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(72) Inventor: **de Bondt, Renzo**
2820 Rijmenam (BE)

(74) Representative: **Patentanwälte Bauer Vorberg**
Kayser
Partnerschaft mbB
Goltsteinstraße 87
50968 Köln (DE)

(71) Applicant: **Econac bvba**
2800 Mechelen (BE)

(54) **RECESS DEVICE FOR PROVIDING A RECESS FOR A HOOK IN A CAST CONSTRUCTION ELEMENT**

(57) The present invention refers to a recess device (20) for providing a recess in a cast construction element (1) for allowing a lifting tool, more particularly a hook, to be attached through the recess to an attachment end of an attachment device, more particularly to a loop (5) of a transport anchor (3), wherein the recess device (6) comprises an upper plate part (30) and a recess forming

body (50), wherein the recess forming body (50) comprises a first part (60) and a second part (70), wherein, in an assembled state, the recess forming body (50) and the upper plate part (30) are arranged in such interacting manner that a free space (21, 64, 74) is formed inside of the recess device (20).

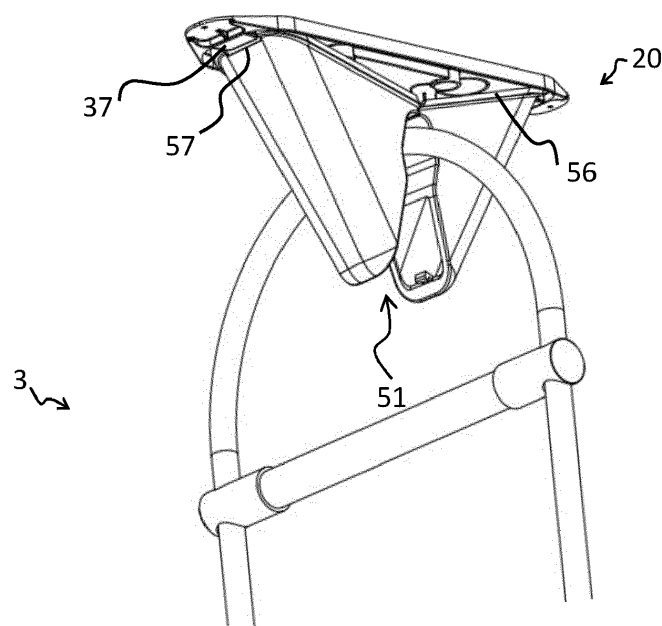


Fig. 4

Description

[0001] The present invention refers to a recess device for providing a recess in a cast construction element for allowing a lifting tool to be attached through the recess to an attachment end of an attachment device. Further, the invention refers to a method for assembling a recess device for providing a recess in a cast construction element for allowing a lifting tool to be attached through the recess to an attachment end of an attachment device. Further, the invention refers to a method for providing a recess in a cast construction element for allowing a lifting tool to be attached through the recess to an attachment end of an attachment device.

[0002] Several recess devices are known in the prior art in order to provide a recess or a void within the cast construction element. Such cast construction elements for example can be wall elements such as a full concrete wall or also sandwich wall elements. Sandwich wall elements usually comprise an outer layer made of concrete and an inner layer made of concrete, as well as a middle layer between the outer layer and the inner layer, which middle layer for example is made of an insulation material. Usually, the outer layer made of concrete is thicker than the inner layer made of concrete. A different type of a cast construction element can be a balcony.

[0003] All the cast construction elements according to the present application are manufactured by a casting process, i.e. by casting concrete or another castable construction material into a mould for forming the cast construction element. The mould, into which concrete is poured during the manufacturing process, defines the outer shape of the cast construction element. The mould can for example comprise a bottom element and four side walls essentially perpendicular to each other in order to create an essentially box-shaped, i.e. essentially cuboid, body as cast construction element. The bottom element and/or the four side walls can be referred to as the formwork or formwork walls. The formwork can be made of wood for example. The formwork also can be made of other materials, such as metal. The formwork in general should be separated from the cast construction element after the casting process. The formwork might be re-used (for example entirely or in parts). It is also possible that the formwork creates a mould and, accordingly, a later body of the cast construction element which body is not essentially cuboid. For example, one or several side walls could not be perpendicular to each other or could not have a plane surface. However, at least a part of a formwork wall provides an inner surface which inner surface is essentially plane.

[0004] The mould limits a casting volume for the cast construction element. Usually, the bottom element defines a first side surface of the cast construction element, whereas for example the four essentially perpendicular formwork side walls of the mould define the four smaller side walls of the cast construction elements. The other, second side surface opposite to said first side surface of the cast construction element can be in contact with air during the casting process and, accordingly, is the side pointing upwards during the casting process.

[0005] For handling said cast construction elements, which have a high weight after the manufacturing process and especially later on the construction site, it is commonly known to integrate an attachment device into the cast construction element. The attachment device usually is a lifting loop element and provides as an attachment end a loop or such, to which loop or such a hook or another suitably lifting tool can be connected for lifting the cast construction element by pulling on the loop. An example for said attachment device can be a transport anchor, which transport anchor comprises a wire (usually a steel cable), which wire defines a loop as an attachment end of the attachment device. The transport anchor might additionally comprise a pressure element, wherein the wire is connected to opposite ends of said pressure element in such way that the wire forms the loop on one side of the pressure element whereas, on the other opposite side of the pressure element, the loose ends of the wire extend downwards (and in the casted state into the body of the cast construction element).

[0006] According to the prior art, the attachment end, i.e. for example the loop for connecting a hook or such, can entirely protrude from the body of the cast construction element, which body is defined by the mould and which body is cast in the manufacturing process. Accordingly, the main part of the attachment end is cast within the casting volume of the cast construction element defined by the mould whereas the hook of the attachment element is arranged outside of the casting volume (outside of the mould). However, usually the formwork walls, therefore, must be provided with through holes, through which parts of the attachment device such as the steel cable extend for providing the loop outside of the formwork walls. Additionally, the formwork walls usually must be destroyed at least partially after the casting process for detaching the formwork walls from the cast construction element and especially for exposing or uncovering the wire in the region of the loop. A reuse of the formwork is impossible or at least less efficient in these cases.

[0007] Nevertheless, according to the prior art to which the present application refers, recess devices can be used to provide a recess within the casting volume defined by the mould. Hence, also the attachment device can be placed entirely inside of the casting volume and do not have to partially extend through the formwork walls anymore. Accordingly, said recess device occupies a small volume of the mould during the casting process as well as the recess device somehow is placed in interaction with or in proximity to the attachment end or loop of the attachment device. During the casting process, concrete is poured over and around the recess device and after the hardening of the cast construction element, the area of the recess device defines an area free of concrete in which the hook or such can interact with the loop or attachment end. Usually, the recess device entirely is removed from the cast construction element after the

casting process in order to uncover the recess or make the recess accessible (for the hook or such) which recess has been provided by the recess device. Removing the recess device entirely can be a quite extensive step which is time consuming.

[0008] Alternatively, the recess device does not have to be removed entirely, but only in parts, in a manner sufficiently to make the recess and, therefore, the attachment end or loop accessible for the hook or such.

[0009] An example for such a recess device according to the prior art is shown in Figures 1A and 1B of the patent application in combination with further construction elements in order to illustrate the procedure according to the prior art. In Figure 1A, with the help of dashed lines 2, the cast construction element 1 in terms of a full concrete block wall element is indicated. The wall element is essentially cuboid and is depicted only in parts in Figure 1A. The mould, and more particularly the two essentially perpendicular formwork walls, are not shown in Figure 1A for the sake of simplicity. Rather, the resulting cast construction element 1 with its two perpendicular short lateral walls 1a and 1b is only indicated and Figure 1A represents a situation in advance to the casting process.

[0010] A transport anchor 3 mainly extends through the cast construction element 1 in order to be able to handle the heavy weight cast construction element 1 later, such as for lifting the element with the help of a hook. The transport anchor 3 accordingly is placed within the casting volume and the transport anchor 3 comprises two legs 4 made of wire in terms of a steel cable. The steel cable is a long continuous cable that forms a loop 5 as an attachment end at the upper end of the transport anchor 3. Whereas the legs 4 mainly extend through the concrete of the later cast construction element 1, the loop 5 or at least the upper part of the loop 5 needs to be mainly free of concrete in order to be able to attach the hook or such to the loop 5 also after the finished casting process.

[0011] For this purpose, a recess device 6 is used during the casting process in order to provide a recess after the casting process for being able to connect the hook or such to said attachment end in terms of the loop 5. The recess device 6 according to the prior art, on which the present invention is based, comprises several parts. The recess device 6 according to the prior art is also shown in Figure 1B only in interaction with the transport anchor 3, to which Figure 1B can be referred at the same time.

[0012] On its upper side, the recess device 6 comprises an upper plate part 7, whereas, extending from the upper plate part 7 to its lower side, the recess device 6 further comprises a recess forming body 8. The recess forming body 8 comprises a first part 9 and a second part 10. Accordingly, two opposite parts in terms of the first part 9 and the second part 10 are separate from each other in a disassembled state, as depicted in Figure 1B. When moving the first part 9 and the second part 10 towards each other and together, as indicated with the help of the two opposing dashed line arrows 9a and 10a in Figure 1B, they can then form the recess forming body 8 in an assembled state. This assembled state of the first part 9 and second part 10 is depicted in Figure 1A, wherein, with the help of the dotted lines A, the two parts of the recess forming body 8 are indicated.

[0013] The recess forming body 8 is a hollow structure with a free space 11 in its inside. The free space 11 in the inside of the recess forming body 8, thus in the inside of the recess device 6, is defined and mainly limited by inner surfaces 12 of side walls 13 and lower walls 14 of the recess forming body 8. Outer surfaces 15, opposite to the inner surfaces 12, of the recess forming body 8 later are in contact with the concrete during the casting process, whereas the inner surfaces 12 and the free space 11 should maintain mainly free of concrete.

