

Side-lift spreader for a container

The present invention relates to container handling equipment. More specifically,
5 the present invention relates to a side-lift spreader intended for the handling of containers, in particular empty containers.

When handling empty containers, it is known to use a side-lift spreader attached to a lifting carriage arranged to be movable on a mast of a vehicle intended for
10 container handling. The side-lift spreader is movable along the mast from the lowermost stacking height to the uppermost stacking height. The side-lift spreader comprises a horizontal support structure which is in the operating position substantially parallel to a vertical plane and to which gripping means have been attached, and the front side of which horizontal support structure is, in the
15 operating position, substantially parallel to the longitudinal side of the container. To bring the gripping means, such as gripping hooks or gripping spindles, to a suitable gripping length at gripping apertures of the container, the gripping length of the horizontal support structure of the side-lift spreader is fixed or, more often, adjustable in order that containers of different gripping lengths, typically 20 – 40
20 feet long, may be handled by means of the side-lift spreader.

Most commonly, when a side-lift spreader of the hook type is used, the gripping hooks projecting from the front side of the side-lift spreader grip the apertures in the corner fittings of the upper corners of a longitudinal side of the container and,
25 when a side-lift spreader of the spindle type is used, gripping spindles grip the top apertures in the corner fittings of a longitudinal side of the container. The horizontal support structure extends in the vertical direction downwards below each gripping means such that the support areas or the corner fittings of the lower corners on the longitudinal side of the container can be supported on the
30 horizontal support structure in the operating position of the side-lift spreader.

In the known container side-lift spreaders it has been found to be problematic that, at the stage of gripping the container, the operator does not see very well the gripping area, the ends, upper corners and upper corner apertures of the container, and is prevented from seeing the gripping means, such as gripping hooks, which are situated on the front side of the upper area of the vertical beams placed at the ends of the horizontal support structure of the lift spreader, when viewed from the direction of the operator of the container loading device. Poor visibility is due to the known structural arrangement in which vertical end beams prevent direct visual contact in particular in higher stacking heights with more than 5 – 8 containers placed one on top of another.

An object of the present invention is to provide a novel and inventive side-lift spreader for a container, which spreader makes it possible to solve or at least minimize the above-mentioned problems and drawbacks.

These objects are achieved by the present invention, the characteristic features of which are defined in the appended set of claims.

The invention is generally characterized in that a fork structure which is open at its outer edge and comprises a gripping means is arranged in the area of a left and a right side end of the horizontal support structure of the side-lift spreader in order to allow direct visual contact with the gripping area of the container and with the gripping means.

It is characteristic of one embodiment of the invention that the fork structure that is open at its outer edge comprises an upper arm to which the gripping means is attached directly or through an intermediate part.

It is characteristic of one embodiment of the invention that the fork structure that is open at its outer edge comprises a lower arm to form a support area below the gripping means.

It is characteristic of one embodiment of the invention that the horizontal support structure comprises a frame and a right-hand lifting arm and a left-hand lifting arm, which arms are arranged in the frame so as to be movable in a lateral direction and to the end areas of which arms the fork structures which are open at the outer edges are attached.

It is characteristic of one embodiment of the invention that the gripping means is of the hook type.

10 It is characteristic of one embodiment of the invention that the gripping means is of the spindle type.

It is characteristic of one embodiment of the invention that the support structure that is open at its outer edge is C-shaped.

15 It is characteristic of one embodiment of the invention that the horizontal support structure comprises a frame that is arranged to move in a lateral direction with respect to the lifting carriage.

20 It is characteristic of one embodiment of the invention that the horizontal support structure comprises a frame, and in the movement fit between the lifting carriage and the frame there is a clearance for free tilting of the horizontal support structure to a position that deviates from a horizontal position.

25 In the arrangement in accordance with the invention, the fork structure that is open at its outer edge is arranged in the area of both ends of the horizontal support structure of the container side-lift spreader, a gripping means being attached to the area of the upper arm of the fork structure. The fork structure is arranged to be open such that it enables the operator of the container handling device to have
30 direct visual contact with the gripping area of the container, i.e. with the upper corners of the ends of the longitudinal side walls of the container, including the

side gripping apertures of the upper corners, and the fork structure is arranged further to be open such that it enables direct visual contact with the gripping means, such as gripping hooks, which are arranged to project, for example, to the front side of the end areas of the upper arms of the open fork structures. When
5 gripping the side gripping apertures, the side-lift spreader in accordance with the invention makes it possible to lift either only one container or simultaneously two containers placed one on top of the other. Visual contact is unhampered and direct advantageously in all container stacking heights when handling 1 – 9 containers, advantageously more than 5 – 9 containers, and in all ISO container gripping
10 lengths of 20 – 40 feet. Advantageously, the invention can also be applied to the side-lift spreaders of the spindle type, in which, for example, gripping spindles arranged in connection with the upper arms of the open fork structures grip, from above, gripping apertures on top of the container.

