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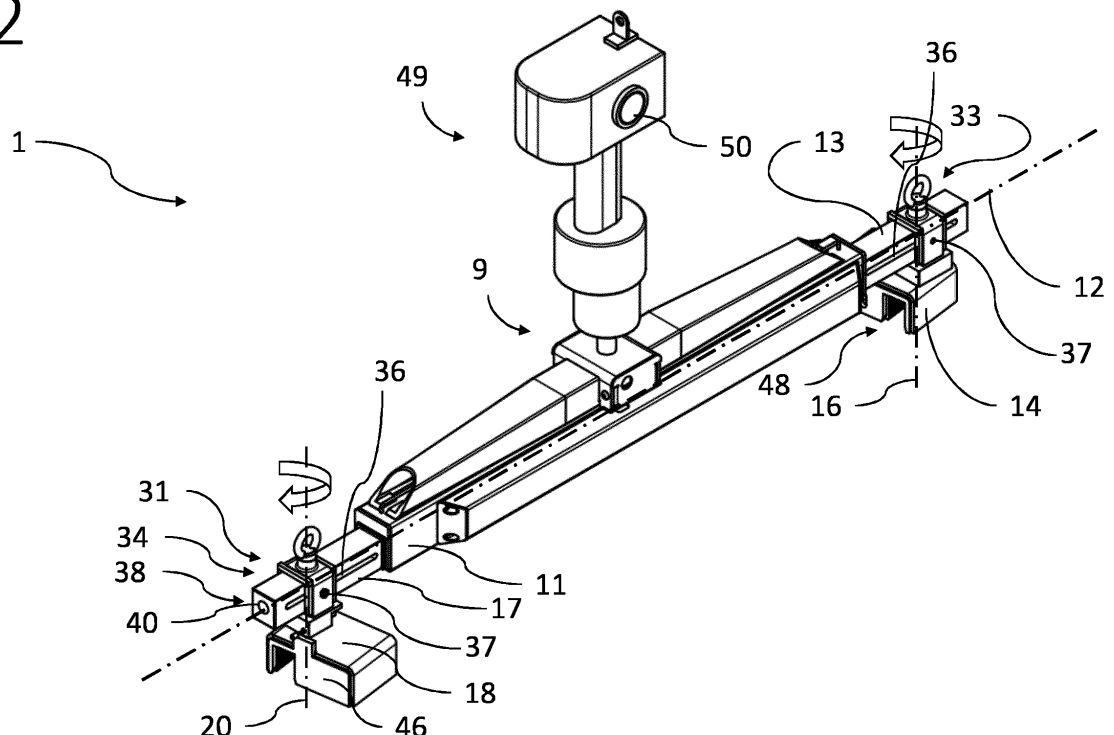
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(54) **HANDLING DEVICE FOR ASSISTING A USER IN MANIPULATING A FOLDABLE PALLET COLLAR**

(57) The present invention relates to a handling device(1) for assisting a user(2) in manipulating a foldable pallet collar(3), the handling device comprising a support frame(11) defining a first axis(12); a first movable member(13) associated with a first gripper member(14) for gripping a first side wall(15) of the pallet collar; a second movable member(17) associated with a second gripper member(18) for gripping a second side wall(19) of the pallet collar; at least one primary actuator(22) connected

to at least one of the movable members and configured for exerting a force on at least one of the movable members in the direction of the first axis, wherein the first and second gripper member are configured to engage and grip any two opposing side walls of the pallet collar, wherein the handling device is configured to facilitate the folding of the pallet collar from the unfolded state to the folded state(8) or unfolding of the pallet collar from the folded state to the unfolded state.

Fig.2



Description

FIELD OF THE INVENTION

[0001] The invention relates to a handling device for assisting a user in manipulating a foldable pallet collar.

BACKGROUND OF THE INVENTION

[0002] Pallets have a wide variety of use cases, wherein the common denominator is the temporary storage of items. As items come in different shapes and sizes, varying from large motor blocks to apples, different types of pallets may be required. A motor block can be placed on a regular flat pallet. A pile of apples however is difficult to store on a flat pallet, as the apples tend to roll down the pile and off the pallet.

[0003] In order to provide some flexibility to the types of items that can be stored on a pallet, often the pallet is provided with one or more pallet collars. Said pallet collars can be stacked on top of each other and on top of the pallet itself. The result is a box with an open top, wherein the pallet provides a bottom, and the pallet collars provide the side walls.

[0004] The pallet collars are often hinged at their corners in order to be foldable to be able to store them efficiently, in a parallelogram configuration. Also other types of foldable pallet collars are used, for example wherein two extra hinges are provided in two opposing shorter side walls. When the foldable pallet collars are taken from the storage, they have to be unfolded and placed on the pallet. This is a tough job for an employee, especially when this has to be done multiple times during the day. It is not only tough because of the weight and the awkward dimensions of the pallet collar which impact the back of the employee, but also because of the required precision when positioning the foldable pallet collar on the pallet. The foldability of the pallet collar provides yet another problem, as the pallet collar has to be kept almost in a perfect rectangle, equal to the shape of the pallet. A small flick of the hand tends to fold the pallet collar back into a parallelogram or in an hourglass shape, depending on which type of foldable pallet collar is used.

[0005] The lapsed Swedish patent SE463257 discloses a device and a process for handling four-sided pallet collars which can be unfolded and folded together by means of hinged corner fittings. The device comprises a vertically raisable and lowerable gripping member which is displaceable in the horizontal plane. The gripping member comprises two gripping tools which are rotatable around their respective axis, with a mutual distance between the said axes which substantially corresponds to the C-C distance between two parallel collar sides belonging to a pallet collar. The collar sides are simultaneously rotated circa 90 degrees about the axes, the mutual distance between the axes being maintained, so that the pallet collar is either unfolded to the point where it forms a rectangle or alternatively is folded together to the point

where it forms a flat parallelogram.

[0006] Said device as disclosed in SE463257 has several drawbacks. In order to be able to place the pallet collar on the pallet, the pallet has to be positioned precisely at an installation location. Also, the pallet collar has to be positioned precisely at a pick-up location.

[0007] Furthermore, the gripping tools have to be moved towards the correct side walls. If the first pallet collar is gripped at the short side walls, the following pallet collar also has to be gripped at the short side walls. This again requires precise positioning of the gripping tools, but also of the pallet collar to be gripped. All the precision requirements decrease the flexibility of the device.

[0008] The device of SE463257 seems to operate automatically. To provide such automation, a complex system of actuators, sensors and other parts is required. This is at least costly and requires considerable maintenance.

[0009] Yet another disadvantage of the device as disclosed SE463257 is that the device is not configured to remove the installed pallet collars from the pallet.

[0010] Also, the device SE463257 does not seem to work with the hourglass shaped foldable pallet collars, this is at least not disclosed.

OBJECT OF THE INVENTION

[0011] It is an object of the invention to provide an improved handling device for manipulating a foldable pallet collar.

[0012] It is another object of the invention to provide a more flexible handling device.

SUMMARY OF THE INVENTION

[0013] In order to achieve at least one object, the present invention provides a handling device for assisting a user in manipulating a foldable pallet collar, in particular for assisting the user in:

- taking the pallet collar from a storage location, unfolding the pallet collar and placing the unfolded pallet collar on a pallet or on a previously positioned pallet collar, and/or
- taking a pallet collar from the pallet or from a lower pallet collar, folding the pallet collar and placing the pallet collar in the storage location,

which pallet collars define, in an unfolded state, a rectangle with either equal or varying wall lengths, wherein the handling device comprises a lifting connector configured to be connected to a lifting device for lifting the handling device and the pallet collar, the handling device comprising:

- a support frame defining a first axis,
- a first movable member associated with a first gripper member for gripping a first side wall of the pallet

collar, wherein the first gripper member is pivotable relative to the first movable member about a respective first vertical axis, and

- a second movable member associated with a second gripper member for gripping a second side wall of the pallet collar, wherein the second gripper member is pivotable relative to the second movable member about a respective second vertical axis,

the first and second movable member being connected to the support frame and arranged at a distance from one another along the first axis, wherein the first and second movable member are configured to move towards and away from each other along the first axis,

- at least one primary actuator connected to at least one of the movable members and configured for exerting a force on at least one of the movable members in the direction of the first axis,

wherein the first and second gripper member are configured to engage and grip any two opposing side walls of the pallet collar, wherein the handling device is configured to facilitate the folding of the pallet collar from the unfolded state to the folded state or unfolding of the pallet collar from the folded state to the unfolded state.

[0014] The handling device, in particular the first and second movable member, facilitates the unfolding and folding of a foldable pallet collar, irrespective of which opposite side walls are gripped by the gripping members. This provides a high level of flexibility to the device, for the user does not have to precisely position the handling device at the exact same locations on the side walls for each subsequent pallet collar. This saves time and is more user-friendly.

[0015] In an embodiment of the handling device, the first and second movable members are coupled to one another via a coupling member, the coupling member being configured to couple the movement of the first movable member to the second movable member and to ensure that a displacement of the first movable member relative to the frame is the same, but in the opposite direction, as the displacement of the second movable member relative to the frame.

[0016] In an embodiment of the handling device, the coupling member comprises a first and second rotary spindle which are interconnected and which have opposed thread, wherein the first movable member is connected to the first spindle via a first nut and the second movable member is connected to the second spindle via a second nut.