[0014] On the upper side of the recess forming body 8, the hollow structure and thus the free space 11, in general, is open. A hook-insertion opening 16 into the recess forming body 8 is provided. Said hook-insertion opening 16 - and, therefore, the free space 11 - is closed in the assembled state of the recess device 6 with the help of the upper plate part 7, which upper plate part 7 is put on the recess forming body 8, as indicated by the dotted line 7a. The upper plate part 7 is put on the recess forming body 8, after the first part 9 and the second part 10 have been assembled together.

[0015] The loop 5 as attachment end is arranged in the assembled state inside the recess forming body 8, that is in the free space 11. As indicated by the dotted lines 17a in Figure 1B, the legs 4 of the transport anchor 3 are received within break-through openings 17 in the lower walls 14 of the two parts (9, 10) of the recess forming body 8 (only half of the two break-through openings 17 can be seen in the first part 9 of the recess forming body 8 in Figure 1B). Hence, a connection between the free space 11 to the outer surroundings S of the recess device 6 is provided since the break-through openings 17 form a direct unobstructed connection between the inner space 11 and the area outside of the outer surfaces 15 of the recess forming body 8.

[0016] In the assembled state, opposing edges 18 and 19 of the two parts of the recess forming body 8 need to fit well together in order to form the free space 11 adequately, which free space 11 should be closed and sealed against the surroundings S, thus avoiding that concrete can enter the inner space 11 during the casting process. Also, the break-through openings 17 can be the origin of the problem that concrete might enter the inner space 11 during the casting process. Usually, the break-through openings 17 need to tightly fit to the legs 4 of the transport anchor 3 with respect to the dimensions of the break-through openings 17 and the legs 4.

[0017] Moreover, the placement of the break-through openings 17 define already the extension of the legs 4 of the transport anchor 3 throughout the casting volume and, thus, the cast construction element 1. In case different pathways or extensions, such as an extension of the legs 4 under a certain different angle, is desired, the break-through openings

17 need to be arranged at a distinctive distance to each other. Accordingly, several different designs of recess devices 6 need to be provided in order to provide different extending transport anchors 3 in different (or even the same) transport anchor(s) 3.

5 **[0018]** Furthermore, the side walls 13 need to be quite resistant since the concrete poured and flowing over the side walls 13 exerts pressure on said side walls 13 and especially since the space between the edges 18 respectively 19 is free due to the free space 11 inside of the recess device 6.

10 **[0019]** Furthermore, the assembling steps according to the described recess device 6 according to the prior art is quite extensive. First, the two opposing parts (9 and 10) of the recess forming body need to be aligned adequately and put together in such manner that the edges 18 and 19 are fit together tightly. At the same time, the transport anchor 3 needs to be placed and hold sufficiently stably in its designated position. Then, the upper plate part 7 needs to be put from above in order to close the inner space 11. Finally, the recess device 6 including the transport anchor 3 need to be connected to a formwork wall.

15 **[0020]** In view of the prior art described above, an objective of the present invention can be seen as to provide a recess device which facilitates the handling of said recess device for preparing the casting process and/or after the casting process, and more particularly with respect to avoiding the danger of entrance of concrete into the recess device. Furthermore, an objective of the present invention can be seen as to provide a method for assembling a recess device which method is more fail-safe in terms of handling and assembling, but also in terms of avoiding the entrance of concrete into the recess device. A further objective of the present invention can be seen as to provide a method for providing a recess in a cast construction element which method is simple to perform and also more fail-safe in terms of avoiding the entrance of concrete into the recess device.

20 **[0021]** The invention is defined in particular by the independent claims. Additional features and advantages of the concepts disclosed herein are set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the described technologies. The features and advantages of the concepts may be realized and obtained by means of the instruments and combinations particularly pointed out in the claims. These and other features of the described technologies will become more fully apparent from the following description and claims, or may be learned by the practice of the disclosed concepts as set forth herein.

25 **[0022]** According to an independent aspect of the invention, the objective with respect to the recess device is solved by a recess device for providing a recess in a cast construction element for allowing a lifting tool, more particularly a hook, to be attached through the recess to an attachment end of an attachment device (according to independent claim 1). The attachment end might be a loop of for example an attachment device in terms of a transport anchor. The recess device comprises an upper plate part and a recess forming body. The recess forming body comprises a first part and a second part. In an assembled state, the recess forming body and the upper plate part are arranged in such interacting manner that a free space is formed inside of the recess device. The recess device according to the invention is characterised in that the recess forming body is configured to be moveable in such manner between a disassembled state and the assembled state that:

- the free space is essentially closed against the outside space when the recess forming body is moved towards the upper plate part to an end position in the assembled state along an assembling direction, and
- an attachment end receiving channel is formed when the recess forming body is moved towards the upper plate part to the end position in the assembled state along the assembling direction.

35 **[0023]** According to an independent aspect of the invention, the objective with respect to the method for assembling a recess device is solved by a method for assembling a recess device (according to independent claim 14). The recess device is configured for providing a recess in a cast construction element for allowing a lifting tool, more particularly a hook, to be attached through the recess to an attachment end of an attachment device. The attachment end might be a loop of for example an attachment device in terms of a transport anchor. According to the invention, an upper plate part and a recess forming body are provided, wherein the recess forming body comprises a first part and a second part, wherein the recess forming body and the upper plate part are arranged in such interacting manner that a free space is formed inside of the recess device. The method is characterised by the steps of:

- closing the free space essentially against the outside space by moving the recess forming body towards the upper plate part along an assembling direction to an end position, and
- forming an attachment end receiving channel by moving the recess forming body towards the upper plate part along the assembling direction to the end position.

50 **[0024]** The method, more particularly, is a method for assembling the recess device according to the present invention, as described before (and/or as described within the claims and or the description, respectively).

55 **[0025]** According to an independent aspect of the invention, the objective with respect to the method for providing a

recess is solved by a method for providing a recess in a cast construction element (according to independent claim 15). The recess in the cast construction element is for allowing a lifting tool, more particularly a hook, to be attached through the recess to an attachment end of an attachment device. The attachment end might be a loop of for example an attachment device in terms of a transport anchor. According to the invention, the following steps are carried out:

- a mould is provided, wherein the mould comprises at least one formwork side wall that defines a side wall of the cast construction element, and wherein the mould limits a casting volume of the cast construction element,
- the attachment device, more particularly the transport anchor, is provided and placed within the casting volume,
- a recess device is provided, wherein the recess device comprises an upper plate part and a recess forming body,
- concrete is cast, within a casting step, into the mould and at least partly around the recess device, wherein the recess device prevents concrete from filling the casting volume entirely during the casting step.

[0026] The method for providing a recess in a cast construction element characterised in that the upper plate part is connected to the formwork side wall with an outer side of the upper plate part, and in that the recess device is formed by assembling the upper plate part and the recess forming body by moving the recess forming body towards the upper plate part along an assembling direction to an end position, wherein an attachment end receiving channel is formed and the attachment end, more particularly the loop, is received at least partly within the attachment end receiving channel.

[0027] Hereinafter, features and resulting advantages, which are described with respect to one type of subject-matter, such as with respect to the recess device, or with respect to the method for assembling a recess device, or with respect to the method for providing a recess in a cast construction element, or with respect to another independent aspect of the invention, can be transferred to the other type(s) of subject-matter. A person skilled in the art is able to derive not explicitly mentioned combinations of features for example of a claimed method, even if the respective features have been only described with respect to the recess device. Single features might be transferred to another claim even if described only in a combination with other features. Accordingly, the invention hereinafter mainly is described with respect to the subject-matter in terms of a recess device, for the sake of simplicity.

[0028] A central aspect of the invention is that no complicated several assembling steps are needed anymore in order to assemble and provide the recess device. No complicated aligning of several parts of a recess forming body is necessary anymore. Rather, the simple movement of the recess forming body towards the upper plate (or vice versa) part leads to the assembly of the recess device. At the same time during said simple movement, the attachment end receiving channel is formed. Accordingly, the attachment end such as a steel cable part of the loop can be received within said channel. Hence, the steps of assembling the recess device and bringing the recess device into the intended interaction with the attachment device can be performed advantageously at the same time. More particularly, the step of moving the attachment device towards the recess forming body can lead to the forming of the attachment end receiving channel and to connecting the recess forming body with the upper plate part within the same kind of movement along the assembling direction.

[0029] In general, the first part and the second part of the recess forming body can be separated parts. However, it is preferred that the first part and the second part of the recess forming body form a one-piece part wherein the first part and the second part of the recess forming body are moveable against each other. More particularly, the first part and the second part of the recess forming body can comprise a common axis, and more particularly can be pivoted against each other about said common axis.

[0030] It is preferred that the upper plate part and the recess forming body are several parts which can be assembled and disassembled entirely from each other. However, it is also possible, that the upper plate part could at least be connected to the recess forming body at one side when a relative movement of the recess forming body to the upper plate part still is guaranteed.

[0031] Whereas, in general, it is preferred that the assembling direction is essentially straight and is essentially perpendicular to the upper plate part, it is also possible that the assembling direction provides a curved path for the movement of the recess forming body in relation to the upper plate part. For example, the recess forming body could first be connected at one side to the upper plate part (or could comprise a single-piece connection at this one side to the upper plate part) and the recess forming body, then, could be swivelled towards upper plate part, fulfilling an assembling movement along a curved path.

[0032] In general, the free space inside of the recess device is formed for being able to insert a hook or such lifting tool into said free space later on. Preferably, the recess forming body maintains within the cast construction element after the casting process, whereas the upper plate part is removed. The hook can then enter through a hook-insertion opening formed at the upper end of the recess forming body and forming the entrance to the free space inside. Nevertheless, the free space inside of the recess device could also be closed by additional inserts, for example by any kind of filling material such as a foam. Said filling material is loosely put into the free space inside and can easily be removed after the casting process. Afterwards, the recess is provided by pulling the filling material out of the free space again, thereby, providing a free entrance into the free space from the upper side through the hook-insertion opening again.