15 The invention will be described in the following with reference to the appended figures, which illustrate one container side-lift spreader in accordance with an embodiment of the invention considered to be advantageous, yet not limiting the invention solely to the illustration of the figures.

20 Figure 1 shows a side-lift spreader for a container in accordance with the prior art.

Figure 2 shows a side-lift spreader for a container in accordance with an advantageous embodiment of the invention as a perspective view seen from the direction of the operator.

25

Figure 3 is a partial sectional view of the right side of a side-lift spreader for a container in accordance with one embodiment of the invention.

Figure 4 is a top view of the right side of the container side-lift spreader shown in
30 Fig. 3.

Figure 5 illustrates the free tilting of a container side-lift spreader in a lifting carriage.

Fig. 1 is a perspective view, seen from the direction of the operator, of a side-lift spreader 2 without a lifting carriage for a container 10, which side-lift spreader is adjustable in gripping length, and of a horizontal support structure 3 of the side-lift spreader 2 in accordance with the prior art. The coupling of the horizontal support structure 3 of the side-lift spreader 2 to the mast of a container handling vehicle by means of a lifting carriage is not shown in Fig. 1. The lifting carriage is movable along the not shown mast in the area between the lowest and the highest stacking height of the container 10.

At the front side, i.e. at the side of a longitudinal side 11 of the container 10, the horizontal support structure 3 is substantially parallel to a vertical plane, and the horizontal support structure 3 comprises a horizontal frame 4, inside which a right-hand lifting arm 5 and a left-hand lifting arm 5' are arranged to be movable, which arms are extendable, for example, by means of a cylinder device in a lateral direction. At the outer ends of the lifting arms 5, 5' there are end beams 6, 6', which are directed perpendicularly upwards with respect to the lifting arms 5, 5' and which are, during the handling of the container 10, substantially parallel to the longitudinal side 11 of the container 10. The outer sides of the end beams 6, 6' are about flush with the end faces of the container 10 to be handled when gripping the container 10. A right-hand gripping hook 7 is placed to project from the front side of an upper part 6a of the right-hand end beam 6, i.e. from the side facing the container 10 and, similarly, a left-hand gripping hook 7' is placed on the front side of an upper part 6a' of the left-hand end beam 6'.

The gripping hooks 7, 7' are not completely visible in the illustration of Fig. 1 because the end beams 6, 6' obstruct direct visual contact. Also, not shown hydraulic and electrical connections leading to the gripping means, which connections in this type of side-lift spreaders are often placed above the horizontal

frame 4 while protected by energy transfer chains or cable cover pipes, hamper visual contact with the gripping area. In Fig. 1, support areas arranged in the area of lower parts 6b, 6b' of the end beams 6, 6', i.e. in the area where the end beams 6, 6' and the lifting arms 5, 5' are joined together, support during lifting the support areas of the container 10 arranged in the end area of the longitudinal side 11 of the container 10 and provided with reinforcement structures, i.e. in this case, the end edges of the longitudinal side 11 above lower corners 14, 15. The vertical end beams 6, 6' belonging to the structure of the prior art side-lift spreader 2 and, in particular in small gripping lengths, also the horizontal frame 4 prevent the operator of the container handling device from having direct visibility to the gripping area of the container 10, as shown in Fig. 1, in particular in greater stacking heights when handling, for example, 5 – 9 containers. In the uppermost stacking heights, the gripping hooks of the side-lift spreader cannot be seen directly, with the result that the risk of accidents and damage increases. The end beams 6, 6' prevent the operator from having direct visual contact with the gripping area, i.e. with upper corners 12, 13 of the longitudinal side 11 of the container 10, the upper corners being provided with gripping apertures in which the gripping hooks 7, 7' projecting from the front side of the end beams 6, 6' of the container side-lift spreader 2 shall be disposed. Visual contact with the gripping hooks 7, 7' and with the gripping apertures deteriorates in particular upon transition to greater stacking heights and to smaller gripping lengths.

