (3) pour recevoir en engagement une première extrémité (5a) d'un montant de support (5) d'une grue (1),

caractérisée par le fait qu'il comprend également :

au moins un siège d'engagement auxiliaire (10) se développant transversalement, éventuellement perpendiculairement, par rapport au siège d'engagement (4) et également agencé pour recevoir en engagement la première extrémité (5a) du montant de support (5) de la grue (1), la présence du siège d'engagement (4) et du siège d'engagement auxiliaire (10) permettant, à l'aide de la portion de fixation (3), à la grue (1) d'être installée sur différentes surfaces de destination, en particulier orthogonales, même plus particulièrement sur une surface cible horizontale ou sur une surface cible verticale.

15. Procédé d'assemblage et d'installation d'une grue (1) pour espaces confinés incluant :

une base d'installation (2) ayant au moins une portion de fixation (3) adaptée pour être fixée à une surface cible d'une structure de construction ou d'une structure de support similaire et au moins un siège d'engagement (4) qui se développe de manière prédominante transversalement, préférentiellement perpendiculairement, à un plan de repos de la portion de fixation (3) ; un montant de support (5) qui se développe le long d'un sens dominant et ayant une première extrémité (5a) agencée pour engager le au moins un siège d'engagement (4) de la base d'installation (2) et une seconde extrémité (5b) faisant face à l'opposé de la première extrémité (5a) ; un bras de levage (6) engagé au niveau du montant de support (5), préférentiellement au niveau de la seconde extrémité (5b) du montant de support (5), et ayant au moins une extrémité en porte-à-faux (6a) ; éventuellement au moins un dispositif de levage (7) engagé de manière amovible au montant de support (5) ou au bras de levage (6), pourvu d'au moins un câble (8) ayant un crochet (8a) pour accrocher une charge à lever ou à abaisser, le dispositif de levage (7) comprenant au moins un mécanisme d'enroulement (9) pouvant fonctionner pour lever ou abaisser le crochet (8a) et, en conséquence, la charge qui lui est associée ; dans lequel la base d'installation (2) comprend additionnellement au moins un siège d'engagement auxiliaire (10) agencé pour recevoir en engagement le montant de support (5) s'étendant transversalement, éventuellement perpendiculairement, par rapport au siège d'engagement (4), la première extrémité (5a) du montant de support (5) de la grue (1) étant accouplée au siège d'engagement (4) ou au siège d'engagement auxiliaire (10) en fonction de l'orientation de la surface cible, le procédé d'assemblage et d'installation de grue (1) incluant les étapes consistant à :

identifier une zone cible d'une structure de construction ou d'une structure de support similaire sur laquelle installer la grue (1) ; reconnaître si la surface cible de la structure de construction ou de la structure de support similaire est horizontale ou verticale ; positionner la base d'installation (2) de la grue (1) sur la surface cible de la structure de construction ou de la structure de support similaire d'une manière telle que la portion de fixation (3) de la base d'installation (2) se trouve en contact avec une telle sur-

face cible et au moins l'un des sièges d'engagement (4, 10) peut être engagé verticalement, en particulier depuis le dessus ; fixer, éventuellement à l'aide d'une pluralité de boulons ou d'éléments de fixation filetés similaires, la portion de fixation (3) de la base d'installation (2) de la grue (1) à la surface cible de la structure de construction ou de la structure de support similaire respective ; engager la première extrémité (5a) du montant de support (5) de la grue (1) dans le siège d'engagement (4) de la base d'installation (2) de la grue (1) si la surface cible de la structure de construction ou de la structure de support similaire est sensiblement horizontale, ou engager la première extrémité (5a) du montant de support (5) de la grue (1) dans le siège d'engagement auxiliaire (10) de la base d'installation (2) de la grue (1) si la surface cible de la structure de construction ou de la structure de support similaire est sensiblement verticale.