[0017] In an embodiment, the handling device comprises at least one play coupling which allows play of the first and second gripper member relative to one another over a limited travel distance along the first axis.

[0018] The play coupling provides an increased flexibility to the device, for the play coupling compensates for slight misalignments when engaging and gripping the

side walls with the gripping member.

[0019] In an embodiment of the handling device, at least one of the first or second gripper members is connected to the associated first or second movable member via the play coupling, wherein the play coupling allows play of the gripper member relative to the associated first or second movable member over a limited travel distance along the first axis.

[0020] In an embodiment of the handling device, the first gripper member is connected to the first movable member via a first play coupling, and the second gripper member is connected to the second movable member via a second play coupling, wherein the first and second play couplings allow play of the gripper members relative to the associated movable member over a limited travel distance along the first axis.

[0021] In an embodiment of the handling device, the limited travel distance is between 1 and 30 percent, preferably between 3 and 20 percent of a distance between the gripper members in any position thereof.

[0022] In an embodiment of the handling device, the distance of play is between 2 and 20 cm.

[0023] In an embodiment of the handling device, the gripper members are positioned under an angle (α) relative to the associated movable member.

[0024] In an embodiment of the handling device, the gripper members are positioned under an angle (α) relative to the first axis.

[0025] The gripper members may comprise suction cups, wherein the side walls are gripped by applying a vacuum to the suction cups.

[0026] In an embodiment of the handling device, the at least one play coupling comprises a cam track provided in or on the associated movable member, the cam track extending parallel to the first axis, wherein each gripper member comprises a cam which is configured to move along said cam track.

[0027] In an embodiment of the handling device, the at least one play coupling comprises at least one biasing member, the biasing member being configured to bias the at least one gripper member to a default position, wherein the biasing member allows a displacement of the gripper member over the limited distance relative to the default position while exerting a biasing force on the gripper member which increases with increased displacement of the gripper member.

[0028] In an embodiment of the handling device, the biasing member is a resilient member. The resilient member may be a spring, said spring extending from an end of the first movable member to the gripper member. The resilient member can also be an elastic band, pneumatic cylinders, soft rubber, or any other comparable part.

[0029] In an embodiment of the handling device, the support frame comprises a first hollow beam, and wherein the first and second movable members comprise respective first and second beams being slideably arranged in the first hollow beam and being configured to move back and forth through said first hollow beam in

the direction of the first axis.

[0030] In an embodiment of the handling device, the primary actuator is configured to essentially only compensate for a friction force between the first movable member, the second movable member and the support frame and to passively assist the movement of the first movable members relative to the support frame when the first and second movable members are moved by the user when folding or unfolding the pallet collar.

[0031] Due to the compensation provided by the primary actuator, the foldable pallet collar can be folded and unfolded with minimum manual effort.

[0032] In an embodiment of the handling device, a centre of gravity of the handling device is located directly below the lifting connector for connecting the handling device to the lifting device.

[0033] In an embodiment of the handling device, each gripper member comprises an operable gripper actuator configured to clamp the gripper member on the wall of the pallet collar, wherein the gripper actuator can be switched between a clamped state and a released state.

[0034] In an embodiment of the handling device, the gripper members have a first pre-determined default position, wherein an angle (α) of the gripping member relative to the first axis is 0 degrees plus or minus of 10 degrees, wherein the first pre-determined default position is used for gripping the foldable pallet collar in the folded state.

[0035] In an embodiment of the handling device, the gripper members have a second pre-determined default position, wherein an angle (α) of the gripper member relative to the first axis is 90 degrees plus or minus of 10 degrees, and the second pre-determined position is used for gripping the foldable pallet collar in the unfolded state.

[0036] The present invention further relates to a system for manipulating pallet collars, in particular for folding and unfolding said foldable pallet collars, which foldable pallet collars define, in an unfolded state, a rectangle with either equal or varying wall lengths, the system comprising:

- a handling device according to any of the handling device claims,
- a lifting device, constructed to lift the handling device and the pallet collar and to allow movement thereof by the user in three dimensions.

[0037] In an embodiment of the system, the lifting device comprises a handle configured to be held by the hand, the handle being located directly above the lifting connector, wherein the primary actuator and the gripper actuators comprise one or more operating organs which are located at the handle, allowing the user:

- to activate the primary actuator and the gripper actuators, and
- to move the handling device and the pallet collar to a target location

with a single hand, wherein the user can use his other hand for unfolding, folding, and holding the pallet collar.

[0038] The present invention yet further relates to a method for manipulating foldable pallet collars, in particular for folding and unfolding said foldable pallet collars, which pallet collars define, in an unfolded state, a rectangle with either equal or varying wall lengths, the method comprising:

- a) providing the system according to the present invention,
- b) providing the pallet collar in an upright position, in a folded or unfolded state,
- c) moving the handling device, in particular the gripper members towards any two opposing side walls of the pallet collar,
- d) engaging and gripping any two opposing side walls with the gripper members,
- e) lifting the pallet collar with the handling device,
- f) unfolding or folding the foldable pallet collar.

[0039] In an embodiment of the method, step f) is performed manually.

[0040] The method has an advantage that the pallet on which the pallet collars are to be placed or removed does not have to be precisely positioned. The positioning of the pallet collars is manually controlled. This advantage also applies to the handling device and the system.

[0041] In an embodiment of the method, when at step b) the foldable pallet collar is in the folded state, after step f) the method further comprises positioning the foldable pallet collar on a pallet or on another unfolded pallet collar.

[0042] In an embodiment of the method, the handling device is moved to a default position by the at least one primary actuator after a pallet collar has been folded or unfolded and the handling device is released from the pallet collar via the gripper members.

[0043] The default position may be chosen as a certain distance between the gripper members which is equal to a length of the shorter side walls of the pallet collar. This way, when the longer side walls are gripped the movable members do not have to move significantly.

[0044] In an embodiment of the method, the handling device is moved manually from a storage location to an installation location while being suspended by the lifting device, or vice versa.

BRIEF DESCRIPTION OF THE FIGURES

[0045] The previous and other features and advantages of the handling device, the system and the method according to the invention will be more fully understood from the following detailed description of exemplary embodiments with reference to the attached drawings. Like reference numerals refer to like parts, and in which:

Figure 1 schematically shows a perspective view of

an embodiment of a system for manipulating pallet collars according to the invention,

Figure 2 schematically shows a perspective view of an embodiment of a handling device according to the invention,

Figure 3 schematically shows a cross-section of an embodiment of the handling device according to the invention,

Figure 4 schematically shows a top view of the handling device of figure 2,

Figure 5 schematically shows a foldable pallet collar in a folded state being gripped by an embodiment of the handling device according to the invention at the longer opposing side walls,

Figure 6 schematically shows the foldable pallet collar of figure 5 in an unfolded state being gripped by an embodiment of the handling device according to the invention,

Figure 7 schematically shows the foldable pallet collar of figure 5 in a folded state being gripped by an embodiment of the handling device according to the invention at shorter opposing side walls,

Figure 8 schematically shows the foldable pallet collar of figure 5 in an unfolded state being gripped by an embodiment of the handling device according to the invention,

Figure 9 schematically shows another type of the foldable pallet collar in a folded state being gripped by an embodiment of the handling device according to the invention,

Figure 10 schematically shows the foldable pallet collar of figure 9 in an unfolded state being gripped by an embodiment of the handling device according to the invention,

Figure 11 schematically shows the foldable pallet collar of figure 9 in a folded state being gripped by an embodiment of the handling device according to the invention,

Figure 12 schematically shows the foldable pallet collar of figure 9 in an unfolded state being gripped by an embodiment of the handling device according to the invention,

Figure 13 schematically shows a perspective view of a pallet with stacked foldable pallet collars.

DETAILED DESCRIPTION OF THE FIGURES

[0046] Turning to figures 1 - 4, a handling device 1 for assisting a user 2 in manipulating a foldable pallet collar 3 is shown. The handling device 1 particularly assists the user 2 in:

taking the pallet collar 3 from a storage location (not shown), unfolding the pallet collar 3 and placing the unfolded pallet collar 3 on a pallet 5 (figure 13) or on a previously positioned pallet collar 6 (figure 13), and/or

taking a pallet collar 3 from the pallet 5 or from a

lower pallet collar, folding the pallet collar 3 and placing the pallet collar 3 in the storage location.

[0047] The foldable pallet collar 3 defines, in an unfolded state 7 (see figure 6), a rectangle 56 with either equal or varying wall lengths.

[0048] The handling device 1 comprises a lifting connector 9 which is configured to be connected to a lifting device 10 for lifting the handling device 1 and the pallet collar 3.

[0049] The handling device 1 has a support frame 11 defining a first axis 12. A first movable member 13 and a second movable member 17 are connected to the support frame 11 and arranged at a distance 21 from one another along the first axis 12, in the shown embodiment the movable members 13, 17 are arranged on the first axis 12. Said first movable member 13 and second movable member 17 can move towards and away from each other along the first axis 12.

[0050] The first movable member 13 is associated with a first gripper member 14 for gripping a first side wall 15 of the pallet collar 3. The first gripper member 14 is pivotable relative to the first movable member 13 about a respective first vertical axis 16.

[0051] The second movable member 17 is associated with a second gripper member 18 for gripping a second side wall 19 of the pallet collar 3. The second gripper member 18 is pivotable relative to the second movable member 17 about a respective second vertical axis 20.