[0033] In general, the free space is separated from an outside space, in the assembled state, thereby avoiding the entrance of concrete during the casting process. In this regard, an essentially closed free space refers to the fact that small openings, such as small gaps or slits, could still be present. However, such small opening does not allow the entrance of poured concrete, at least in a harmful manner which would lead to the free space inside the recess not providing sufficient space for an insertion of a hook or such later on.

[0034] The separation of the free space and the outside space can be guaranteed by the upper plate part and by walls of the recess forming body. The walls of the recess forming body can provide inner surfaces facing towards the free space inside and, oppositely, outer surfaces facing towards the outside space. The walls do not have to be several walls but can also be a continuous wall element.

[0035] Preferably, the attachment end receiving channel is formed in the outside space. The attachment end receiving channel, in particular, can be formed by outer surfaces of the recess forming body, in particular, by outer surfaces of the first part and by outer surfaces of the second part. The attachment end receiving channel does not have to provide an entirely closed channel structure in the assembled state. Even if a small slit or gap still is present, when the attachment end receiving channel is formed in the assembled state, it might be sufficient for preventing the entrance of concrete or at least a harmful amount of entrance. Due to the fact that, after removing of the upper plate part of the recess device, the area of the attachment end receiving channel is the area of the part of the attachment end (such as the part of the steel cable of the transport anchor) to which the hook or such needs to be connected, a passage of the hook or such in the area below the attachment end receiving channel needs to be possible. Hence, even if a small amount of concrete has entered said area below the attachment end receiving channel due to a non-perfect closing of said channel, such small amounts of concrete can be removed easily, for example even by passing the hook or such through the respective formed thin barrier of concrete. Preferably, the recess forming body, in the assembled state, forms an essentially V-shaped body. More particularly, the lower end of the recess forming body forms an angle of essentially 90°. Accordingly, in case the recess device is to be used in a sandwich wall element and needs to at least partly occupy an area of the middle layer of the sandwich wall element (e.g. insulation material), then the middle layer usually needs to be cut, e.g. sawed, for providing space for the recess device. After then putting the recess device in said cut space, a second or final layer of concrete is poured. In case of an essentially V-shaped recess forming body, the cutting or sawing step of cutting the insulation material is facilitated in comparison to other rather spherical recess forming bodies of other recess devices.

[0036] According to a further embodiment of a recess device (as described in claim 2), in the disassembled state, the recess forming body provides an attachment end receiving opening for receiving an attachment end from a lower end of the recess forming body. Hence, the attachment device can be easily inserted from below the recess device through the attachment end receiving opening. The assembly of the recess device and at the same time the interaction with the attachment device such as the anchor can be facilitated.

[0037] According to a further embodiment of a recess device (as described in claim 3), in the assembled state, the attachment end receiving opening is closed in such manner that the attachment end receiving channel is formed. Hence, forming of the channel can be simplified and automatically combined with the movement of the interaction of the attachment device (e.g. transport anchor) with the recess forming body. The assembly of the recess device and at the same time the interaction with the attachment device such as the anchor can be facilitated.

[0038] According to a further embodiment of a recess device (as described in claim 4), in the disassembled state, lower ends of the first part and the second part of the recess forming body are arranged at a distance from each other, and wherein, in the assembled state, the lower ends essentially abut each other. Hence, the assembly of the recess device and at the same time the interaction with the attachment device such as the anchor can be facilitated.

[0039] According to a further embodiment of a recess device (as described in claim 5), the recess forming body has a swivel axis, wherein at least the first part, and more particularly also the second part, can be swivelled around the swivel axis (P) between the disassembled state and the assembled state. Hence, a simple change from the disassembled state to the assembled state is provided.

[0040] According to a further embodiment of a recess device (as described in claim 6), in a state of operation, two lifting tool passage openings are formed in the recess forming body below the attachment end receiving channel and are essentially aligned in such manner that the lifting tool passage openings form a connection inside the free space between the first part and the second part of the recess forming body for providing a passage for a lifting tool inside the free space below the attachment end receiving channel. A state of operation refers to a later state even after the assembled state when the cast construction element has been formed, e.g. after hardening of the cast concrete. Usually, the upper plate part then is removed from the recess forming body in the state of operation. Then, the hook or such is to be inserted into the free space and needs to be able to pass from the first part to the second part of the recess forming body. Accordingly, the two lifting tool passage openings enable passage of the hook. Hence, a simple-to-handle recess device is provided since after a simple removal of the upper plate part the use of the hook for lifting the cast construction element can be possible. The two lifting tool passage openings might be opening in the walls of the recess forming body.

[0041] Additionally, according to an embodiment of a recess device (as described in claim 7), in the assembled state,

at least one of the two lifting tool passage openings, and more particularly both two lifting tool passage openings, are essentially closed with a releasable closure, more particularly with a cover with, preferably perforated, weakening lines for pushing out. Hence, a more fail-safe recess device can be provided since the danger of entrance of concrete through said lifting tool passage openings is reduced. The provision of the recess and the possibility to insert a hook into the recess, i.e. into the free space of the recess forming body, is facilitated. More particularly, also in the disassembled state, one of or both two lifting tool passage openings are essentially closed with said releasable closure. Essentially closed refers to a state where at least a harmful entrance of concrete during the casting process is avoided.

[0042] According to a further embodiment of a recess device (as described in claim 8), the recess forming body comprises corresponding connection elements in a region of lower ends, respectively of the lower ends, of the first part and the second part of the recess forming body for holding the first part and the second part in the region of the lower ends together in the assembled state, and wherein, more particularly, the corresponding connection elements form a form-fit connection, preferably a snap-fit connection. Hence, a more fail-safe recess device can be provided since the danger of entrance of concrete in the area between the first part and the second part of the recess forming body and, therefore, below the attachment end receiving channel can be reduced. A stable connection of the two parts of the recess forming body can be achieved.

[0043] According to a further embodiment of a recess device (as described in claim 9), the recess forming body comprises at its upper end a, at least partially, circumferential edge for forming an essentially sealed connection between the upper plate part and the recess forming body in the assembled state, and more particularly for guiding the recess forming body when moving from the disassembled state to the assembled state along an inner side of the upper plate part. Hence, a more fail-safe recess device can be provided since the danger of entrance of concrete in the area between the recess forming body and the upper plate part can be reduced. Also, the assembly of the parts can be simplified and be more fail-safe since no complex aligning of the parts has to be performed. The circumferential edge can be formed as a folded rim.

[0044] According to a further embodiment of a recess device (as described in claim 10), the recess forming body comprises at its upper end at least one insertion opening, and more particularly two insertion openings at opposite ends, for providing a coupling of at least one connecting element of the upper plate part, and more particularly, for forming an essentially sealed, and preferably form-fit, connection between the upper plate part and the recess forming body in the assembled state. Accordingly, the process of assembly of the recess forming body and the upper plate part can be facilitated and be more fail-safe. Complex aligning movements of the parts can be reduced. Also, an essentially tight connection can be provided. An unintended disassembly of the parts can be avoided. More particularly, the recess forming body cannot easily fall away from the upper plate part against the assembling direction. The insertion openings can be provided in the side walls of the recess forming body at its upper end, and more particularly can be provided in terms of slits.

[0045] According to a further embodiment of a recess device (as described in claim 11), the upper plate part comprises at its inner side at least one connecting element, in particular at least one coupling protrusion, at a side end, and more particularly two connecting elements, in particular two coupling protrusions, at the side end and an opposite side end, for coupling with the recess forming body, and more particularly, for forming an essentially sealed, and preferably form-fit, connection between the upper plate part and the recess forming body in the assembled state. Accordingly, the process of assembly of the recess forming body and the upper plate part can be facilitated and be more fail-safe. Complex aligning movements of the parts can be reduced. Also, an essentially tight connection can be provided. An unintended disassembly of the parts can be avoided. More particularly, the recess forming body cannot easily fall away from the upper plate part against the assembling direction. The connecting elements or coupling protrusions can interact with and especially extend into the insertion openings in the recess forming body. The coupling protrusions can be formed as flaps.

[0046] According to a further embodiment of a recess device (as described in claim 12), the upper plate part comprises a receiving tray area for receiving a holding plate from an outer side of the upper plate part. Such a holding plate, which can be made of metal for example, usually is used for connecting the recess device to the inner side of the formwork wall. Therefore, a connection with the help of nails as connecting elements can be made, but also a magnetic connection between the metal plate and magnets is possible. The receiving tray area serves as a negative cavity for receiving the holding plate.

[0047] More particularly, the receiving tray area extends seen from a direction from the outer side of the upper plate part towards an inner side of the upper plate part for receiving the holding plate in a flush manner, without the holding plate extending further outwards than the outer side of the upper plate part.

[0048] More particularly, the upper plate part comprises at least one, in particular two, clamping receiver(s) for receiving and, preferably, clamping at least one, in particular two, protruding cylinder(s) of the holding plate for guiding the holding plate and for connecting the holding plate with the upper plate part.

[0049] A simple assembly of the entire recess device in terms of the intended connection to the formwork wall is possible, as well as a more fail-safe procedure in terms of limiting the danger of concrete entering the recess device is

possible.

[0050] According to a further embodiment of a recess device (as described in claim 13), the upper late part comprises at least one, in particular two, flap(s) for providing an access with a finger from an outer side to an inner side of the upper plate part, preferably by bending the flap(s) around its living hinge along a curved bending direction. Hence, an easy access into the free space of the recess device even in an assembled state can be provided. This, for example is useful for removing the upper plate part after the casting process by going with the fingers through the flaps below the upper plate part and removing it from the remaining recess forming body.