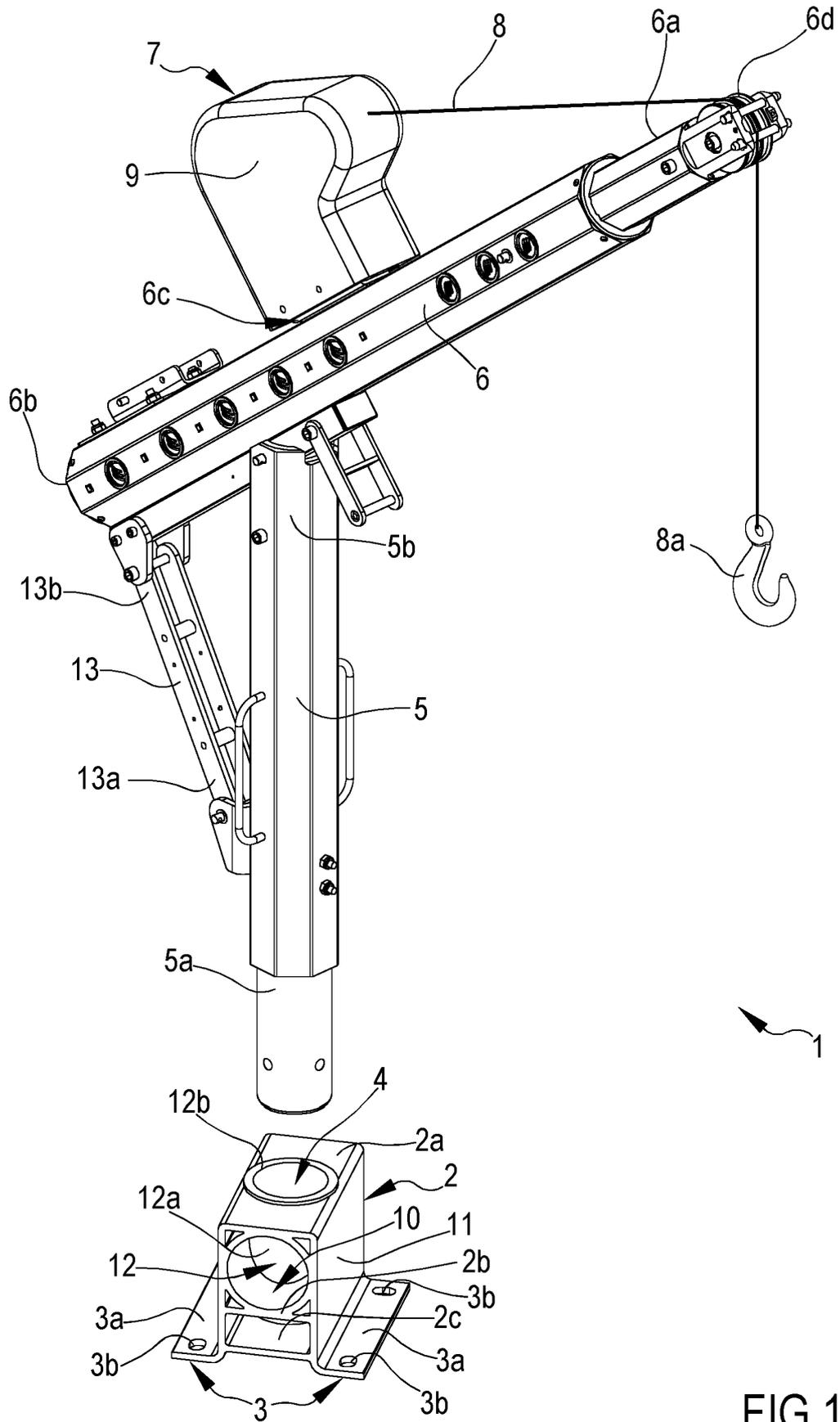


FIG.1

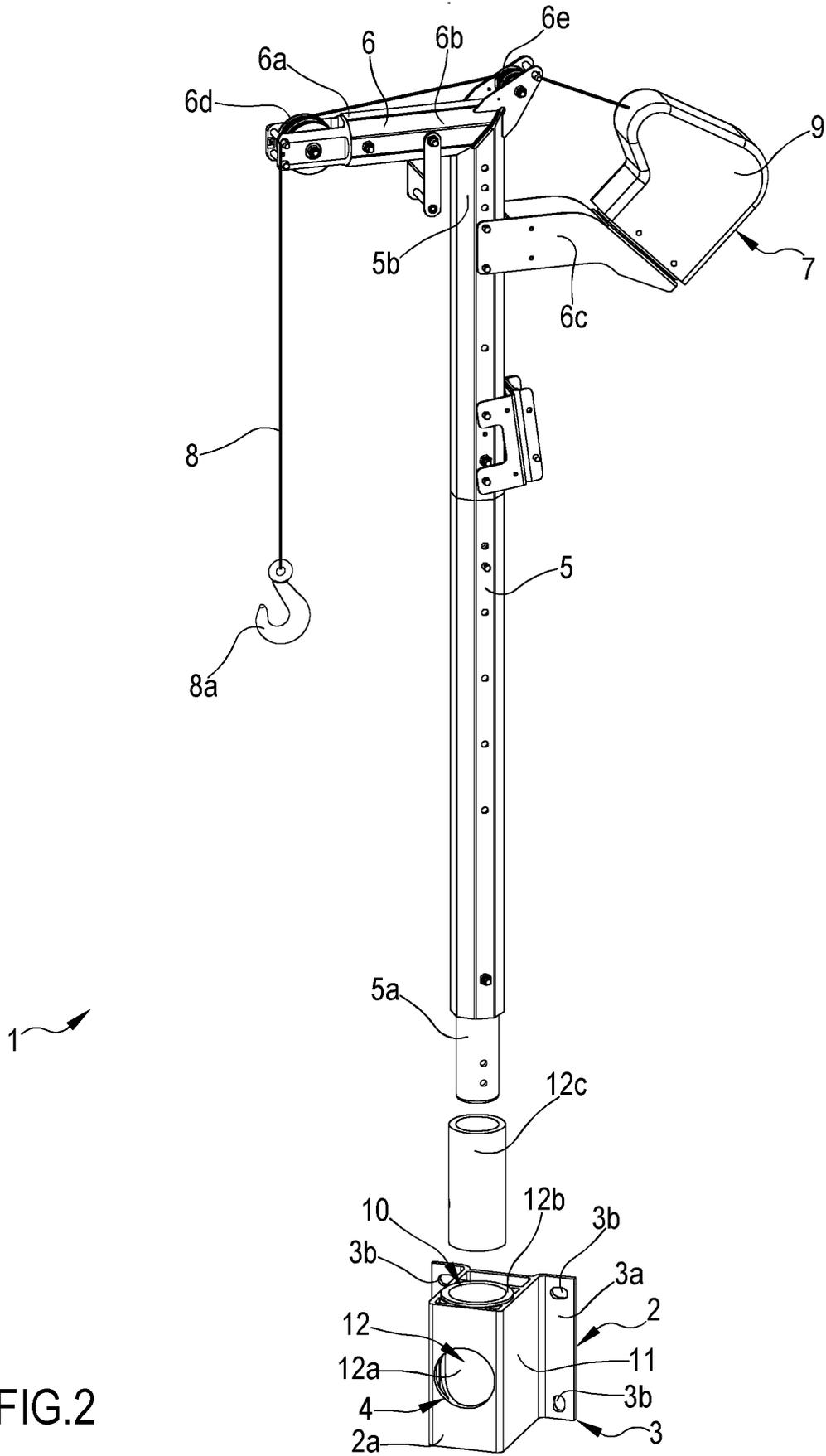


FIG. 2