[0052] The first and second gripper member 18 are configured to engage and grip any two opposing side walls of the pallet collar 3. So the handling device 1 is flexible in the sense that the two shorter opposing side walls of the foldable pallet collar 3 can be gripped as well as the two longer opposing side walls.

[0053] Each gripper member comprises an operable gripper actuator 46 configured to clamp the gripper member on the wall of the pallet collar 3. The gripper actuator 46 can be switched between a clamped state 47 and a released state 48.

[0054] Figure 3 shows a primary actuator 22 which is connected to at least one of the movable members 13, 17, in particular to the first movable member 13. The primary actuator 22 may also be connected to the support frame 11. It is also possible to connect the primary actuator to both movable members 13, 17 and not to the support frame. The primary actuator 22 is configured for exerting a force on at least one of the movable members 13, 17 in the direction of the first axis 12. In the shown embodiment only one primary actuator 22 is shown which is connected to the first movable member 13. It is also possible to connect the primary actuator 22 to the second movable member 17, or provide another primary actuator 22 and connect both movable members 13, 17 to an individual primary actuator.

[0055] The handling device 1 is configured to facilitate the folding of the pallet collar 3 from the unfolded state 7 to the folded state 8 or unfolding of the pallet collar 3

from the folded state 8 to the unfolded state 7.

[0056] In order to fold the pallet collar from the unfolded state to the folded state, the gripper members have to be in a position wherein they can grip the side walls. The correct position is shown in figure 3, wherein the gripper members are positioned at an angle α (see figure 4) of 90 degrees with respect to the first axis.

[0057] When the user wants to grip the shorter side walls in the unfolded state, the first and second movable members have to be extended first, in particular to a distance wherein the gripper members 14, 18 are in a position wherein the distance 35 is substantially equal to the length of the longer side walls. However, if the user grips the longer side walls, the gripper members may be in a default position which is equal to the length of the shorter side wall.

[0058] During said folding and unfolding the primary actuator 22 is configured to essentially only compensate for a friction force between the first movable member 13, the second movable member 17 and the support frame 11. The primary actuator 22 passively assists the movement of the first movable members relative to the support frame 11 when the first and second movable members 13, 17 are moved by the user 2 when folding or unfolding the pallet collar 3.

[0059] The first and second movable members 13, 17 are coupled to one another via a coupling member 23. The coupling member 23 couples the movement of the first movable member 13 to the second movable member 17. This coupling is intended to ensure that a displacement of the first movable member 13 relative to the frame is the same, but in the opposite direction, as the displacement of the second movable member 17 relative to the frame.

[0060] The coupling member 23 comprises a first rotary spindle 26 and a second rotary spindle 27 which are interconnected. The spindles 26, 27 have opposed thread 28. The first movable member 13 is connected to the first spindle via a first nut 29 and the second movable member 17 is connected to the second spindle via a second nut 30.

[0061] The first spindle extends through the first movable member 13, and the second spindle extends through the second movable member 17.

[0062] The handling device 1 has at least one play coupling 31 which allows play of the first and second gripper member 18 relative to one another over a limited travel distance 32 along the first axis 12.

[0063] In order to allow play of the gripper members 14, 18 relative to one another, at least one of the first or second gripper members is connected to the associated first or second movable member via the play coupling.

[0064] In the shown embodiment of figure 3, the first gripper member 14 is connected to the first movable member 13 via a first play coupling 33, and the second gripper member 18 is connected to the second movable member 17 via a second play coupling 34. So both gripper members 14, 18 are connected to a play coupling.

Therefore both the first and second play couplings 33, 34 allow play of the gripper members 14, 18 relative to the associated movable member over a limited travel distance 32 along the first axis 12. This embodiment is advantageous in order to keep the suspended foldable pallet collar 3 balanced. The play couplings 33, 34 also assist in keeping the suspended foldable pallet collar 3 balanced in case a centre of gravity 45 of the handling device does not coincide with a centre of gravity 58 (figure 6) of the pallet collar.

[0065] In order to keep the pallet collar 3 and the handling device 1 balanced the centre of gravity 45 of the handling device 1 may be located directly below the lifting connector 9 for connecting the handling device 1 to the lifting device 10.

[0066] The limited travel distance 32 is typically between 1 and 30 percent, preferably between 3 and 20 percent of the distance 35 between the gripper members 14, 18 in any position thereof.

[0067] Expressed in centimetres, the distance of play is between 2 and 20 cm.

[0068] The play coupling comprises a cam track 36 provided in or on the associated movable member. Said cam track 36 extends parallel to the first axis 12. Each gripper member comprises a cam 37 which is configured to move along said cam track 36.

[0069] The play coupling comprises at least one biasing member 38. The biasing member 38 is configured to bias the at least one gripper member to a default position 39. The biasing member 38 is further configured to allow a displacement of the gripper member over the limited distance relative to the default position 39 while exerting a biasing force on the gripper member. The biasing force increases with increased displacement of the gripper member.

[0070] In the shown embodiments the biasing member 38 is a spring 40. Said spring 40 extends from an end 41 of the first movable member 13 to the gripper member 14. Other types of biasing members 38 may also be provided instead of a spring 40, such as an elastic band, pneumatic cylinders, soft rubber, or any other comparable part. A spring 40 can be seen as simple and effective. It is also possible to have the resilient member extend from another location instead of the end of the movable member 13, 17.

[0071] The gripper members 14, 18 are positioned under an angle α relative to the associated movable member, as shown in figure 4. This may make it easier to engage the opposing side walls. It may be possible to have different angle settings of the gripper member, depending on whether the pallet collar needs to be folded or unfolded. When the pallet collar needs to be folded, the gripper members may be set to an angle α (see figure 4) of substantially 90 degrees, or at least parallel with respect to each other. Said parallel configuration is shown in figure 3.

[0072] The gripper members may have a first pre-determined default position, wherein an angle (α) of the

gripping member relative to the first axis is 0 degrees plus or minus of 10 degrees. The first pre-determined default position is used for gripping the foldable pallet collar in the folded state.

[0073] The gripper members may also have a second pre-determined default position, wherein an angle (α) of the gripper member relative to the first axis is 90 degrees plus or minus of 10 degrees. The second pre-determined position is used for gripping the foldable pallet collar in the unfolded state.

[0074] A default distance 35 between the gripper members 14, 18 may be chosen such that it is substantially equal to the length of the shorter side walls X. This may be advantageous for folding the pallet collar 3, as the handling device has already the desired length. When the longer side walls Y are gripped in the unfolded state and the handling device extends parallel to the shorter side walls, as shown in figure 6, the first and second movable members 13, 17 can remain stationary. Only the gripping members 14, 18 will pivot relative to the first axis about their respective vertical axes 16, 20.

[0075] The support frame 11 has a first hollow beam 42. Other configurations are also possible, such as a U-beam. The first and second movable members 13, 17 comprise respective first and second beams 43, 44 being slideably arranged in the first hollow beam 42. The first and second beams 43, 44 can also be hollow, or be U-beams, or be any other suitable configuration. The beams can for example also be provided below the support frame. Said first and second beams 43, 44 are configured to move back and forth through said first hollow beam 42 in the direction of the first axis 12.

[0076] Turning to figures 5 - 8, the flexibility of the device is shown. Figures 5, 7 and 6, 8 respectively show the pallet collar 3 in a folded and unfolded state 7. In figure 5 the gripping members of the handling device 1 engage and grip the long side walls Y of the pallet collar 3. Figure 6 shows the same pallet collar 3 in the subsequent unfolded state 7. The first and second movable members 13, 17 did not significantly move outwards, because the length of the handling device 1 is chosen such that it equals the length of the short side walls X.

[0077] In figure 7 the gripping members grip the short side walls. Figure 8 shows the same pallet collar 3 in the unfolded state 7. In this case the first and second movable members 13, 17 have moved outwardly more significantly.

[0078] Turning to figures 9 - 12, a different type of a foldable pallet collar 3 is shown, namely one with six hinges. The handling device is also suitable to be used with this type.

[0079] Figures 9 and 10 show an embodiment wherein the gripping members 14, 18 grip the opposing longer side walls. In the unfolded state (figure 10) the movable members 13, 17 are in the extended position. When the pallet collar is to be folded, said extended position is desired in order to be able to move the movable members 13, 17 towards each other during the folding, ending in

the position of figure 9.

[0080] Figures 11 and 12 show an embodiment wherein the gripping members 14, 18 grip the opposing shorter side walls 60. The first and second movable member are in the extended position when the pallet collar is in the unfolded state, as shown in figure 12.

[0081] Returning to figure 1 a system 100 is shown for manipulating pallet collars, in particular for folding and unfolding said foldable pallet collars. The foldable pallet collars define, in an unfolded state 7, a rectangle 56 with either equal or varying wall lengths. In the folded state 8 as shown in figures 1, 5 and 7 the foldable pallet collar 3 defines a parallelogram. Figures 9 and 11 show the foldable pallet collar having six hinges folded in an hour-glass shape.

[0082] The system 100 comprises the handling device 1 as described above, and a lifting device 10, constructed to lift the handling device 1 and the pallet collar 3 and to allow movement thereof by the user 2 in three dimensions. The lifting device may comprise a mast 101 and a pivotable boom 102 extending over a horizontal distance away from the mast. A suspension organ 103, e.g. a cable 104 or chain, is connected to a free end 105 of the mast. The cable 104 may move towards the mast via the boom 102.