[0051] More particularly, the upper late part comprises at its inner side a, at least partially, circumferential upright wall for forming an essentially sealed connection between the upper plate part and the recess forming body in the assembled state, and more particularly for guiding the recess forming body when moving from the disassembled state to the assembled state along the inner side of the upper plate part. In particular, the upright wall can interact with a/the, at least partially, circumferential edge at the upper end of the recess forming body in the assembled state and even when moving the parts from the disassembled state into the assembled state.

[0052] According to another independent inventive concept, a single upper plate part is suggested. Said upper plate part, according to the invention, is configured for closing the free space inside of the recess forming body, as described before and hereinafter. Said upper plate part, according to the invention, is configured for forming a recess device together with the recess forming body, as described before and hereinafter. The features described before and hereinafter referring to the upper plate part, when describing the entire recess device, can be transferred to the single upper plate part according to the invention. Patent protection can be sought for an upper plate part as a single subject-matter as well.

[0053] According to another independent inventive concept, a single recess forming body is suggested. Said recess forming body, according to the invention, is configured for providing a free space inside of a recess device, as described before and hereinafter. Said recess forming body, according to the invention, is configured for forming a recess device together with the upper plate part, as described before and hereinafter. The features described before and hereinafter referring to the recess forming body, when describing the entire recess device, can be transferred to the single recess forming body according to the invention. Patent protection can be sought for a recess forming body as a single subject-matter as well.

[0054] According to another independent inventive concept, an assembly group comprising at least an upper plate part and a recess forming body is suggested. The features described before and hereinafter referring to the upper plate part and the recess forming body, when describing the entire recess device, can be transferred to the assembly according to the invention. The assembly can also comprise a holding plate, and/or an attachment device, such as a transport anchor, as described before and hereinafter. Patent protection can be sought for an assembly as a single subject-matter as well.

[0055] Further benefits and advantages of the present invention will become apparent after a careful reading of the detailed description with appropriate reference to the accompanying drawings. Understanding that these drawings depict only exemplary embodiments of the invention and are not therefore to be considered to be limiting in scope, the examples will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

Fig. 1A shows a recess device according to the prior art in interaction with a mould and a transport anchor;

Fig. 1B shows the recess device according to the prior art as in Fig. 1A, in a disassembled state, in interaction with the transport anchor;

Fig. 2 shows an embodiment of a recess device in a disassembled state in interaction with a transport anchor;

Fig. 3 shows the detail III of Fig. 2 in an enlarged view;

Fig. 4 shows the recess device according to Fig. 2 in an intermediate state (between the disassembled state and an assembled state) in interaction with the transport anchor;

Fig. 5 shows the recess device according to Fig. 2 in an assembled state in interaction with the transport anchor;

Fig. 6 shows an embodiment of a recess forming body from a perspective showing the inside of the recess forming body;

Fig. 7 shows the recess forming body according to Fig. 6 in another perspective side view;

Fig. 8 shows the recess forming body according to Fig. 6 in a same view, but in a different state; and

Fig. 9 shows an embodiment of an upper plate part with further mounting elements.

[0056] Figures 1A and 1B depict the prior art, the present invention is based on, which prior art has been described in the introduction. Various embodiments of the suggested recess device and methods are discussed in detail below. While specific implementations are discussed, it should be understood that this is done for illustration purposes only. A person skilled in the relevant art will recognize that other components, configurations, and steps may be used without parting from the spirit and scope of the disclosure. Same reference signs are used to describe same technical features. For the sake of simplicity, in some of the Figures not all of the features are marked with a reference sign, whereas, however, the respective feature might be marked in another Figure.

[0057] Figure 2 shows a perspective side view of a suggested recess device 20. The recess device 20 is a two-part recess device 20 comprising a recess forming body comprising a recess forming body 50 and an upper plate part 30. The recess forming body 50 by two parts, that is the first part 60 and the second part 70. The first part 60 and the second part 70 are connected and form a single piece. However, the upper plate part 30 and the recess forming body 50 are separate from each other.

[0058] Nevertheless, the two parts 60, 70 are movable against each other. The first part 60 and the second part 70 can be swivelled about a common axis, in terms of the swivel axis P. In Figure 2, the recess device 20, and in particular the recess forming body 50, are depicted in the disassembled state. From this disassembled state, the components can be moved into an assembled state, as depicted in Figure 5. An intermediate state between the disassembled state and the assembled state is depicted in Figure 4.

[0059] In Figures 2, 4, 5, furthermore, an attachment device in terms of a transport anchor 3 is shown. The transport anchor 3 is made of wire in terms of a steel cable and a pressure element 3a. The steel cable provides 2 legs 4, as well as at the upper end of the transport anchor 3 and attachment end in terms of the loop 5. The transport anchor 3 is to be casted in the concrete of the cast construction element 1 (as indicated within the Figures 1A and 1B) during the casting process. The loop 5, or at least an upper part of it, needs to be free of concrete. After the casting process, in order to be able to connect the hook or such lifting tool to the loop and, accordingly, to the steel cable so that the cast construction element 1 can be lifted. Therefore, the transport anchor 3 interacts with the recess device 20 during the casting process in such manner that the recess forming body 50 ensures that the hook or such has sufficient space to be positioned around the upper part of the loop 5.

[0060] The recess forming body 50, therefore, provides a free space 21 inside of the recess device 20. The free space 21 is formed by a free space 64 inside the first part 60 and by a free space 74 inside the second part 74. Said free space 21, 64, 74 maintains mainly concrete free during the casting process so that, after the hardening of the cast construction element 1, the hook or such can be passed through the free space 21, 64, 74. In the assembled state, the free space 21 of the recess device 20 is closed at an upper end 55 of the recess forming body 50 by the upper plate part 30.

[0061] When the hook or such is to be connected to the transport anchor 3, that is in a state of operation, the upper plate part 30 is removed from the recess forming body 50, which recess forming body 50 stays within the cast construction element 1. The hook or such then passed through a hook-insertion opening 58 for being connected to the upper part of the transport anchor 3.

[0062] The free space 21, 64, 74 is separated from an outside space O outside of the recess device 20 by walls 52 of the recess forming body 50 and at the upper end 55 by the upper plate part 30. The walls 52 have inner surfaces 63, 73 facing towards the free space 21, 64, 74 inside of the recess forming body 50. Furthermore, the walls 52, have outer surfaces 61, 71 facing towards the outside space O.

[0063] As shown in Figure 2, the transport anchor 3 is moved along an assembling direction Z and brought into action with the recess forming body 50 in the area of a lower end 54 by moving into and passing the attachment end receiving opening 51 of the recess forming body 50. Two opposing ends in terms of the lower ends 62, 72 of the first part 60, respectively the second part 70, of the recess forming body 50 are arranged at a distance from each other in the disassembled state (Figure 2). In the assembled state, as depicted in Figure 5, the lower ends 62, 72 essentially abut each other with respective abutting surfaces (cf. Figure 2 or 3). The before existing attachment end receiving opening 51, then, is closed. A received upper part of the loop 5 of the transport anchor 3, then, in the assembled state, extends through attachment end receiving channel 53.

[0064] The attachment end receiving channel 53 is formed in the assembled state when the recess forming body 50 has been moved towards the upper plate 32 to an end position along the assembling direction Z. At the same time, the free space 21, 64, 74 is essentially closed against the outside space since, in the end position along the assembling direction Z, the upper plate part 30 covers the hook-insertion opening 58 and the free space 21, 64, 74 at the upper end 55 of the recess forming body 50.

[0065] When changing from the disassembled state to the assembled state, the first part 60 and the second part, 70 swivel around the common swivel axis P. At the same time, the recess forming body 50 moves along the assembling direction Z towards the upper plate part 30. Said upper plate part 30 preferably has been mounted at the formwork wall before. When moving the recess forming body 52 towards the upper plate part 30, the outer edges of the upper end 55

of the recess forming body 51 first come into contact with an inner side 31 of the upper plate part 30. Then, when further moving the recess forming body 50 along the assembling direction Z, the outer edges of the upper end 55 of the recess forming body 51 are urged towards the side ends 34 of the inner side 31 of the upper plate part 30. The outer edges of the upper end 55 of the recess forming body 51 slide along the inner side 31 along the two contrary outer side directions X_1 and X_2 of the upper plate part 30..

[0066] This process is supported by matching guiding edges. The recess forming body 50 comprises at its upper end 55 a circumferential edge 56. With said circumferential edge 56, the recess forming body 50 slides along a circumferential upper right wall 38, which is provided at the inner side 31 of the upper plate part 30 (cf. Fig. 9). Later, in the assembled state, the circumferential edge 56 and the circumferential upright wall 38 build a pair also for sealing the free space 21, 64, 74 inside of the recess device 20 against entrance of concrete.

[0067] In order to provide a good connection between the upper plate part 30 and the recess forming body 50, further measures are suggested. Accordingly, the upper plate part 30 comprises at its inner side 31 two connecting elements in terms of two coupling protrusions 33 at the two opposing side ends 34. The coupling protrusions 33 are for coupling with the recess forming body 50. More particularly, an essentially sealed and form-fit connection between the upper plate part 30 and the recess forming body 50 is provided in the assembled state by inserting said coupling protrusions 33 into two insertion openings 57 at opposite ends at the upper end 55 of the recess forming body 50.

[0068] Figures 6, 7 and 8 illustrate only the recess forming body 30. Figure 6 is shown from an angle looking into the hook-insertion opening 58. Most of the features have already been described before. Hence, reference is only made hereinafter with respect to unmentioned aspects of the recess forming body 30.