Fig. 2 depicts a side-lift spreader 22 with adjustable gripping length for a container 10 in accordance with an advantageous embodiment of the invention, as a perspective view from the direction of the operator of a container handling vehicle, without a lifting carriage. The side-lift spreader 22 comprises a horizontal support structure 23, and a fork structure 26, 26' that is open at its outer edge is arranged in the area of both side ends of the horizontal support structure, a gripping means being attached directly or through an intermediate part/intermediate parts to the area of an upper arm 26a, 26a' of the fork structure; in other words, a fork structure 26, which is open at its outer edge and to the area of whose upper

arm 26a a gripping means is attached, is arranged in the area of the right end of the horizontal support structure 23, and a fork structure 26', which is open at its outer edge and to the area of whose upper arm 26a' a gripping means is attached, is arranged in the area of the left end of the horizontal support structure 23. The coupling of the horizontal support structure 23 of the side-lift spreader 22 to the mast of the container handling vehicle by means of a lifting carriage is not shown in Fig. 2.

At the front side, i.e. at the side of a longitudinal side 11 of the container 10, the horizontal support structure 23 in the hook-type side-lift spreader 22 of Fig. 2 is substantially parallel to a vertical plane, and the horizontal support structure 23 comprises a horizontal frame 24 and lifting arms, a right-hand lifting arm 25 and a left-hand lifting arm 25', arranged one upon the other so as to be movable inside the frame 24, which arms are extendable, for example, by means of a cylinder device in a lateral direction and to the end areas of which arms the fork structures 26, 26', which are open at their outer edge and comprise gripping hooks, are attached.

The frame 24 can be arranged to move in a lateral direction to the right and to the left in a not shown lifting carriage in order to bring the side-lift spreader 22 of the container 10 to a suitable position in the longitudinal direction of the container to dispose the gripping means in gripping apertures of the container 10.

The fork structures 26, 26' which are open at their outer edge and comprise a gripping means, i.e. a gripping hook 27, 27' in Fig. 2, in accordance with the invention are attached to the ends of the lifting arms 25, 25' at the same height level with respect to the frame 24. Each fork structure 26, 26' is arranged to be open such that it enables the operator of the handling vehicle of the container 10 to have direct visual contact with the gripping area of the container, i.e. with the upper corners 12, 13 at the ends of the longitudinal side walls 11 of the container 10, including side gripping apertures 28, 28' of the upper corners, and, in addition,

the fork structures 26, 26' are arranged to be open such that they enable direct visual contact with the gripping hooks 27, 27', which are arranged to project to the front side of the end areas of the upper arms 26a, 26a' of the open fork structures 26, 26'.

5

When comparing the side-lift spreader 22 of an advantageous embodiment of the invention shown in Fig. 2 with the prior art side-lift spreader 2 shown in Fig. 1, it can be clearly seen that, in the side-lift spreader 22 of Fig. 2, in the immediate vicinity below the gripping means, such as a gripping hook 27, 27' or a gripping
10 spindle, there are no structures that prevent visual contact, such a structure being, for example, the vertical end beam 6, 6' of the prior art side-lift spreader 2 of Fig. 1. Moreover, visual contact with the gripping areas is not prevented by hydraulic and electrical connections, not shown, possibly leading to the gripping means if it were desirable to place them above the horizontal frame 24 while protected by
15 energy transfer chains or cable cover pipes, since said hydraulic and electrical connections can be attached, for example, to the vertical portions of the upper arms 26a, 26a' of the fork structures 26, 26', which vertical portions are at the side out of the way of direct visual contact with the gripping area and the gripping means. In accordance with the invention, direct visual contact with the gripping
20 area of the container 10 and with the gripping hooks 27, 27' is enabled by the open fork structure 26, 26' in the stacking heights of 1 – 9 containers, advantageously in the great stacking heights of 5 – 9 containers, and in all container gripping lengths.

25 In Fig. 2, the laterally outermost parts of the right-hand fork structure 26 and the left-hand fork structure 26' are arranged to be about flush with the end face of the container 10 to be handled when the container 10 is gripped in order that containers 10 may be stacked closely one after another and that, for example, a single container 10 may be handled in the middle of containers arranged closely
30 one after another. In Fig. 2, support areas 29, 29' arranged in the area of lower arms 26b, 26b' of the fork structures 26, 26' below the gripping hooks support

during lifting the support areas of the container 10 arranged in the end areas of the longitudinal side 11 of the container 10 and provided with reinforcement structures, i.e. they support the end edges of the longitudinal side 11 above lower corners 14, 15 of the container.