[0083] The lifting device 10 comprises a handle 49 connected to a lower end of the suspension organ 103 and configured to be held by the hand. An operable winch may be provided to lift the handle 49, the handling device 1 and the pallet collar 3.

[0084] Said handle 49 is located directly above the lifting connector 9. The primary actuator 22 and the gripper actuators 46 comprise one or more operating organs 50 which are located at the handle 49, allowing the user:

to activate the primary actuator 22 and the gripper actuators 46, and
to move the handling device 1 and the pallet collar 3 to a target location
with a single hand 52, wherein the user 2 can use his other hand 53 for unfolding, folding, and holding the pallet collar 3.

[0085] The winch may also be operated with one of the operating organs 50. The winch may be controlled to provide an upward force which is equal to the combined weight of the combination of the handle 49, the handling device 1 and the pallet collar 3, allowing the user to freely move the combination up and down with little force. The pivotable boom may allow the user to move the combination in a horizontal plane. Obviously, other variants than a mast and boom are possible, e.g. a crane or a spring balanced device.

[0086] During operation, the system 100 comprising the handling device 1 and lifting device 10 facilitates in a method for manipulating foldable pallet collars, in particular for folding and unfolding said foldable pallet collars. The method comprises:

providing the above described system 100,
 providing the pallet collar 3 in an upright position 54,
 in a folded or unfolded state 7,
 moving the handling device 1, in particular the grip-
 per members 14, 18 towards any two opposing side
 walls of the pallet collar, 5
 engaging and gripping any two opposing side walls
 with the gripper members 14, 18, lifting the pallet
 collar 3 with the handling device 1,
 unfolding or folding the foldable pallet collar 3. 10

Step f) can be performed manually.

[0087] When at step b) the foldable pallet collar 3 is in
 the folded state 8, the method can comprise after step f) 15
 positioning the foldable pallet collar 3 on a pallet or on
 another unfolded pallet collar 3.

[0088] It is to be understood that the disclosed embod-
 iments are merely exemplary of the invention, which can
 be embodied in various forms. Therefore, specific struc-
 tural and functional details disclosed herein are not to be
 interpreted as limiting, but merely as a basis for the claims
 and as a representative basis for teaching one skilled in
 the art to variously employ the present invention in virtu-
 ally any appropriately detailed structure. 20 25

[0089] Furthermore, the terms and phrases used here-
 in are not intended to be limiting, but rather, to provide
 an understandable description of the invention.

[0090] The terms "a" or "an", as used herein, are de-
 fined as one or more than one. The term another or sub-
 sequent, as used herein, is defined as at least a second
 or more. The terms including and/or having, as used
 herein, are defined as comprising (i.e., not excluding oth-
 er elements or steps). Any reference signs in the claims
 should not be construed as limiting the scope of the
 claims or the invention. The mere fact that certain meas-
 ures are recited in mutually different dependent claims
 does not indicate that a combination of these measures
 cannot be used to advantage. The scope of the invention
 is only limited by the following claims. 30 35 40

Clauses

[0091] The present invention further relates to the fol-
 lowing numbered clauses: 45

1. Handling device for assisting a user in manipulat-
 ing a foldable pallet collar, in particular for assisting
 the user in:

- taking the pallet collar from a storage location,
 unfolding the pallet collar and placing the unfold-
 ed pallet collar on a pallet or on a previously
 positioned pallet collar, and/or 50
- taking a pallet collar from the pallet or from a
 lower pallet collar, folding the pallet collar and
 placing the pallet collar in the storage location, 55

which pallet collars define, in an unfolded state, a
 rectangle with either equal or varying wall lengths,
 wherein the handling device comprises a lifting con-
 nector configured to be connected to a lifting device
 for lifting the handling device and the pallet collar,
 the handling device comprising:

- a support frame defining a first axis,
- a first movable member associated with a first
 gripper member for gripping a first side wall of
 the pallet collar, wherein the first gripper mem-
 ber is pivotable relative to the first movable
 member about a respective first vertical axis, and
- a second movable member associated with a
 second gripper member for gripping a second
 side wall of the pallet collar, wherein the second
 gripper member is pivotable relative to the sec-
 ond movable member about a respective sec-
 ond vertical axis,

the first and second movable member being con-
 nected to the support frame and arranged at a dis-
 tance from one another along the first axis, wherein
 the first and second movable member are configured
 to move towards and away from each other along
 the first axis,

- at least one primary actuator connected to at
 least one of the movable members and config-
 ured for exerting a force on at least one of the
 movable members in the direction of the first ax-
 is,

wherein the first and second gripper member are
 configured to engage and grip any two opposing side
 walls of the pallet collar, wherein the handling device
 is configured to facilitate the folding of the pallet collar
 from the unfolded state to the folded state or unfold-
 ing of the pallet collar from the folded state to the
 unfolded state.

2. Handling device according to clause 1, wherein
 the first and second movable members are coupled
 to one another via a coupling member, the coupling
 member being configured to couple the movement
 of the first movable member to the second movable
 member and to ensure that a displacement of the
 first movable member relative to the frame is the
 same, but in the opposite direction, as the displace-
 ment of the second movable member relative to the
 frame.

3. Handling device according to the preceding
 clause, wherein the coupling member comprises a
 first and second rotary spindle which are intercon-
 nected and which have opposed thread, wherein the
 first movable member is connected to the first spindle

via a first nut and the second movable member is connected to the second spindle via a second nut.

4. Handling device according to any of the preceding clauses, comprising at least one play coupling which allows play of the first and second gripper member relative to one another over a limited travel distance along the first axis.

5. Handling device according to the preceding clause, wherein at least one of the first or second gripper members is connected to the associated first or second movable member via the play coupling, wherein the play coupling allows play of the gripper member relative to the associated first or second movable member over a limited travel distance along the first axis.

6. Handling device according to clause 4 or 5, wherein the first gripper member is connected to the first movable member via a first play coupling, and wherein the second gripper member is connected to the second movable member via a second play coupling, wherein the first and second play couplings allow play of the gripper members relative to the associated movable member over a limited travel distance along the first axis.

7. Handling device according to any of clauses 4-6, wherein the limited travel distance is between 1 and 30 percent, preferably between 3 and 20 percent of a distance between the gripper members in any position thereof.

8. Handling device according to any of clauses 4-7, wherein the distance of play is between 2 and 20 cm.

9. Handling device according to any of clauses 4-8, wherein the at least one play coupling comprises a cam track provided in or on the associated movable member, the cam track extending parallel to the first axis, wherein each gripper member comprises a cam which is configured to move along said cam track.

10. Handling device according to any of clauses 4-9, wherein the at least one play coupling comprises at least one biasing member, the biasing member being configured to bias the at least one gripper member to a default position, wherein the biasing member allows a displacement of the gripper member over the limited distance relative to the default position while exerting a biasing force on the gripper member which increases with increased displacement of the gripper member.

11. Handling device according to the preceding clause, wherein the biasing member is a resilient member, said resilient member extending from an

end of the first movable member to the gripper member.

12. Handling device according to any of the preceding clauses, wherein the support frame comprises a first hollow beam, and wherein the first and second movable members comprise respective first and second beams being slideably arranged in the first hollow beam and being configured to move back and forth through said first hollow beam in the direction of the first axis.

13. Handling device according to any of the preceding clauses, wherein the primary actuator is configured to essentially only compensate for a friction force between the first movable member, the second movable member and the support frame and to passively assist the movement of the first movable members relative to the support frame when the first and second movable members are moved by the user when folding or unfolding the pallet collar.

14. Handling device according to any of the preceding clauses, wherein a centre of gravity of the handling device is located directly below the lifting connector for connecting the handling device to the lifting device.

15. Handling device according to any of the preceding clauses, wherein each gripper member comprises an operable gripper actuator configured to clamp the gripper member on the wall of the pallet collar, wherein the gripper actuator can be switched between a clamped state and a released state.

16. Handling device according to any of the preceding clauses, wherein the gripper members have a first pre-determined default position, wherein an angle (α) of the gripping member relative to the first axis is 0 degrees plus or minus of 10 degrees, wherein the first pre-determined default position is used for gripping the foldable pallet collar in the folded state.

17. Handling device according to any of the preceding clauses, wherein the gripper members have a second pre-determined default position, wherein an angle (α) of the gripper member relative to the first axis is 90 degrees plus or minus of 10 degrees, and the second pre-determined position is used for gripping the foldable pallet collar in the unfolded state.

18. System for manipulating pallet collars, in particular for folding and unfolding said foldable pallet collars, which foldable pallet collars define, in an unfolded state, a rectangle with either equal or varying wall lengths, the system comprising:

- a handling device according to any of the preceding clauses,
- a lifting device, constructed to lift the handling device and the pallet collar and to allow movement thereof by the user in three dimensions. 5

19. System according to the preceding clause, wherein the lifting device comprises a handle configured to be held by the hand, the handle being located directly above the lifting connector, wherein the primary actuator and the gripper actuators comprise one or more operating organs which are located at the handle, allowing the user: 10

- to activate the primary actuator and the gripper actuators, and 15
- to move the handling device and the pallet collar to a target location with a single hand, wherein the user can use his other hand for unfolding, folding, and holding the pallet collar. 20

20. Method for manipulating foldable pallet collars, in particular for folding and unfolding said foldable pallet collars, which pallet collars define, in an unfolded state, a rectangle with either equal or varying wall lengths, the method comprising: 25

- a) providing the system according to any of the preceding clauses 18-19,
- b) providing the pallet collar in an upright position, in a folded or unfolded state, 30
- c) moving the handling device, in particular the gripper members towards any two opposing side walls of the pallet collar,
- d) engaging and gripping any two opposing side walls with the gripper members, 35
- e) lifting the pallet collar with the handling device,
- f) unfolding or folding the foldable pallet collar.