[0069] In a state of operation, the recess device 20 and more particularly the recess forming body 30 comprises two lifting tool passage openings 65, 75 (cf. also Figs. 2 and 3). The lifting tool passage openings 65, 75 are formed in the recess forming body 50 below the attachment end receiving channel 53 and are essentially aligned, in a state of operation, in such manner that the lifting tool passage openings 65, 75 form a connection inside the free space 21, 64, 74 between the first part 60 and the second part 70 of the recess forming body 50. Accordingly, a passage for a lifting tool such as a hook is provided inside the free space 21, 64, 74 below the attachment end receiving channel 53.

[0070] It is preferred that, in the assembled state, the two lifting tool passage openings 65, 75 are essentially closed with a releasable closure 66, 76, which releasable closure 66, 76 is only indicated with a dashed line in Figure 6. Then a danger of introduction of concrete is reduced. However, in order to open the lifting tool passage openings 65, 75 (the open state can be seen in Figure 8), the releasable closures 66, 76 have to be removed. This is supported by the provision of perforated weakening lines 67, 77 for pushing out (as can be seen in Figure 6).

[0071] The recess forming body 50 comprises corresponding connection elements or at least one connection element 78 in a region of the lower ends 62, 72 of the first part 60 and the second part 70 of the recess forming body 50 for holding the first part 60 and the second part 70 in the region of the lower ends 62, 72 together in the assembled state. As depicted for example in Figures 2, 3 and 6, only one connection element 78 in terms of a fastening hook is provided. The connection element 78 engages behind the opposite edge of the tool passage opening 65 in order to form a form-fit connection, more particularly a snap-fit connection, between the two parts of the recess forming body 30.

[0072] Figure 9 illustrates the upper plate part 30. Furthermore, a holding plate 40, which can preferably be a metal plate, is depicted. The holding plate 40 can be mounted to the inner side of a formwork wall by means of mounting elements such as the depicted four nails 43 which, in the mounted state, pass through the four openings 42 in the holding plate 40. Thereby, the holding plate 40 is firmly connected to the - in Figure 9 not depicted - formwork wall. With the help of the two protruding cylinders 41, then the upper plate part 30 can be connected via a form-fit and, furthermore, also in a kind of clamping connection to the holding plate 40 and, hence, to the formwork wall. For this purpose, the upper plate part 30 comprises a receiving tray area 35, which is kind of a negative cavity for the holding plate 40, for receiving said holding plate 40 from an outer side 32 of the upper plate part 30. The receiving tray area 35 extends seen from a direction from the outer side 32 towards the inner side 31 of the upper plate part 30 for receiving the holding plate 40 in a flush manner, without the holding plate 40 extending further outwards than the outer side 32. Accordingly, a tight fit and connection between the entire upper plate part 30, and accordingly later of the entire recess device 20, to the formwork wall can be achieved. For the purpose of connection, the upper plate part 30 comprises two clamping receivers 36 for receiving and clamping the two protruding cylinders 41 of the holding plate 40 for guiding the holding plate 40 and for connecting the holding plate 40 with the upper plate part 30. The upper plate part 30 can simply be put into connection with the holding plate 40 attached to the formwork wall. For this, simply the upper plate part 30 is put with its outer side 32 on the holding plate 40, thereby, receiving the holding plate 40 inside of the receiving tray area 35 and, thereby, receiving the two protrusion cylinders inside of the two clamping receivers 36.

[0073] After the casting process and after hardening of the cast construction element 1, for example the formwork wall with the holding plate 40 can be removed from the upper plate part 30 and, accordingly, from the entire recess device 20 and the cast construction element 1. After this, only the upper plate part 30 needs to be removed from the recess forming body 50 as described before and hereinafter and then a hook or such can interact with the free space 21, 64, 74 and, in particular, with the upper part of the loop 5 in order to lift the entire cast construction element 1.

[0074] An alternative connection between the - not depicted - formwork wall and the upper plate part 30, and therefore the recess device 20, can be achieved by means of different connection means such as for example two screws (not depicted). Said screws could be connected from the outside of the formwork wall through the formwork wall and could then on the inside of the formwork wall engage with the two nuts 44. These nuts 44 are fixed non-rotatably inside of two corresponding nut receiving protrusions 39. The nut receiving protrusion 39 holds its respective nut 44 in position avoiding that the nut 44 could turn when the screw is connected and engaged from the outside of the formwork wall. Afterwards, in the opposite manner, the screws could be disassembled from the outside of the formwork wall after the casting process in order to disassemble the nuts 44 from the screws, thereby, disconnecting the upper plate part 30, and accordingly the entire recess device 20, from the formwork wall.

[0075] For supporting the disconnection process of the upper plate part 30 and the recess forming body 50 after the casting process and after a disconnection of the formwork walls as described before by way of an example, the upper plate part 30 comprises two flaps 37 for providing an access with a finger from the outer side 32 to the inner side 31 of the upper plate part 30. The flaps 37 can be bent around a living hinge 37a of the respective flap 37 along a curved bending direction 37b (indicated by the curved dashed arrow in Figure 9). After the formwork walls have been removed, the upper plate part 30, accordingly, can be removed easily from the recess forming body 50 by going with the fingers from the outer side 32 into the inside of the recess device 20, i.e. into the free space 21, 64, 74. Then the upper plate part 30 can be lifted. To support the lifting movement of the upper plate part 30, the upper plate part 30 has folding lines 37c (as indicated by the dotted lines in Figure 9) around which the outer parts of the upper plate part 30 can be bent towards the outer side 32. The bending is performed by bending the side ends 34 away from the inner side 31 and, accordingly, away from the recess forming body 50 and away from the cast construction element 1.

[0076] An advantage of the embodiment shown is that the attachment end receiving channel 53 is formed in the outside space O, as might be seen best in Figures 5 and 8. The attachment end receiving channel 53, in particular, is formed by the outer surfaces 61, 71 of the recess forming body 50. Accordingly, no break-through openings or such have to be provided for letting the transport anchor 3 pass into the free space 21, 64, 74 inside of the recess device. Accordingly, no extensive sealing steps have to be performed and the danger of entrance of concrete during the casting process is advantageously reduced. It is not harmful in case the attachment end receiving channel 53 is not an entirely closed channel structure in the assembled state. Even if a small slit or gap still is present between the lower ends 62 and 72 of the two parts 60, 70 of the recess forming body 50, when the attachment end receiving channel 53 is formed in the assembled state, it might be sufficient for preventing the entrance of concrete or at least a harmful amount of entrance. Since, after removing of the upper plate part 30 of the recess device 20, the area of the attachment end receiving channel 53 is the area of the part of the loop 5 to which the hook or such needs to be connected, a passage of the hook or such in the area below the attachment end receiving channel 53 needs to be possible. In this regard, even if a small amount of concrete has entered said area below the attachment end receiving channel 53 between the two lower ends 62 and 72 due to a non-perfect closing of said channel, such small amounts of concrete can be removed easily, for example even by passing the hook or such through the respective formed thin barrier of concrete.

[0077] Although the invention has been explained in relation to its preferred embodiment(s) as mentioned above, it is to be understood that many other possible modifications and variations can be made without departing from the scope of the present invention. It is, therefore, contemplated that the appended claim or claims will cover such modifications and variations that fall within the true scope of the invention. The single devices in terms of the described upper plate part 30 and/or the recess forming body 50 are of an independent inventive character.

Reference list

1,	cast construction element	34	side ends
1a, 1b	short lateral walls (of the cast construction element)	35	receiving tray area
2	outer shape of the cast construction element (dashed lines)	36	clamping receivers
3	transport anchor (attachment device)	37	flaps
3a	pressure element	37a	living hinge
4	legs	37b	curved bending direction
5	loop (attachment end)	37c	folding line
6, 20	recess device	38	circumferential upright wall
7, 30	upper plate part	39	nut receiving protrusions
7a	assembling direction of the upper plate part	40	holding plate
		41	protruding cylinders
		42	holes
		43	nails

(continued)

	8, 50	recess forming body	44	nuts
	9, 60	first part (of the recess forming body)	51	attachment end receiving opening (of the recess forming body)
5	9a	assembling direction of the first part	52	walls (of the recess forming body)
	10, 70	second part (of the recess forming body)	53	attachment end receiving channel
			54	lower end (of the recess forming body)
	10a	assembling direction of the second part	55	upper end (of the recess forming body)
10	11, 21, 64, 74	free space	56	(at least partially) circumferential edge
	12, 63, 73	inner surfaces (of the first part and the second part of the recess forming body)	57	insertion opening
	13	side walls (of the recess forming body)	62, 72	lower ends (of the first part and the second part of the recess forming body)
15	14	lower walls (of the recess forming body)	65, 75	lifting tool passage opening
			66, 76	releasable closure
20	15,	outer surfaces (of the first part and	67, 77	weakening lines
	61, 71	the second part of the recess forming body)	78	connection element
	16, 58	hook-insertion opening	69, 79	abutting surfaces
25	17	break-through openings	A	separation lines of the two parts 9a and 10a (dotted lines)
	17a	direction of receiving the legs of the transport anchor (dotted lines)	S	surroundings (of the recess device)
30	18, 19	edges (of the first part and the second part of the recess forming body)	O	outside space (of the recess device)
	31	inner side (of the upper plate part)	P	swivel axis
	32	outer side (of the upper plate part)	Z	assembling direction
	33	coupling protrusions	X ₁ , X ₂	outer side directions of the upper plate part
35				

Claims

1. Recess device (20) for providing a recess in a cast construction element (1) for allowing a lifting tool, more particularly a hook, to be attached through the recess to an attachment end of an attachment device, more particularly to a loop (5) of a transport anchor (3), wherein the recess device (6) comprises an upper plate part (30) and a recess forming body (50), wherein the recess forming body (50) comprises a first part (60) and a second part (70), wherein, in an assembled state, the recess forming body (50) and the upper plate part (30) are arranged in such interacting manner that a free space (21, 64, 74) is formed inside of the recess device (20),

characterised in that

the recess forming body (50) is configured to be moveable in such manner between a disassembled state and the assembled state that:

- the free space (21, 64, 74) is essentially closed against the outside space (O) when the recess forming body (50) is moved towards the upper plate part (30) to an end position in the assembled state along an assembling direction (z), and
- an attachment end receiving channel (53) is formed when the recess forming body (50) is moved towards the upper plate part (30) to the end position in the assembled state along the assembling direction (z).