5

Fig. 3 is a partial sectional view of the right side of a container side-lift spreader 22 in accordance with one embodiment of the invention, and Fig. 4 is a top view of the right side of the container side-lift spreader 22 of Fig. 3, the container 10 being almost in contact with the side-lift spreader 22 in Figs. 3 and 4. In Figs. 3 and 4, the right-hand part of the hook type side-spreader 22 illustrates how the container 10 is gripped. The container 10 shown with broken lines is supported, on the side of its longitudinal side 11, on a horizontal support structure 23 of the container side-lift spreader 22. More specifically, a hook 27 which serves as a gripping means and is placed in the area of an upper arm 26a of an open fork structure 26, which is situated at the end of a laterally movable lifting arm 25 disposed in a frame 24, to project to the front side of the upper arm 26a, is disposed in a gripping aperture 28 of the container 10 and, on the other hand, the longitudinal side 11 of the container 10 rests at its sufficiently reinforced support area, for example, at its lower part or at its lower corner or at its end edge, on a support area 29 arranged at a lower end 26b of the C-shaped fork structure 26 that is open at its outer edge. Thus, the C-shaped fork structure 26 of the side-lift spreader 22, which is open at its outer edge in accordance with the invention, enables the gripping area of the container 10 to be visible.

25 The upper arm 26a of the open fork structure 26 directed upwards and outwards carries by the gripping hook 27 the vertical load caused by the mass of the container 10 and the support area 29 directed downwards and outwards and arranged on the lower arm 26b of the open fork structure 26 supports the container in the upright position. In Figs. 3 and 4, the support area 29 is arranged below the gripping hook 27 and a support area provided with a reinforcement structure and situated in the lower part of the longitudinal side 11 of the container 10 - a

30

container corner in this exemplifying case - is supported on the support area 29 in the situation when the container is handled.

Differing from the illustration of Figs. 1 – 4, the fork structure 26, 26' can also have a shape other than the C-shape such that a gripping means is arranged on the upper arm 26a, 26a' of the fork structure and the purpose of a support area arranged on the lower arm 26b, 26b' is to support the container 10 substantially below the gripping means, for example, in the area of the reinforced end edge of the longitudinal side 11 of the container 10.

10

Fig. 5 shows the structure of a lifting carriage 30 of the horizontal support structure 23 of the side-lift spreader 22, which structure enables free-tilting of the horizontal support structure 23 in the lifting carriage 30 within limits, at the most to the extreme positions, deviating from the horizontal position, indicated with broken lines. The lifting carriage 30 comprises a horizontal upper support 31 and a horizontal lower support 32, between which the frame 24 of the horizontal support structure 23 is disposed. When tilted, the extreme positions of the horizontal support structure 23 deviate by about 3° from the horizontal position. The tilting of the side-lift spreader 22 from the horizontal position is needed, for example, when the gripping surface of the container to be stacked or the surface on which the container to be stacked has been placed is not parallel to the support surface of the container handling vehicle. When the side-lift spreader 22 shown in Fig. 5 is used for gripping a container situated on an inclined surface, the horizontal support structure 23 is disposed along the container freely such that the gripping means can be passed into the gripping apertures. Similarly, when the container is lowered onto an inclined lowering surface, the horizontal support structure 23 follows the container freely, with the gripping means secured to the gripping apertures, so far down until the container in its entirety is supported by the lowering surface or both ends of the container have been lowered onto the lowering surface. Thus, a separate actuator is not needed to tilt the horizontal

30

support structure 23 of the side-lift spreader 22 to a position that deviates from the horizontal position.

In Fig. 5, the portions situated at the sides of the frame 24 of the horizontal support structure 23, such as open fork structures comprising lifting arms and gripping means, are excluded from the side-lift spreader 22. The lifting carriage 30 and the frame 24 are depicted in Fig. 5 as a sectional drawing of principle, as a section at the longitudinal vertical division plane of the frame 24.

The free tilting of the lifting carriage 30 enabling the horizontal support structure 23 to tilt to a position deviating from a horizontal position is accomplished by arranging a suitable vertical clearance F in the movement fit between the lifting carriage 30 and the frame 24. In this exemplifying embodiment, the movement fit is a sliding fit. In Fig. 5, the frame 24 is arranged to slide a limited distance in a lateral direction within the lifting carriage 30 between the upper support 31 and the lower support 32, for example, by means of a not shown cylinder device placed above the lifting carriage 30 and attached pivotably to the lifting carriage 30 and to the frame 24 in order that the tilting of the frame 24 be enabled in a manner limited by the clearance F.