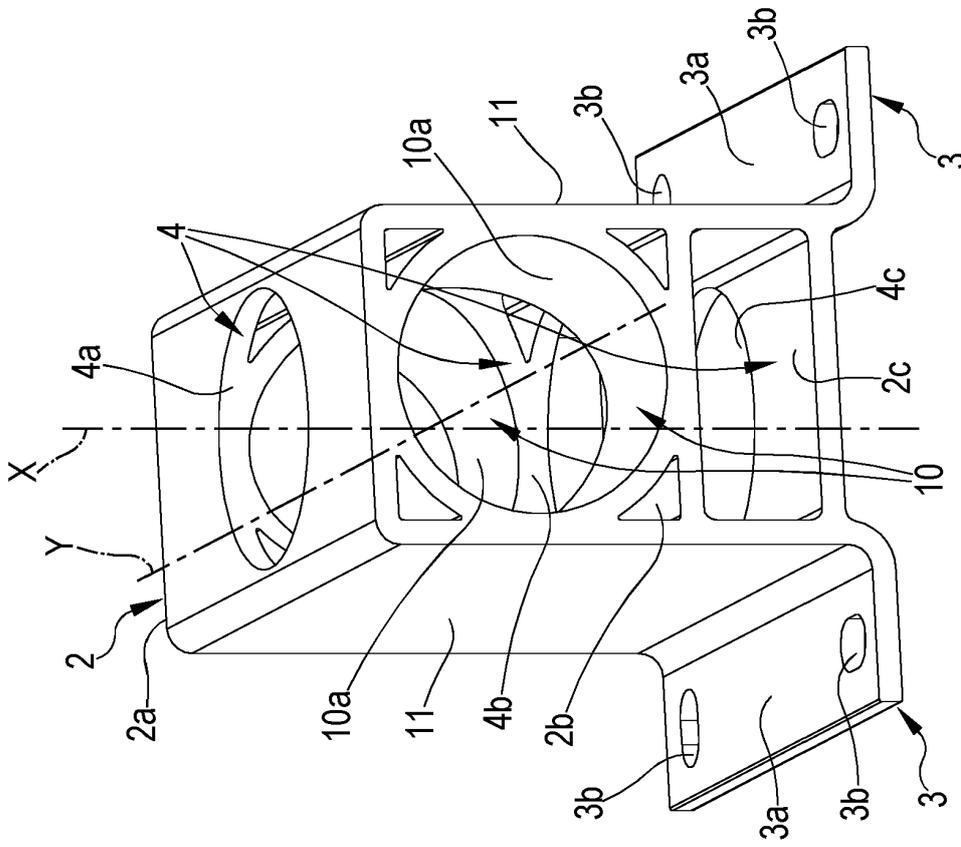


FIG. 3

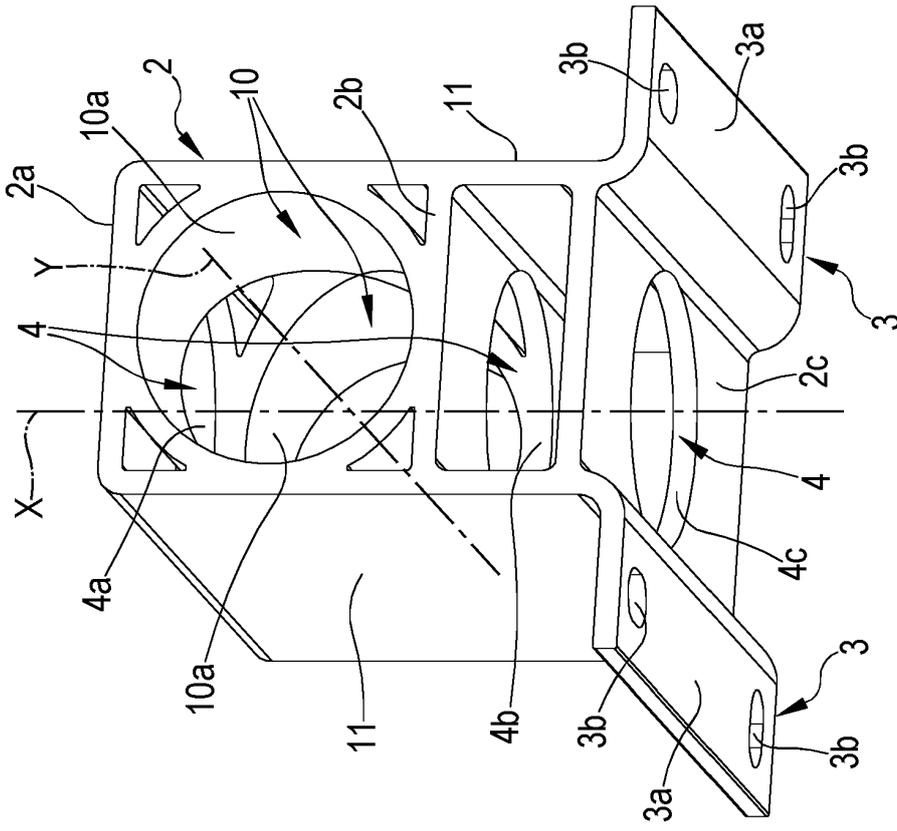


FIG. 4