2. Recess device (20) according to the preceding claim, wherein, in the disassembled state, the recess forming body (50) provides an attachment end receiving opening (51) for receiving an attachment end from a lower end (54) of the recess forming body (50).

3. Recess device (20) according to the preceding claim, wherein, in the assembled state, the attachment end receiving opening (51) is closed in such manner that the attachment end receiving channel (53) is formed.
- 5 4. Recess device (20) according to one of the preceding claims, wherein, in the disassembled state, lower ends (62, 72) of the first part (60) and the second part (70) of the recess forming body (50) are arranged at a distance from each other, and wherein, in the assembled state, the lower ends (62, 72) essentially abut each other.
- 10 5. Recess device (20) according to one of the preceding claims, wherein the recess forming body (50) has a swivel axis (P), wherein at least the first part (60), and more particularly also the second part (70), can be swivelled around the swivel axis (P) between the disassembled state and the assembled state.
- 15 6. Recess device (20) according to one of the preceding claims, wherein, in a state of operation, two lifting tool passage openings (65, 75) are formed in the recess forming body (50) below the attachment end receiving channel (53) and are essentially aligned in such manner that the lifting tool passage openings (65, 75) form a connection inside the free space (21, 64, 74) between the first part (60) and the second part (70) of the recess forming body (50) for providing a passage for a lifting tool inside the free space (21, 64, 74) below the attachment end receiving channel (53).
- 20 7. Recess device (20) according to the preceding claim, wherein, in the assembled state, at least one of the two lifting tool passage openings (65, 75), and more particularly both two lifting tool passage openings (65, 75), are essentially closed with a releasable closure (66, 76), more particularly with a cover with, preferably perforated, weakening lines (67, 77) for pushing out.
- 25 8. Recess device (20) according to one of the preceding claims, wherein the recess forming body (50) comprises corresponding connection elements (78) in a region of lower ends (62, 72), respectively of the lower ends (62, 72), of the first part (60) and the second part (70) of the recess forming body (50) for holding the first part (60) and the second part (70) in the region of the lower ends (62, 72) together in the assembled state, and wherein, more particularly, the corresponding connection elements (78) form a form-fit connection, preferably a snap-fit connection.
- 30 9. Recess device (20) according to one of the preceding claims, wherein the recess forming body (50) comprises at its upper end (55) a, at least partially, circumferential edge (56) for forming an essentially sealed connection between the upper plate part (30) and the recess forming body (50) in the assembled state, and more particularly for guiding the recess forming body (50) when moving from the disassembled state to the assembled state along an inner side (31) of the upper plate part (30).
- 35 10. Recess device (20) according to one of the preceding claims, wherein the recess forming body (50) comprises at its upper end (55) at least one insertion opening (57), and more particularly two insertion openings (57) at opposite ends, for providing a coupling of at least one connecting element of the upper plate part (30), and more particularly, for forming an essentially sealed, and preferably form-fit, connection between the upper plate part (30) and the recess forming body (50) in the assembled state.
- 40 11. Recess device (20) according to one of the preceding claims, wherein the upper plate part (30) comprises at its inner side (31) at least one connecting element, in particular at least one coupling protrusion (33), at a side end (34), and more particularly two connecting elements, in particular two coupling protrusions (33), at the side end (34) and an opposite side end (34), for coupling with the recess forming body (50), and more particularly, for forming an essentially sealed, and preferably form-fit, connection between the upper plate part (30) and the recess forming body (50) in the assembled state.
- 45 12. Recess device (20) according to one of the preceding claims, wherein the upper plate part (30) comprises a receiving tray area (35) for receiving a holding plate (40) from an outer side (32) of the upper plate part (30),

wherein, more particularly, the receiving tray area (35) extends seen from a direction from the outer side (32) of the upper plate part (30) towards an inner side (31) of the upper plate part (30) for receiving the holding plate (40) in a flush manner, without the holding plate (40) extending further outwards than the outer side (32) of the upper plate part (30),

wherein, more particularly, the upper plate part (30) comprises at least one, in particular two, clamping receiver(s) (36) for receiving and, preferably, clamping at least one, in particular two, protruding cylinder(s) (41) of the holding plate (40) for guiding the holding plate (40) and for connecting the holding plate (40) with the upper plate part (30).

13. Recess device (20) according to one of the preceding claims, wherein the upper late part (30) comprises at least one, in particular two, flap(s) (37) for providing an access with a finger from an outer side (32) to an inner side (31) of the upper plate part (30), preferably by bending the flap(s) around its living hinge (37a) along a curved bending direction (37b),

wherein, more particularly, the upper late part (30) comprises at its inner side (31) a, at least partially, circumferential upright wall (38) for forming an essentially sealed connection between the upper plate part (30) and the recess forming body (50) in the assembled state, and more particularly for guiding the recess forming body (50) when moving from the disassembled state to the assembled state along the inner side (31) of the upper plate part (30).

14. Method for assembling a recess device (20) for providing a recess in a cast construction element (1) for allowing a lifting tool, more particularly a hook, to be attached through the recess to an attachment end of an attachment device, more particularly to a loop (5) of a transport anchor (3), wherein an upper plate part (30) and a recess forming body (50) are provided, wherein the recess forming body (50) comprises a first part (60) and a second part (70), wherein the recess forming body (50) and the upper plate part (30) are arranged in such interacting manner that a free space (21, 64, 74) is formed inside of the recess device (20), **characterised by** the steps of:

- closing the free space (21, 64, 74) essentially against the outside space (O) by moving the recess forming body (50) towards the upper plate part (30) along an assembling direction (z) to an end position, and
- forming an attachment end receiving channel (53) by moving the recess forming body (50) towards the upper plate part (30) along the assembling direction (z) to the end position.

15. Method for providing a recess in a cast construction element (1) for allowing a lifting tool, more particularly a hook, to be attached through the recess to an attachment end of an attachment device, more particularly to a loop (5) of a transport anchor (3), wherein the following steps are carried out:

- a mould is provided, wherein the mould comprises at least one formwork side wall that defines a side wall of the cast construction element (1), and wherein the mould limits a casting volume of the cast construction element (1),
- the attachment device, more particularly the transport anchor (3), is provided and placed within the casting volume,
- a recess device (6) is provided, wherein the recess device (6) comprises an upper plate part (30) and a recess forming body (50),
- concrete is cast, within a casting step, into the mould and at least partly around the recess device (6), wherein the recess device (6) prevents concrete from filling the casting volume entirely during the casting step, **characterised in that**

the upper plate part (30) is connected to the formwork side wall with an outer side (32) of the upper plate part (30), and

in that the recess device (6) is formed by assembling the upper plate part (30) and the recess forming body (50) by moving the recess forming body (50) towards the upper plate part (30) along an assembling direction (z) to an end position, wherein an attachment end receiving channel (53) is formed and the attachment end, more particularly the loop (5), is received at least partly within the attachment end receiving channel (53).