21. Method according to the preceding clause, wherein step f) is performed manually. 40

22. Method according to the clause 20 or 21, wherein, when at step b) the foldable pallet collar is in the folded state, after step f) the method further comprises positioning the foldable pallet collar on a pallet or on another unfolded pallet collar. 45

23. Method according to any of the clauses 20-22, wherein the handling device is moved manually from a storage location to an installation location while being suspended by the lifting device, or vice versa. 50

Claims 55

1. Handling device (1) for assisting a user (2) in manipulating a foldable pallet collar (3), in particular for

assisting the user in:

- taking the pallet collar from a storage location, unfolding the pallet collar and placing the unfolded pallet collar on a pallet (5) or on a previously positioned pallet collar (6), and/or
- taking a pallet collar from the pallet or from a lower pallet collar, folding the pallet collar and placing the pallet collar in the storage location,

which pallet collars define, in an unfolded state (7), a rectangle (56) with either equal or varying wall lengths, wherein the handling device comprises a lifting connector (9) configured to be connected to a lifting device (10) for lifting the handling device and the pallet collar, the handling device comprising:

- a support frame (11) defining a first axis (12),
- a first movable member (13) associated with a first gripper member (14) for gripping a first side wall (15) of the pallet collar, wherein the first gripper member is pivotable relative to the first movable member about a respective first vertical axis (16), and
- a second movable member (17) associated with a second gripper member (18) for gripping a second side wall (19) of the pallet collar, wherein the second gripper member is pivotable relative to the second movable member about a respective second vertical axis (20),

the first and second movable member being connected to the support frame and arranged at a distance (21) from one another along the first axis, wherein the first and second movable member are configured to move towards and away from each other along the first axis,

- at least one primary actuator (22) connected to at least one of the movable members and configured for exerting a force on at least one of the movable members in the direction of the first axis,

wherein the first and second gripper member are configured to engage and grip any two opposing side walls of the pallet collar, wherein the handling device is configured to facilitate the folding of the pallet collar from the unfolded state to a folded state (8) or unfolding of the pallet collar from the folded state to the unfolded state.

2. Handling device according to claim 1, wherein the first and second movable members are coupled to one another via a coupling member (23), the coupling member being configured to couple the movement of the first movable member to the second movable member and to ensure that a displacement of

the first movable member relative to the frame is the same, but in the opposite direction, as the displacement of the second movable member relative to the frame.

3. Handling device according to the preceding claim, wherein the coupling member comprises a first and second rotary spindle (26, 27) which are interconnected and which have opposed thread (28), wherein the first movable member is connected to the first spindle via a first nut (29) and the second movable member is connected to the second spindle via a second nut (30).
4. Handling device according to any of the preceding claims, comprising at least one play coupling (31) which allows play of the first and second gripper member relative to one another over a limited travel distance (32) along the first axis.
5. Handling device according to the preceding claim, wherein at least one of the first or second gripper members is connected to the associated first or second movable member via the play coupling, wherein the play coupling allows play of the gripper member relative to the associated first or second movable member over a limited travel distance along the first axis.
6. Handling device according to claim 4 or 5, wherein the first gripper member is connected to the first movable member via a first play coupling (33), and wherein the second gripper member is connected to the second movable member via a second play coupling (34), wherein the first and second play couplings allow play of the gripper members relative to the associated movable member over a limited travel distance along the first axis.
7. Handling device according to any of claims 4 - 6, wherein the at least one play coupling comprises a cam track (36) provided in or on the associated movable member, the cam track extending parallel to the first axis, wherein each gripper member comprises a cam (37) which is configured to move along said cam track.
8. Handling device according to any of claims 4 - 7, wherein the at least one play coupling comprises at least one biasing member (38), the biasing member being configured to bias the at least one gripper member to a default position (39), wherein the biasing member allows a displacement of the gripper member over the limited distance relative to the default position while exerting a biasing force on the gripper member which increases with increased displacement of the gripper member.

9. Handling device according to any of the preceding claims, wherein the support frame comprises a first hollow beam (42), and wherein the first and second movable members comprise respective first and second beams (43, 44) being slideably arranged in the first hollow beam and being configured to move back and forth through said first hollow beam in the direction of the first axis.

10. Handling device according to any of the preceding claims, wherein the primary actuator is configured to essentially only compensate for a friction force between the first movable member, the second movable member and the support frame and to passively assist the movement of the first movable members relative to the support frame when the first and second movable members are moved by the user when folding or unfolding the pallet collar.

11. System (100) for manipulating pallet collars, in particular for folding and unfolding said foldable pallet collars, which foldable pallet collars define, in an unfolded state, a rectangle with either equal or varying wall lengths, the system comprising:

- a handling device according to any of the preceding claims,
- a lifting device, constructed to lift the handling device and the pallet collar and to allow movement thereof by the user in three dimensions.

12. System according to the preceding claim, wherein the lifting device comprises a handle (49) configured to be held by the hand, the handle being located directly above the lifting connector, wherein the primary actuator and the gripper actuators comprise one or more operating organs which are located at the handle, allowing the user:

- to activate the primary actuator and the gripper actuators, and
- to move the handling device and the pallet collar to a target location with a single hand, wherein the user can use his other hand for unfolding, folding, and holding the pallet collar.

13. Method for manipulating foldable pallet collars, in particular for folding and unfolding said foldable pallet collars, which pallet collars define, in an unfolded state, a rectangle with either equal or varying wall lengths, the method comprising:

- a) providing the system according to any of the preceding claims 11-12,
- b) providing the pallet collar in an upright position, in a folded or unfolded state,
- c) moving the handling device, in particular the gripper members towards any two opposing

side walls of the pallet collar,
d) engaging and gripping any two opposing side
walls with the gripper members,
e) lifting the pallet collar with the handling device,
f) unfolding or folding the foldable pallet collar. 5

14. Method according to the preceding claim, wherein
step f) is performed manually.

15. Method according to the preceding claim, wherein, 10
when at step b) the foldable pallet collar is in the
folded state, after step f) the method further compris-
es positioning the foldable pallet collar on a pallet or
on another unfolded pallet collar.