The frame 24 slides in a horizontal position on its lower surface on both slide pieces 33 arranged inside the lifting carriage 30 in the end areas of the lower support 32 of the lifting carriage. The slide pieces 33 in the lower part of the lifting carriage 30 are provided, for example, on the bottom surface of the slide piece 30, with a floating frame that is in contact with the inner surface of the lower support 32 in order that during tilting the surface pressure of the frame 24 and of the slide piece 33 in contact therewith be even.

When the frame 24 is tilted in a direction deviating from a horizontal position, in the respective extreme positions the inside end edge of the upper support 31 of the lifting carriage 30 forms on the right and on the left a backup part, on which the

upper surface of the frame 24 is supported. The degree of tilting of the frame 24 can be affected by dimensioning the clearance F between the slide pieces 33 of the lifting carriage 30 and the frame 24, the distance between the slide pieces 33 from each other and the height of the frame 24 in the vertical direction such that the
5 desired degree of tilting is achieved, for example, between 1° and 5°, advantageously 3° from the horizontal position. In addition to the sliding guiding, the frame 24 can also be guided into the lifting carriage 30, for example, using an arrangement of the roller bearing type.

10 The invention has been described above by way of example with reference to the figures of the appended drawings. However, the invention has not been limited to the illustration of the figures but the different embodiments of the invention may vary within the inventive idea defined in the appended claims.

15 Thus, the container side-lift spreader in accordance with the invention can also be applied to a container handling vehicle in which the lifting of the container takes place on support of something other than a mast, for example, on support of a boom or equivalent. In that case, the horizontal support structure of the container side-lift spreader can be arranged to be movable by means of a boom or an
20 equivalent lifting arm, and in place of the lifting carriage there can be a lifting frame allowing free tilting in accordance with one embodiment of the invention.

Claims

1. A container side-lift spreader (2, 22) for handling containers (10), in particular empty containers, comprising a lifting carriage (30) arranged on a mast of a container handling vehicle so as to be movable in a vertical direction and a horizontal support structure (3, 23) arranged in the lifting carriage, gripping means (7, 7') for gripping gripping apertures (28) of a longitudinal side (11) of the container from a lateral direction or gripping means for gripping gripping apertures of a top side of the container being arranged in the area of both side ends of said horizontal support structure for gripping the container, and the horizontal support structure (3, 23) extending downwards in a vertical direction to support the container at support areas (14, 15) of the longitudinal side (11) of the container, **characterized** in that a fork structure (26, 26') which is open at its outer edge and comprises a gripping means (27, 27') is arranged in the area of a left and a right side end of the horizontal support structure (23) of the side-lift spreader (22) in order to allow direct visual contact with the gripping area of the container (10) and with the gripping means (27, 27').
2. A slide-lift spreader as claimed in claim 1, **characterized** in that the fork structure (26, 26') that is open at its outer edge comprises an upper arm (26a, 26a') to which the gripping means (27, 27') is attached directly or through an intermediate part.
3. A slide-lift spreader as claimed in claim 1, **characterized** in that the fork structure (26, 26') that is open at its outer edge comprises a lower arm (26b, 26b') to form a support area (29, 29') below the gripping means.
4. A slide-lift spreader as claimed in any one of claims 1 to 3, **characterized** in that the horizontal support structure (23) comprises a frame (24) and a right-hand lifting arm (25) and a left-hand lifting arm (25'), which arms are arranged in the

frame (24) so as to be movable in a lateral direction and to the end areas of which arms the fork structures (26, 26') which are open at the outer edges are attached.

5 5. A slide-lift spreader as claimed in any one of claims 1 to 4, **characterized** in that the gripping means (27, 27') is of the hook type.

6. A slide-lift spreader as claimed in any one of claims 1 to 4, **characterized** in that the gripping means (27, 27') is of the spindle type.

10 7. A slide-lift spreader as claimed in any one of claims 1 to 6, **characterized** in that the support structure (26, 26') that is open at its outer edge is C-shaped.

8. A slide-lift spreader as claimed in claim 1, **characterized** in that the horizontal support structure (23) comprises a frame (24) that is arranged to move in a lateral
15 direction with respect to the lifting carriage (30).

9. A slide-lift spreader as claimed in claim 1, **characterized** in that the horizontal support structure (23) comprises a frame (24), and in the movement fit between the lifting carriage (30) and the frame (24) there is a clearance (F) for free tilting
20 of the horizontal support structure (23) to a position that deviates from a horizontal position.