Prior art

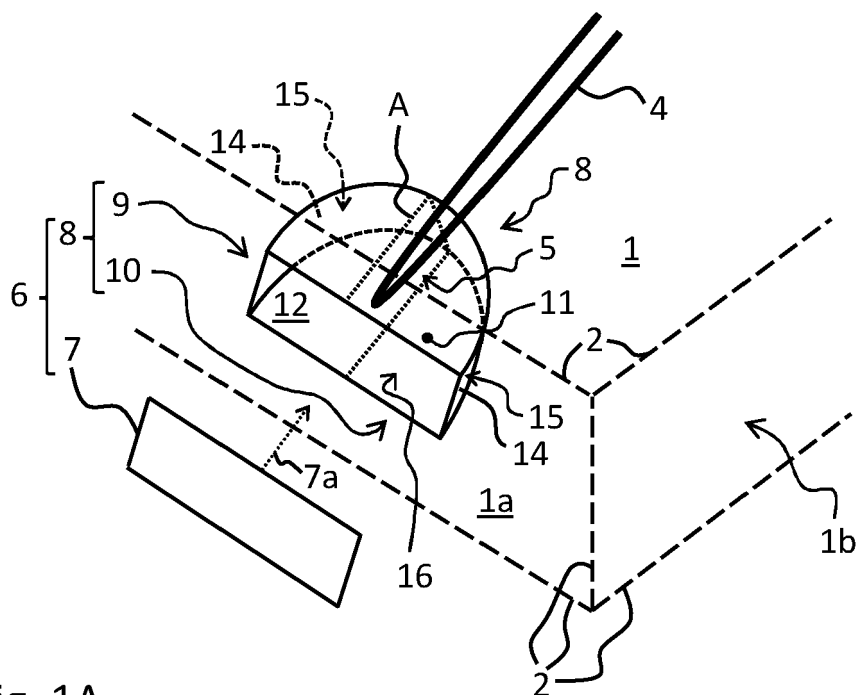


Fig. 1A

Prior art

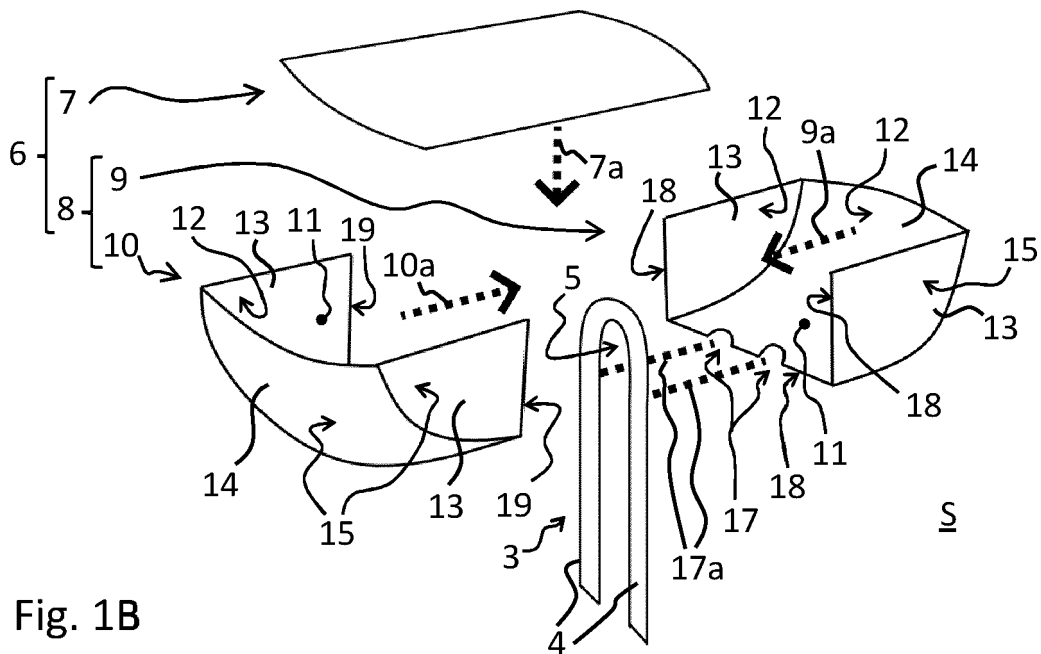


Fig. 1B

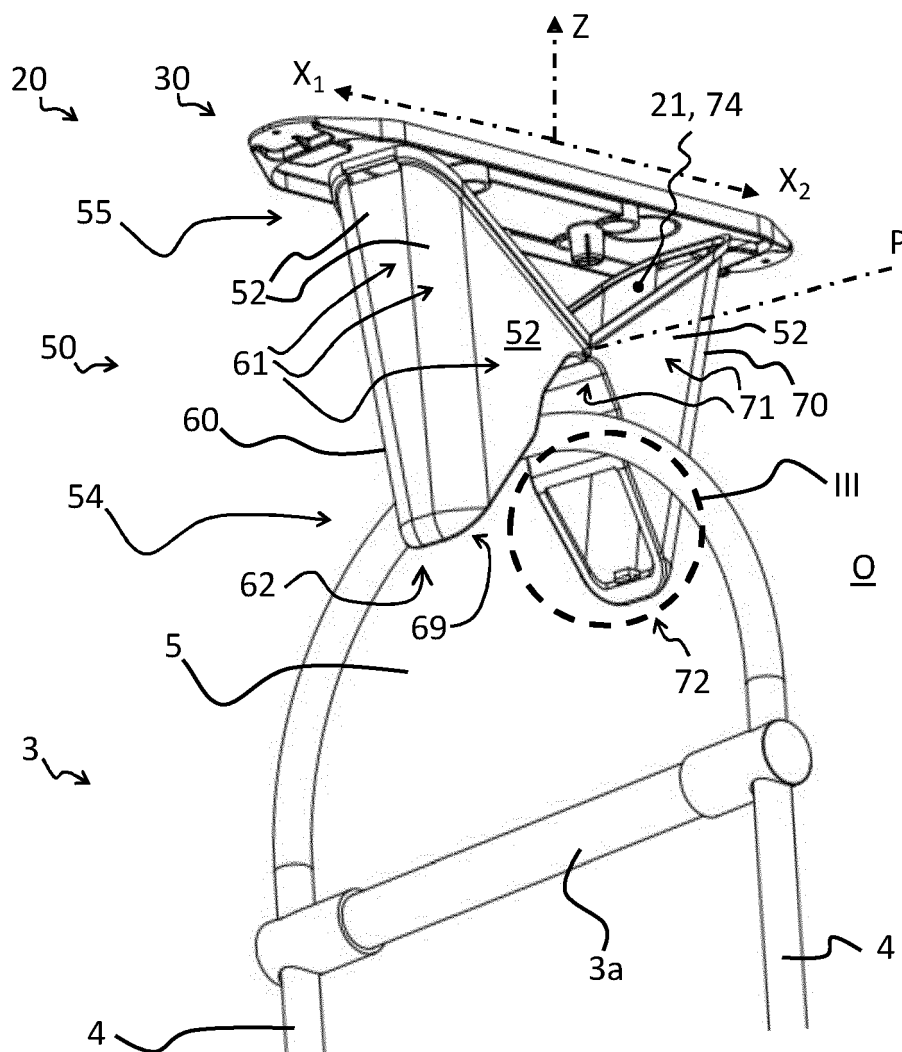


Fig. 2

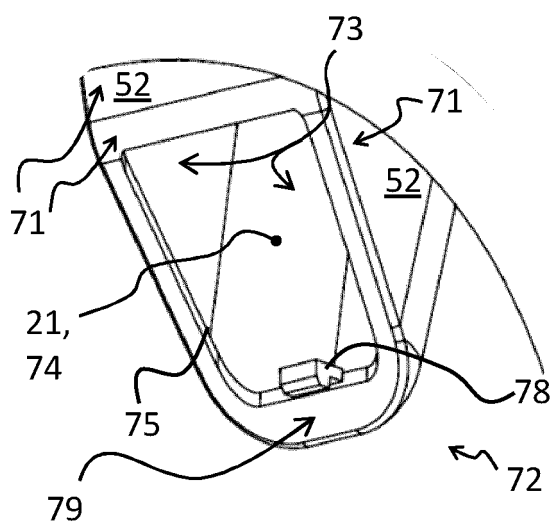


Fig. 3

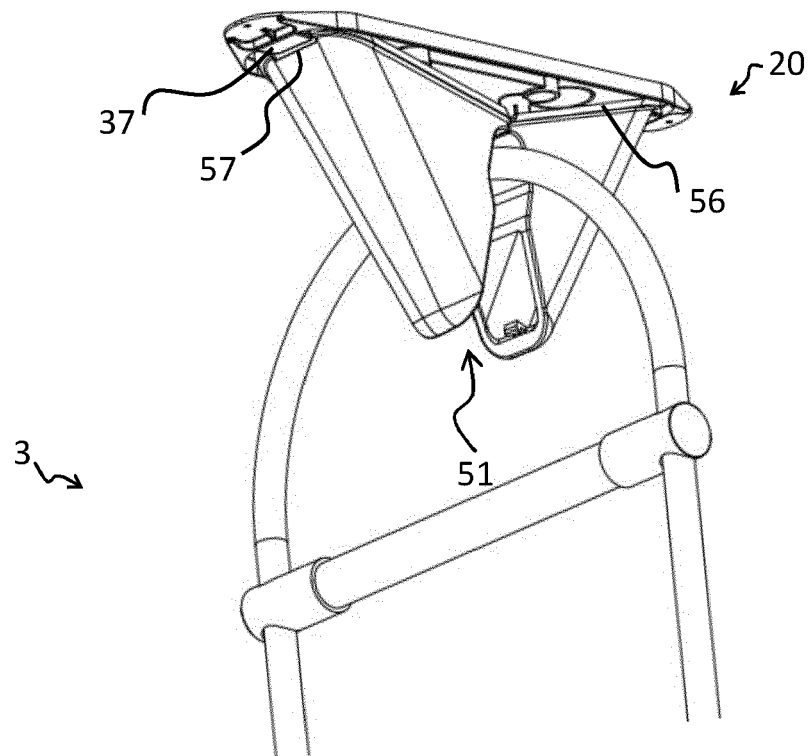


Fig. 4

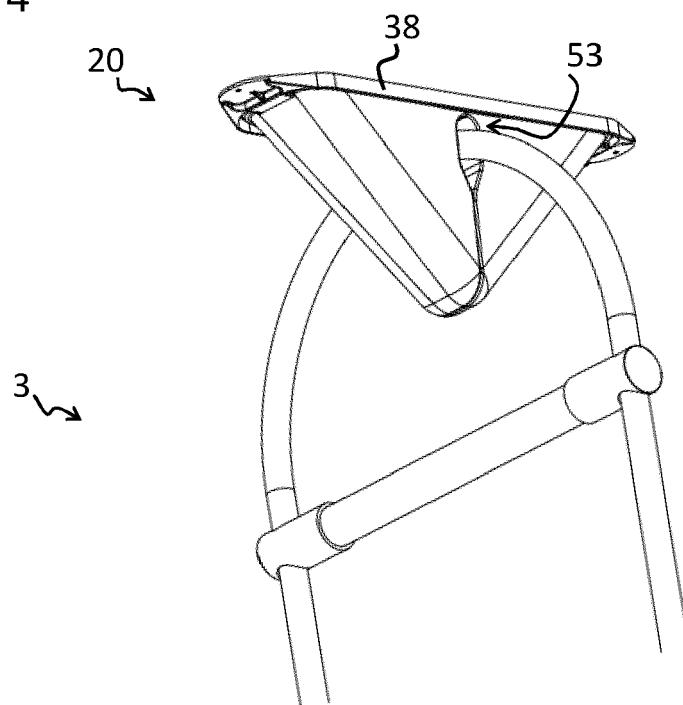


Fig. 5

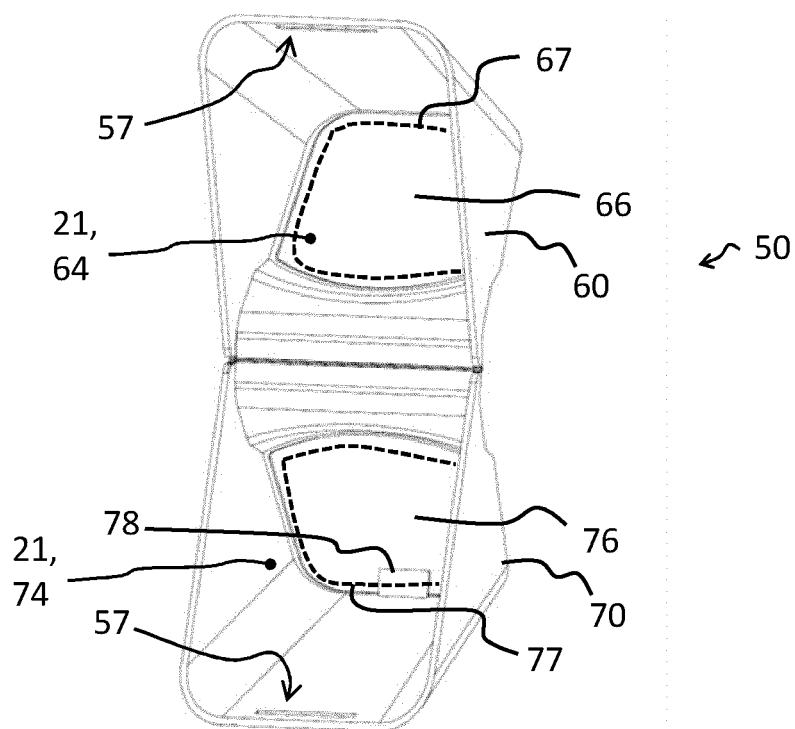


Fig. 6

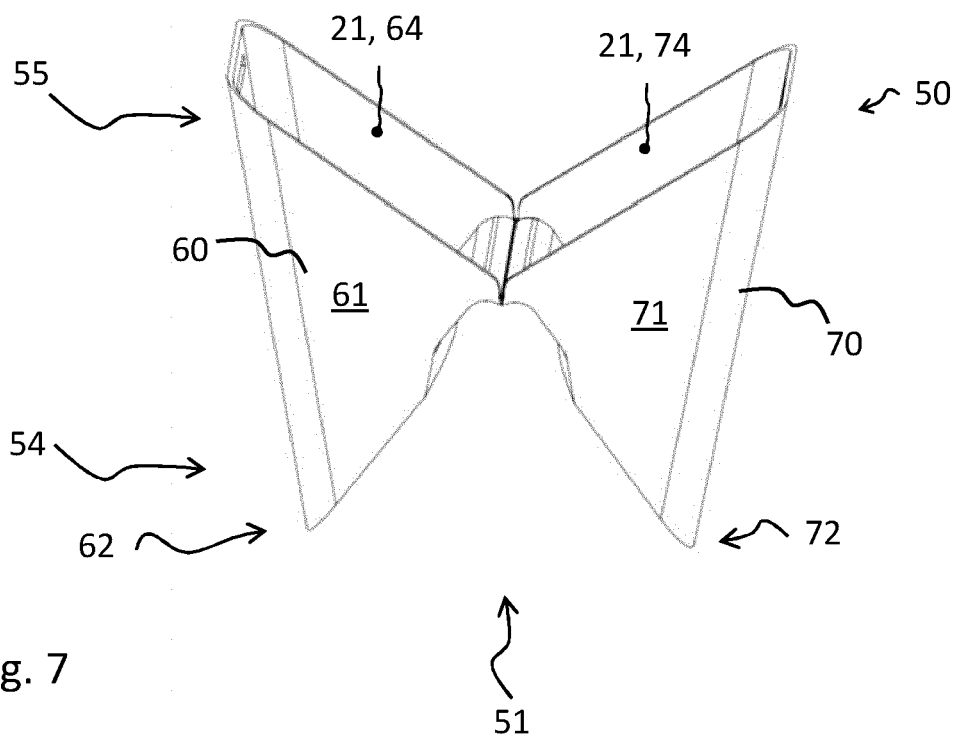