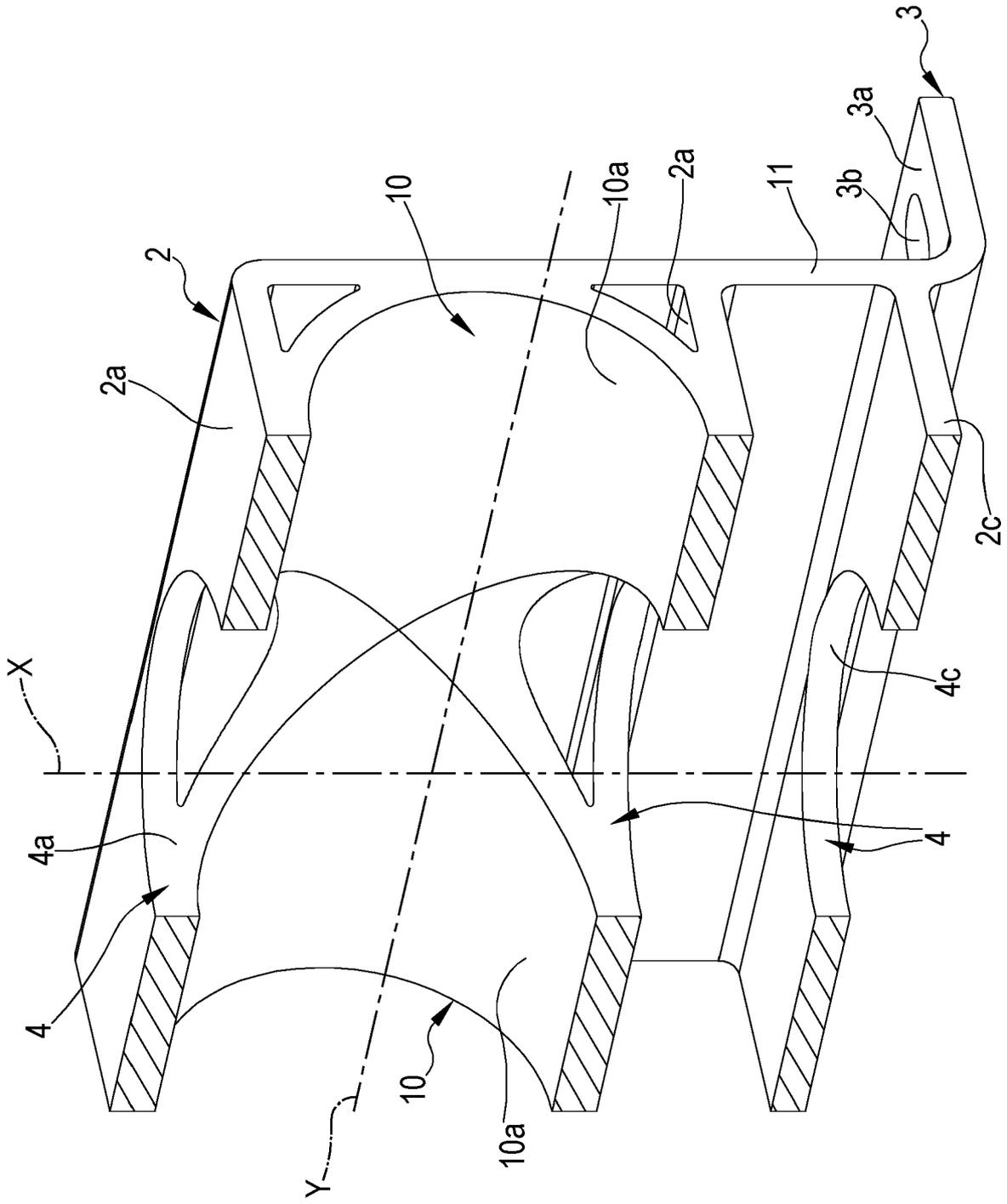


FIG.5

FIG.6

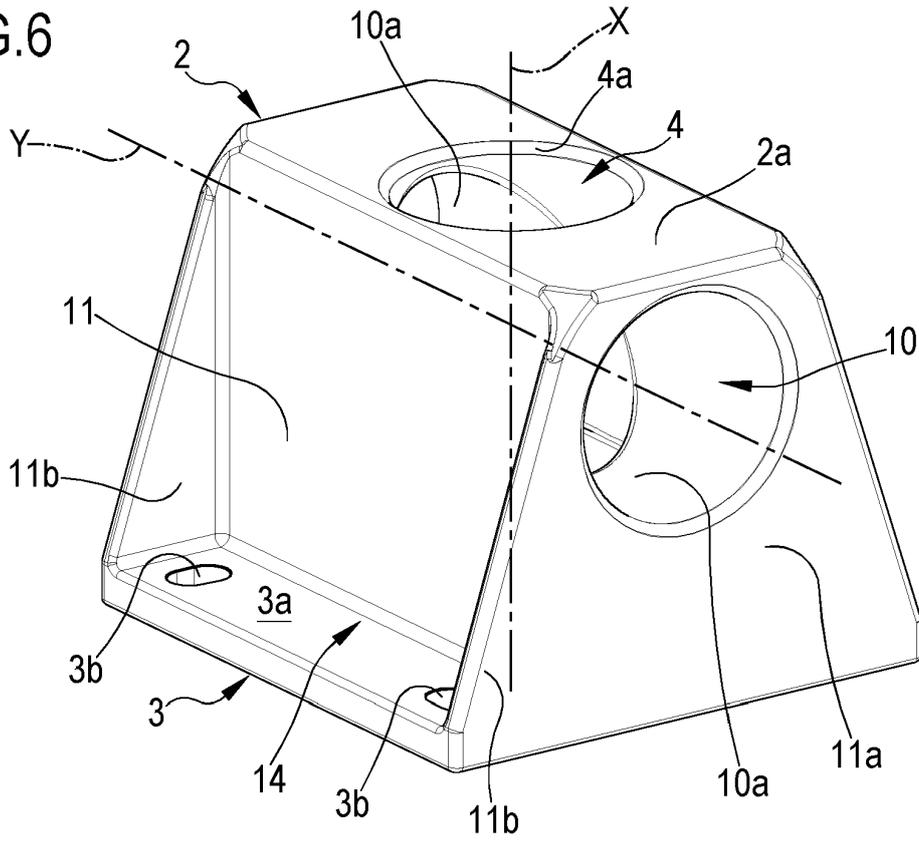
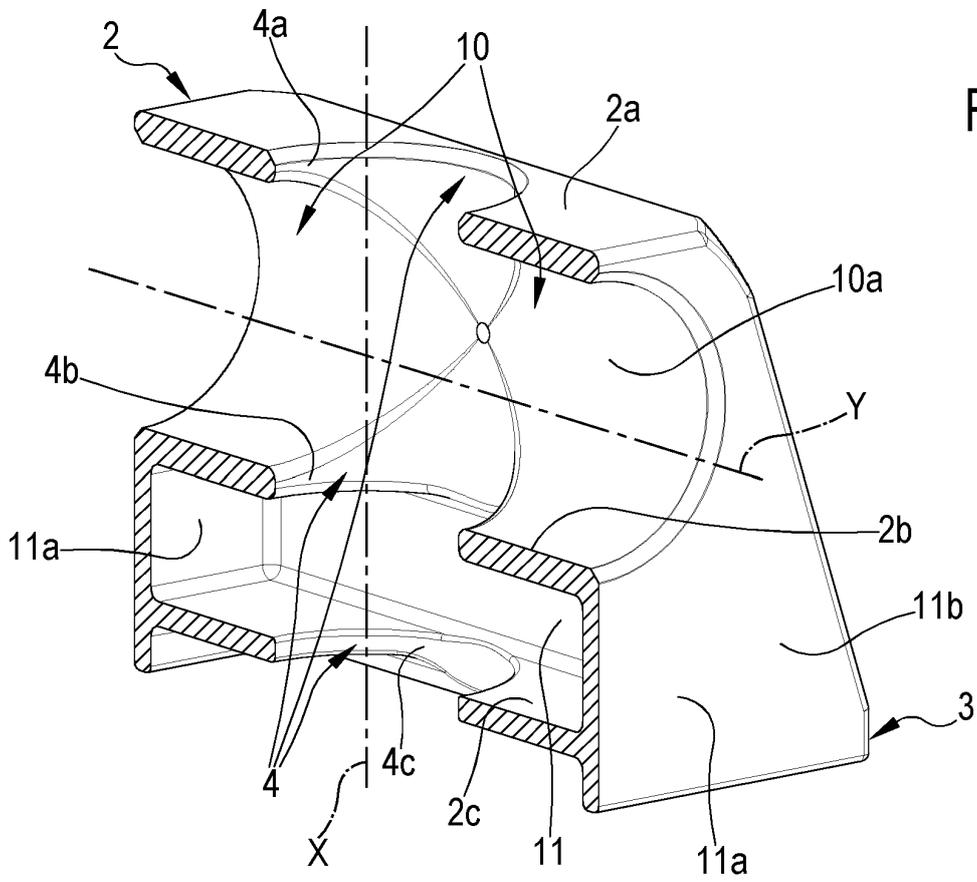


FIG.7



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- FR 1557966 [0013] [0014]
- US 5445487 A [0018]
- US 2021053801 A [0022] [0023]
- EP 3730447 A [0022] [0024]
- DE 10319856 [0022] [0025]