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Fig. 1

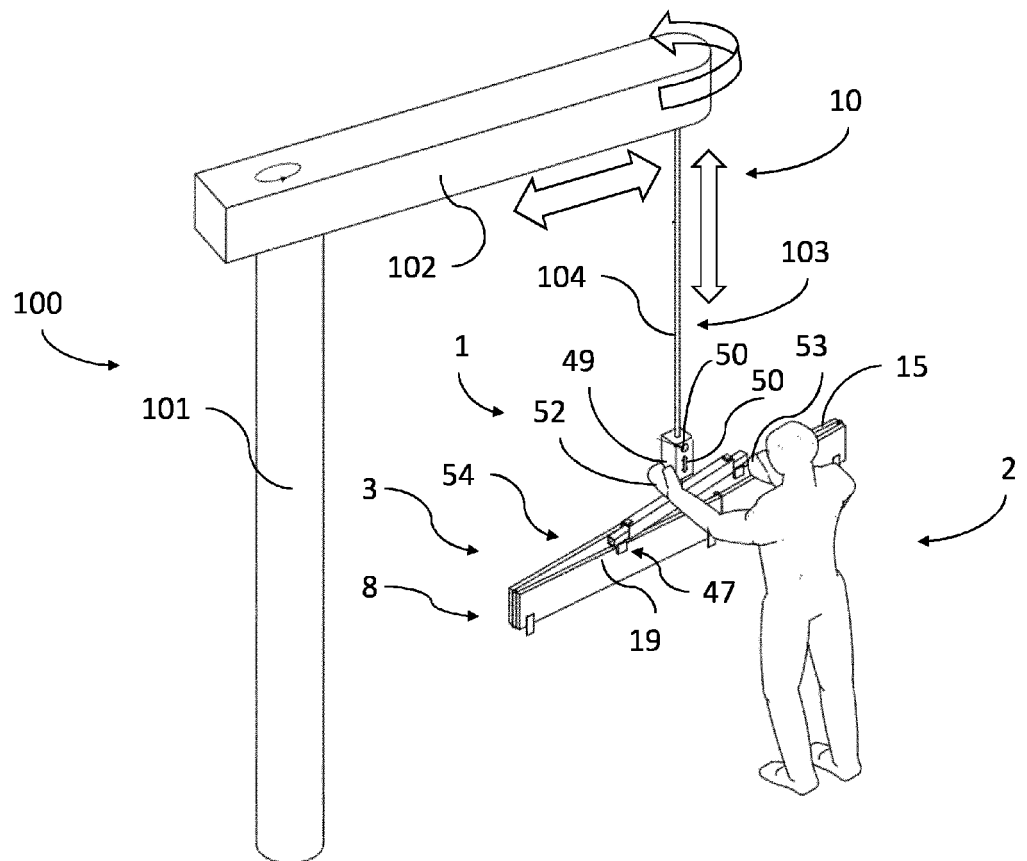


Fig.2

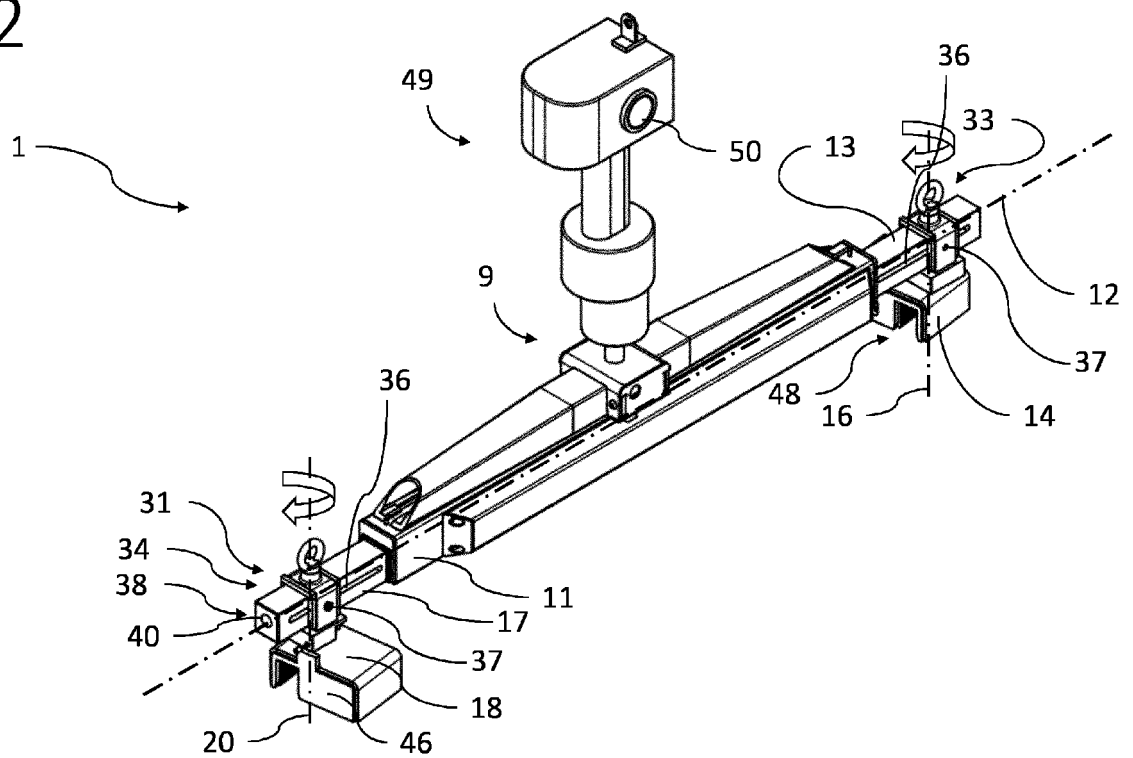


Fig. 3

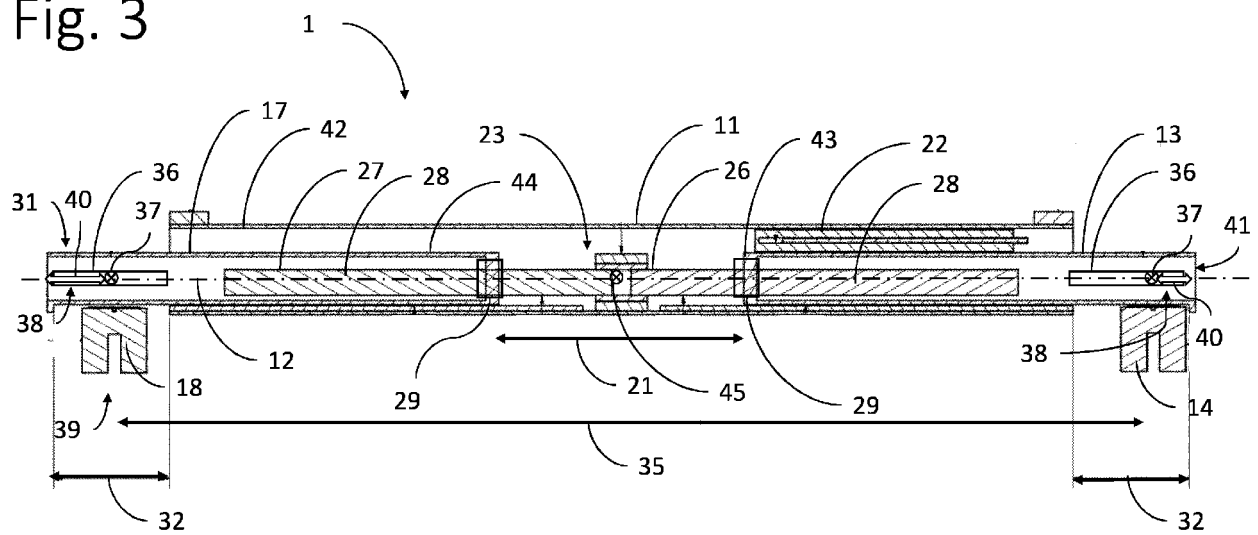


Fig. 4

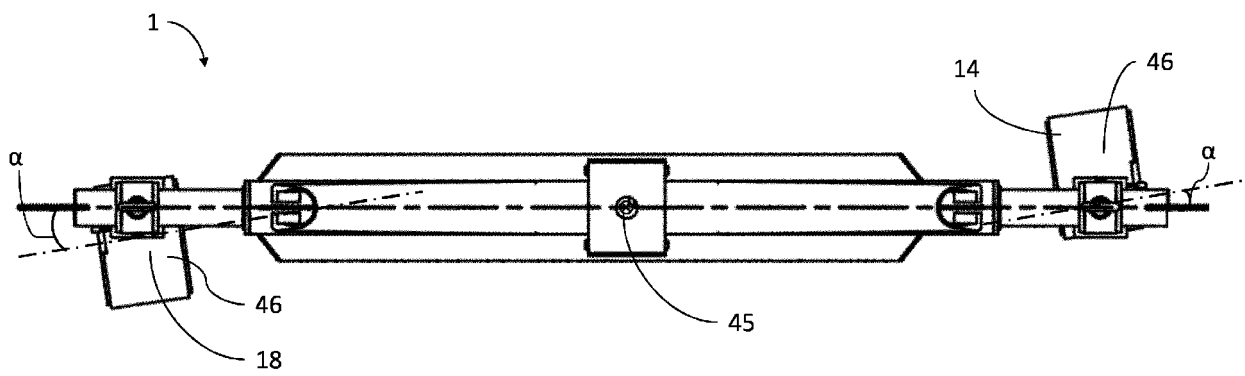


Fig. 5

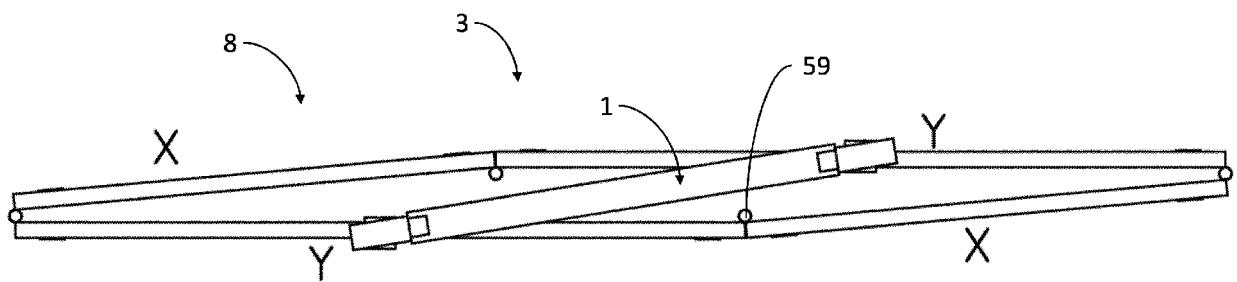


Fig. 6

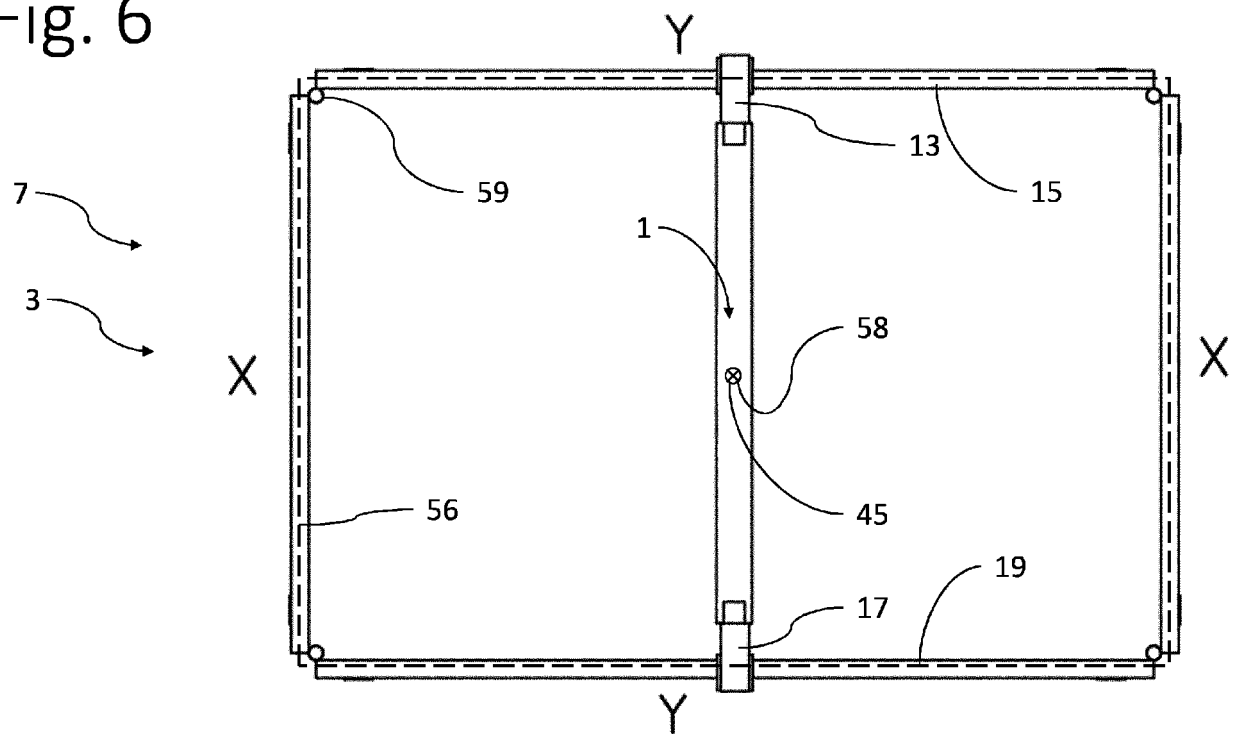


Fig. 7

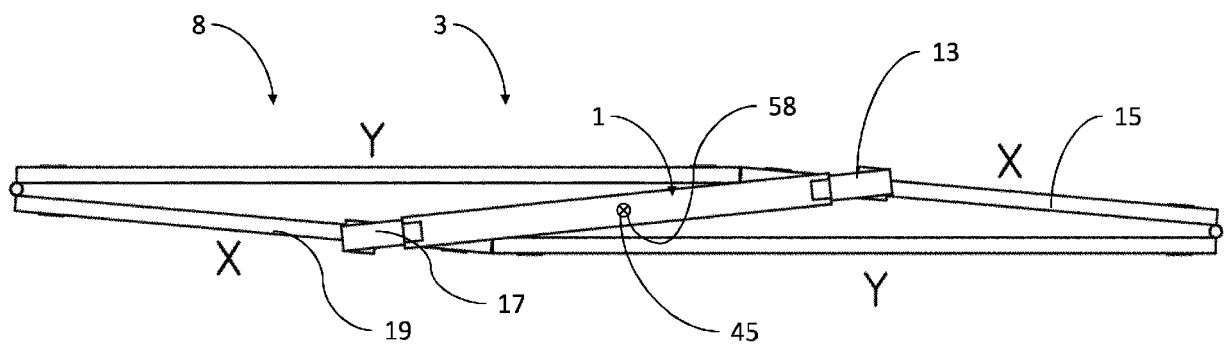


Fig. 8

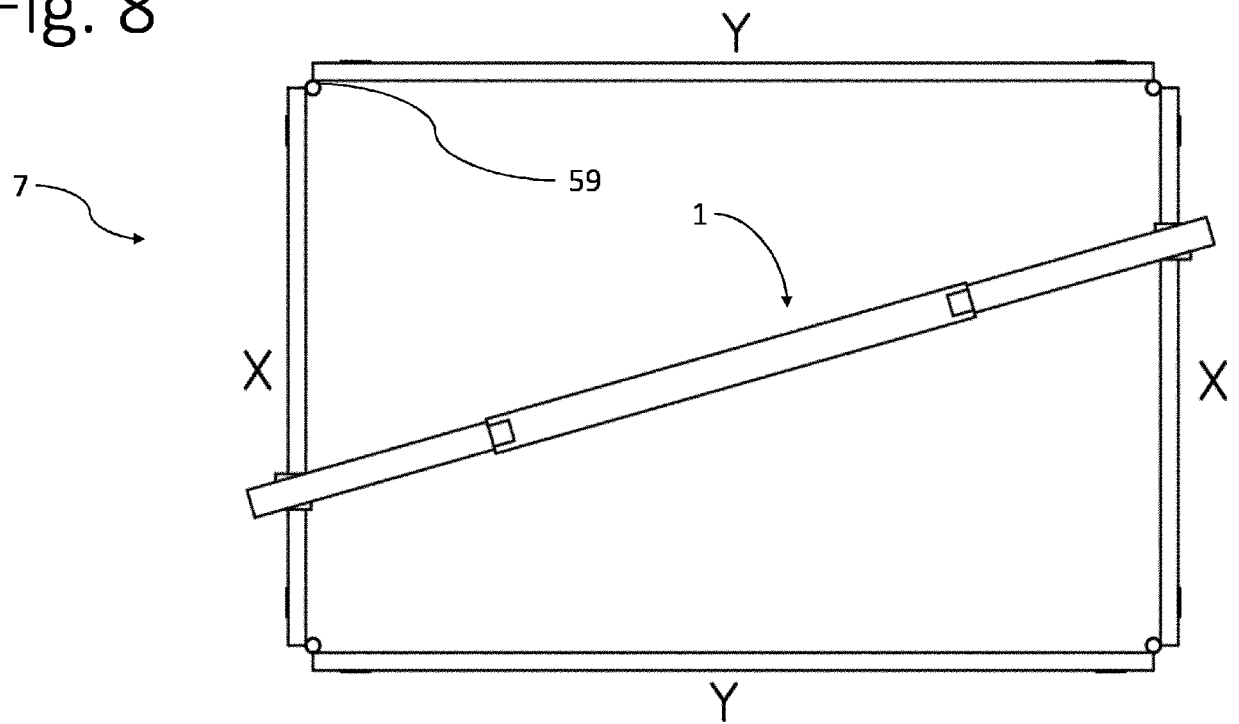


Fig. 9

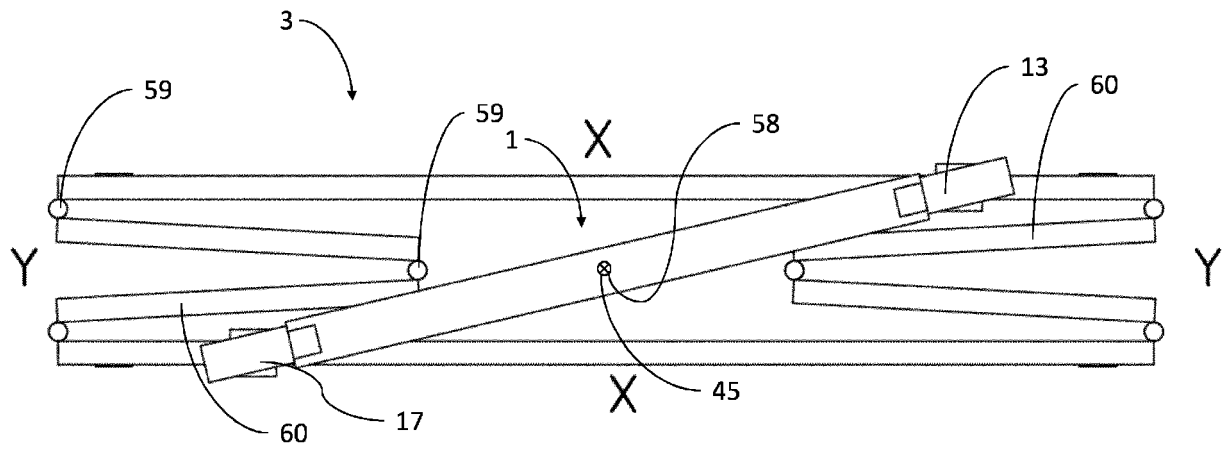


Fig. 10

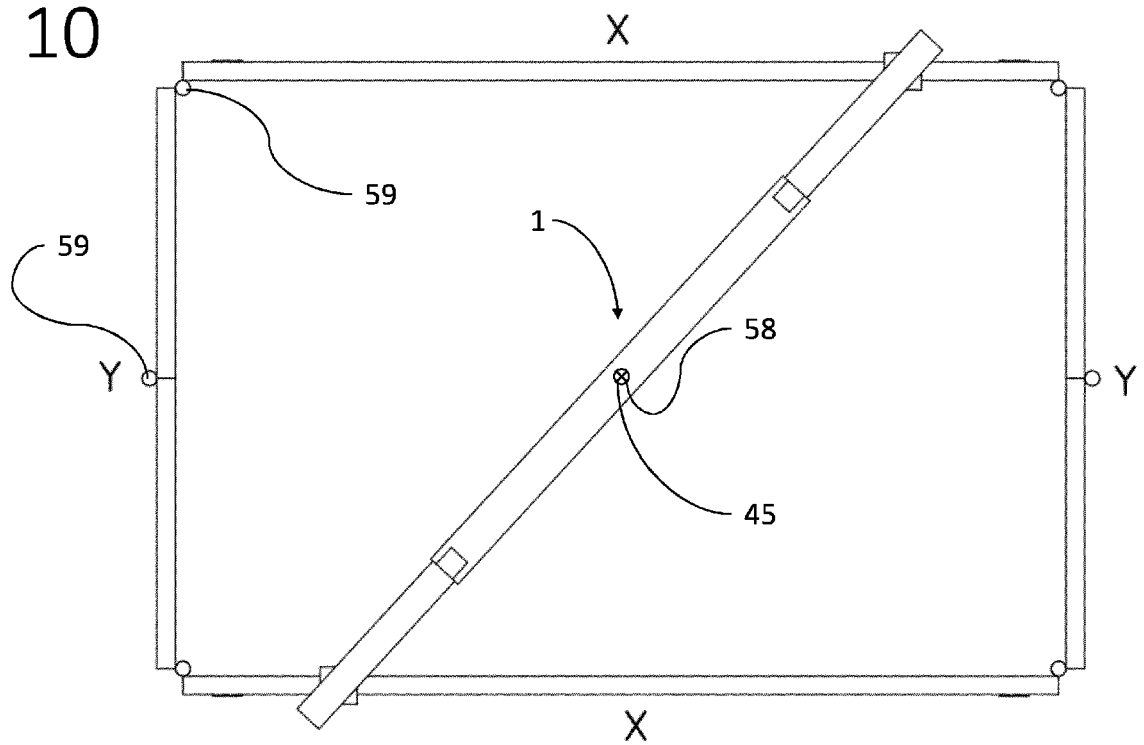


Fig. 11

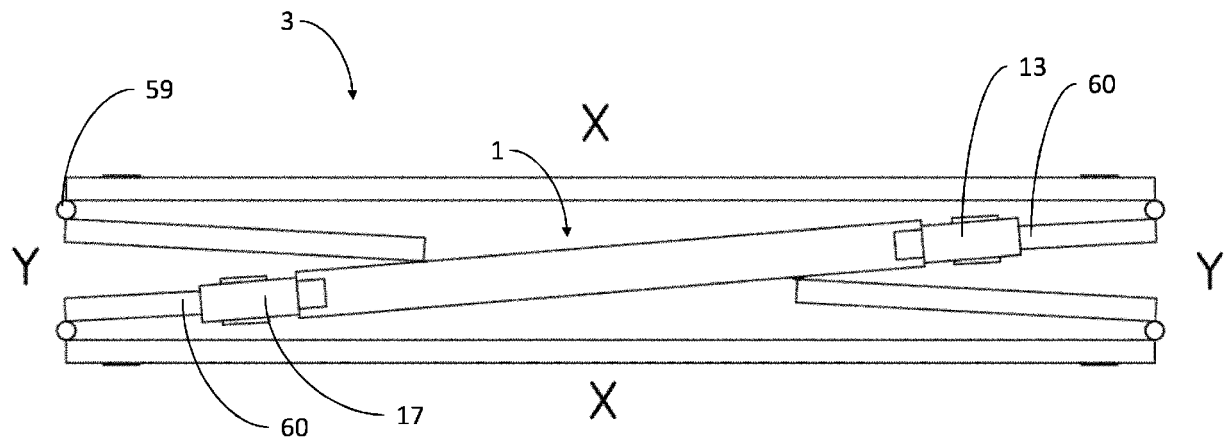


Fig. 12

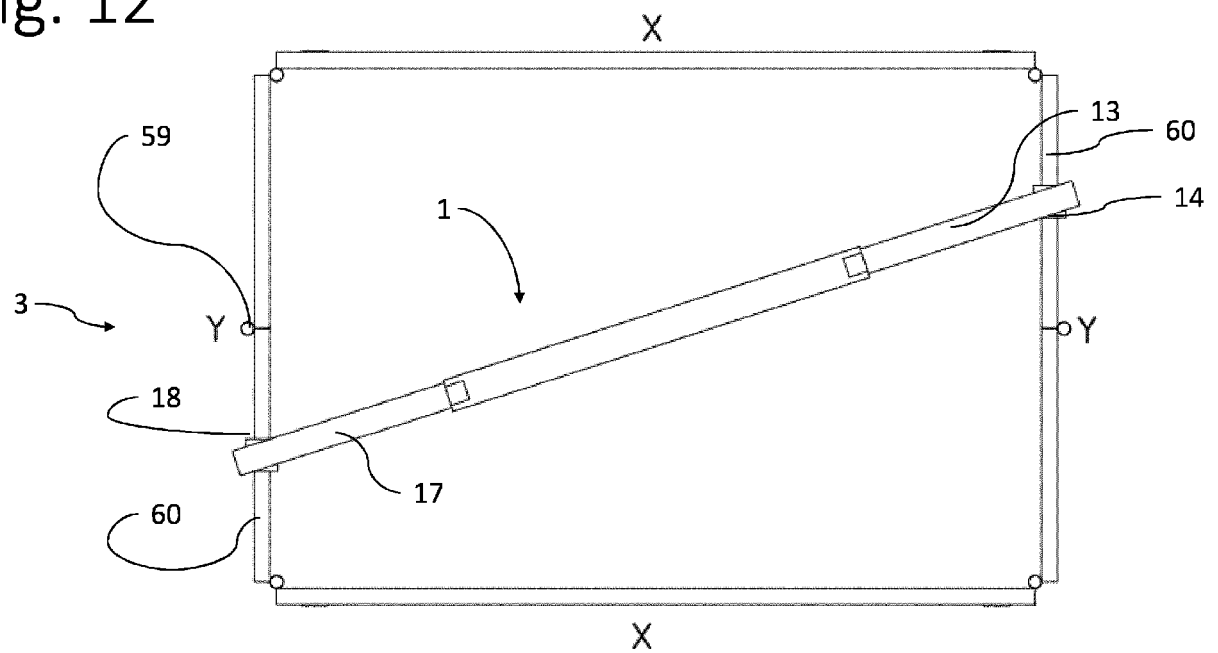