Fig. 7

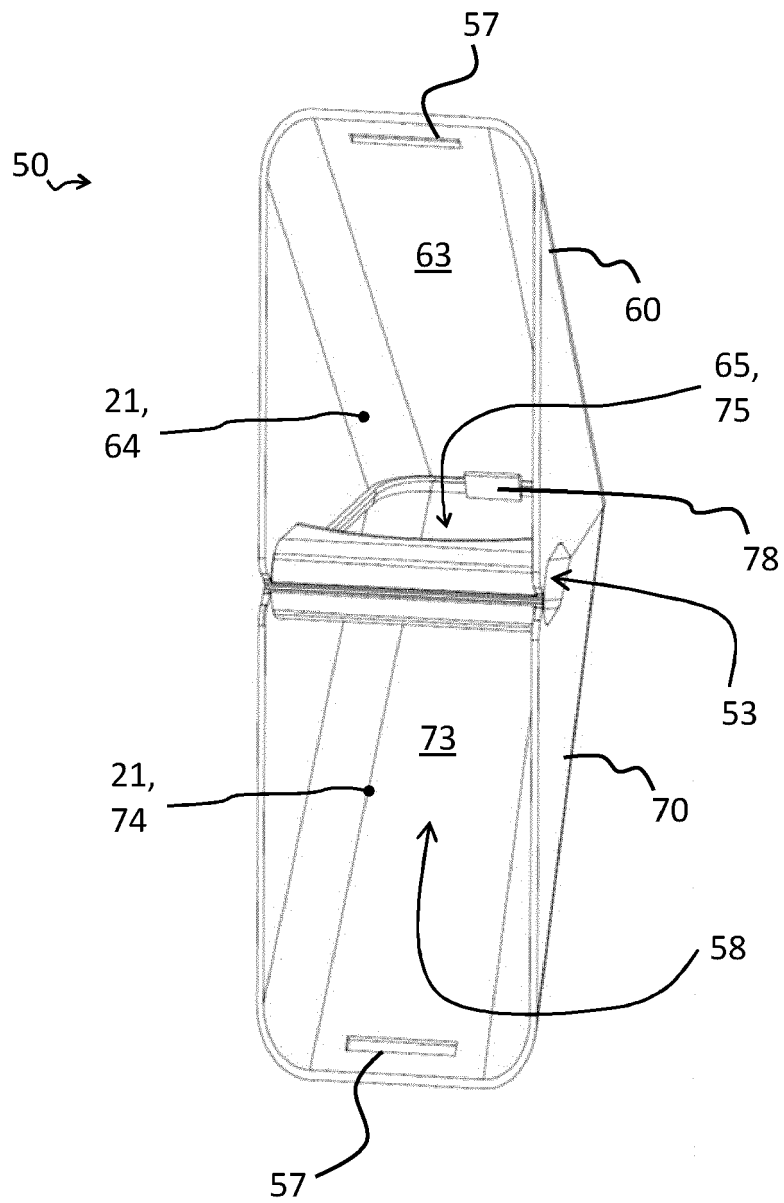


Fig. 8

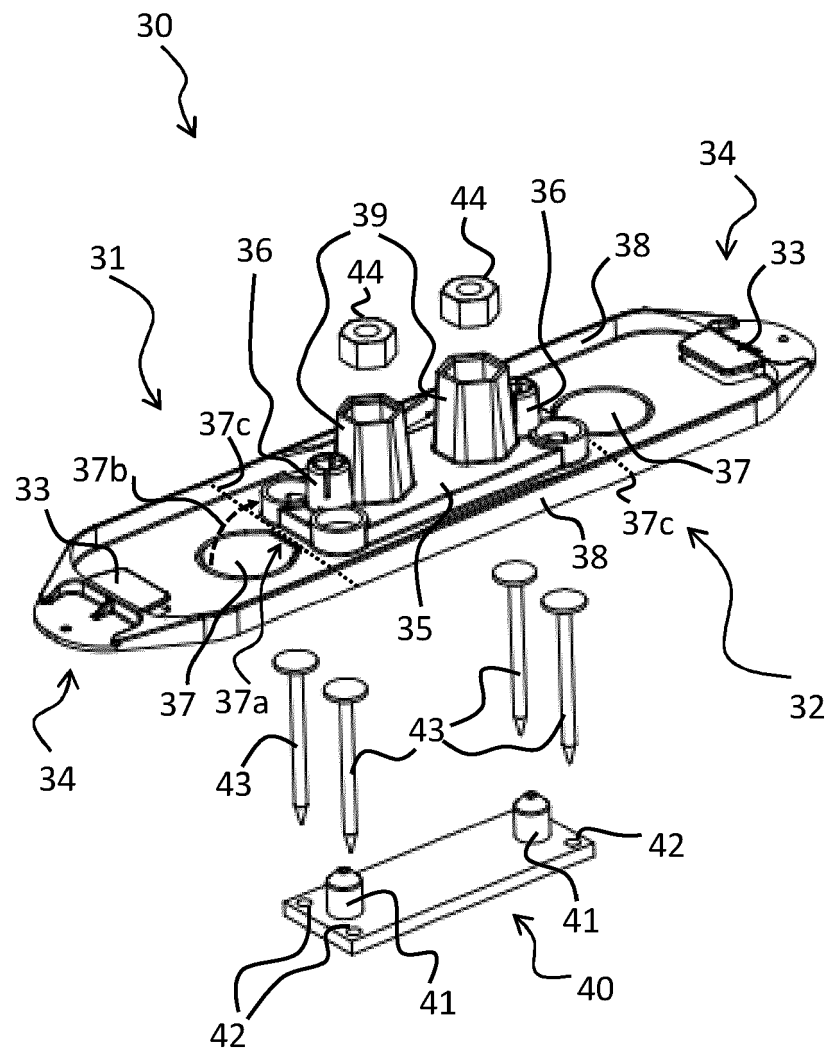


Fig. 9



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			E04G B28B B66C
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 July 2022	Examiner Baumgärtel, Tim
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

**ANNEX TO THE EUROPEAN SEARCH REPORT
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