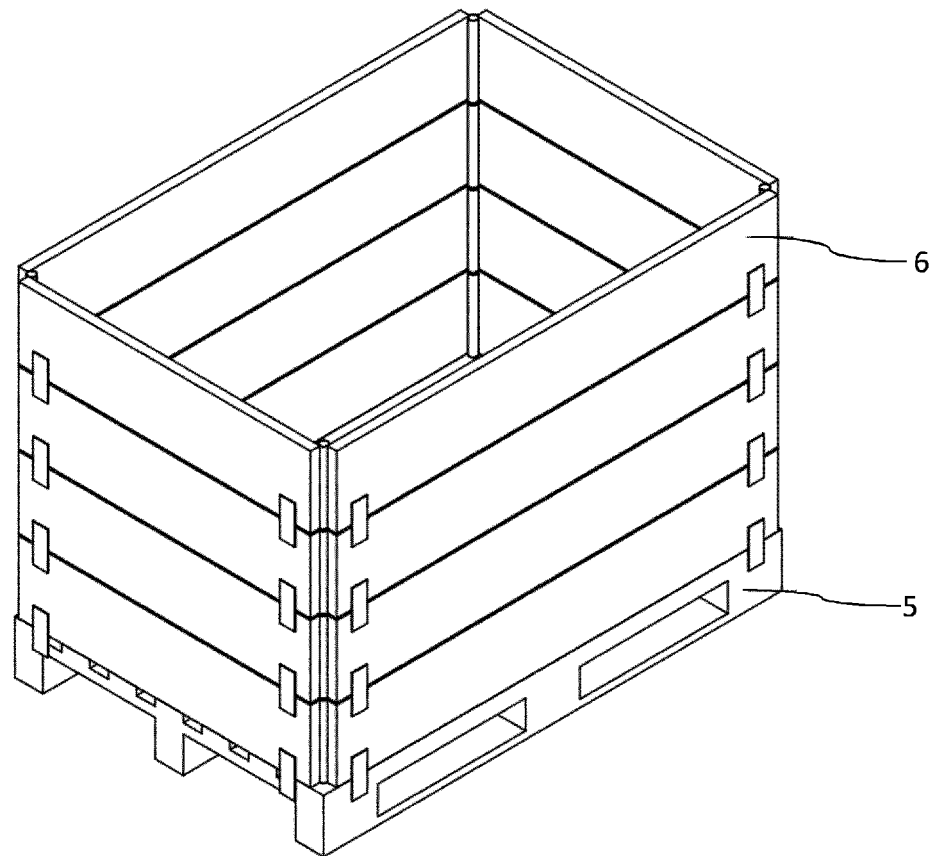


Fig. 13





EUROPEAN SEARCH REPORT

Application Number
EP 18 18 2283

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A,D	SE 463 257 B (UVA FMS AB [SE]) 29 October 1990 (1990-10-29) * abstract * * figures *	1,11,13	INV. B66C1/44
A	----- WO 99/00309 A1 (NILSSON KENT [SE]) 7 January 1999 (1999-01-07) * abstract * * figures *	1,11,13	
A	----- WO 2018/026320 A1 (CS CONSTRUCTION AND GEOTECHNIC PTE LTD [SG]) 8 February 2018 (2018-02-08) * abstract * * figures *	1,11,13	

			TECHNICAL FIELDS SEARCHED (IPC)
			B66C B65D B65G B25J
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 8 January 2019	Examiner Colletti, Roberta
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	

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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 18 18 2283

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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08-01-2019

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SE 463257	B	29-10-1990	NONE
WO 9900309	A1	07-01-1999	AU 7945598 A 19-01-1999 SE 509231 C2 21-12-1998 WO 9900309 A1 07-01-1999
WO 2018026320	A1	08-02-2018	SG 11201707987W A 30-05-2018 WO 2018026320 A1 08-02-2018

REFERENCES CITED IN THE DESCRIPTION

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- SE 463257 [0005] [0006] [0008] [0009] [0010]