

Automatic locking mechanism, locking system and a method for operating the locking mechanism

TECHNICAL FIELD

5 The present invention relates to the field of mechanical interlocking of object, such as the interlocking of a container module to a mounting surface.
Specifically, the invention relates to an automatic locking mechanism, a locking system comprising at least on locking mechanism for interconnecting an object to a mounting surface, and a method for operating the locking mechanism.

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The locking mechanism and locking system of the present invention are particularly suitable to be used in combination with standard cargo containers or equipment modules having sizes corresponding to 20- or 40-foot cargo containers or corresponding to several interconnected cargo containers, which are to be connected to a mounting surface, such as a mounting surface on a sea vessel.

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BACKGROUND OF THE INVENTION

Within the technical field of container or equipment module shipping, or shipping in general, it is known to interconnect equipment modules or cargo containers to a mounting surface, such as the deck of a ship, a truck or freight train, by using manually operated standard twist locks such as ISO twist locks, suitable to be used with standard container corners, such as standard ISO 1161 container corners.

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For the operation of interconnecting the container or equipment module to the mounting surface, it is known that an operator needs to manually operate the lock into a locked position or vice versa. The operation is therefore time consuming, and entails a security risk for the operator, as the containers or modules are extremely heavy, and usually weigh several tons.

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Especially when arranging the modules or container on cargo ships, which containers/modules are arranged in stacks closely positioned in relation to each other, it is difficult, dangerous, and cumbersome for an operator to manually lock/unlock the twist locks. Further, in situations where the containers/modules are arranged in stacks against each other, it is not possible to gain access to all twist locks by the operator, which twist locks cannot be locked. Hereby some containers/modules are not fully interconnected with the mounting surface.

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One example of prior art systems is disclosed in DK 179486 B1. The referred document discloses a

- 5 It is an object of the present invention to provide an automatic locking mechanism, a locking system and method for operating the locking mechanism which overcomes the above-described disadvantages.

The above object and advantages, together with numerous other objects and advantages, which will be evident from the following description of the present invention,
10 are according to a first aspect of the present invention obtained by:

An automatic locking mechanism for the interconnection of an equipment module or cargo container to a mounting surface, the locking mechanism comprising a housing, an elongated shaft element and a top part for interconnection with a part of the
15 equipment module or cargo container, where the shaft element and top part are longitudinally displaceable within the housing.

The automatic locking mechanism is hereby suitable to be installed, removably or permanently into a mounting surface, such as the deck of a ship, a truck or freight train etc. in which the locking mechanism can be in at least two positions, a first position where the top part is disengaged with a part of the equipment module or cargo container and a second position, where the top part is engaged with a part of the equipment module or cargo container.

25 In a basic, embodiment, the automatic locking mechanism moves from the first position to the second position once the module/container has been correctly positioned on the mounting surface, such that the part(s) of the equipment module or cargo container for connection, aligns correctly with the locking mechanism(s). Preferable, the module/container comprises a part for connection at each corner, where the part(s)
30 are preferably arranged as standard ISO container corners. Each module/container may comprise fewer or more of such connection parts, for interconnection with a corresponding number of automatic locking mechanisms arranged in or on the mounting surface.

Once the top part has projected into the part of the module/container for connection,
35 the module/container is prevented from unintentionally moving across the mounting surface.

The automatic locking mechanism is preferably removably arranged in the mounting surface. The locking mechanism comprises a housing in which the elongated shaft element and top part is arranged longitudinally displaceable.

5 The housing comprises means for connection to the mounting surface, such that locking mechanism can be arranged within the mounting surface. The means for connection may comprise bolt fastening means or other suitable fastening means for releasably connecting the locking mechanism to the mounting surface.

10 The mounting means preferably comprises a mounting surface element, which is arranged as a plate-shaped element which can be removably incorporated into the mounting surface such that an upper part of the plate-shaped element forms part of the mounting surface. The plate-shaped element comprises an opening, and the locking mechanism can be connected to the lower surface of the plate-shaped element, such that at least the top element can extend through the opening, and into engagement with the part of the module/container.

15 The plate-shaped element comprises first means, e.g. bolt holes for interconnection with the housing via a number of fastening bolts, and second means, e.g. also arranged as bolt holes for connecting the plate-shaped element to the mounting surface such as the deck of a ship, a truck or freight train etc.

20 The means for connecting the plate shaped element to the housing, and the mounting surface, may be arranged differently than bolt holes, such as differently arranged connection means for interconnection, preferably releasably interconnection, of the different parts, which lies within the capabilities of the skilled person.

25 The housing is preferably sealed and arranged as a fluid-tight housing, such that water, oil, moisture, dirt, etc. cannot enter the interior of the locking mechanism. Therefore, between the housing and the shaft and/or top part, there is arranged suitable sealing means, such as packing, e.g. rubber packings/O-rings, to prevent any intrusion of unwanted matter which could result in malfunctioning of the locking mechanism.

30 The locking mechanism preferably comprises drive means for performing a longitudinal displacement of the elongated shaft element and/or the top part in relation to the housing, such that the top part can move between a position where the locking is disconnected from the module/container to a position where the locking mechanism is connected to the container. The drive means may be incorporated into the locking
35 mechanism or arranged as an external drive mechanism which displaces the elongated shaft element and/or top part.

Preferably, the drive means are incorporated into the housing and comprises a hydraulic piston, a screw thread mechanism or a rack and pinion mechanism.

According to a further embodiment of the first aspect of the invention, the shaft element and/or at least part of the top part is arranged rotatable in relation to an axis substantially parallel with the direction of longitudinal displacement.

After the elongated shaft element has been displaced such that at least part of the top part projects into engagement with the part of the module/container, the elongated shaft element and/or at least a part of the top part is rotatably arranged in the housing, such that at least the part of the top part after rotation engages the part of the module/container for preventing movement of the module/container in a vertical direction. The rotational movement of the shaft element and/or at least part of the top part is automatically performed by suitable forcing means.

The forcing means may be incorporated into the locking mechanism or arranged as external forcing means, which rotates the elongated shaft element and/or at least part of the top part. The forcing means may be driven by any suitable force, such as hydraulic, electrical, pneumatic or mechanical means.

Preferably, the forcing means are incorporated into the housing and comprises a hydraulic piston, a screw thread mechanism or a rack and pinion mechanism.

According to a further embodiment of the first aspect of the invention, the top part comprises a rotatable top element, such as a cone-shaped top element, for interconnection with the part of said equipment module or cargo container, such as an ISO container corner, of the equipment module or cargo container, by the rotation.

In a preferred embodiment, the top part comprises a rotatable top element which is preferably a cone-shaped top element suitable to interlock with a standard ISO container corner.

By actuation of the forcing means, the top element rotates into engagement with the part of the module/container.

According to a further embodiment of the first aspect of the invention, the top part comprises a collar part, extending between the top element and the elongated shaft

element, the collar part being arranged for engagement with an opening in the part of the equipment module or cargo container in a non-rotationally manner.

5 The top part comprises a collar part, which when the elongated shaft element and/or top part has been displaced, interacts with an opening into the part of the module/container. Preferably the opening corresponds to a standard elongated opening in a standard ISO container corner.

Once the top part has been displaced into engage with the part of the module/container, the collar part projects into the opening and is hereby kept in a non-rotationally
10 position in relation to the housing. Arranging the locking mechanism with such collar part provides a stabile position of the module/container in a horizontal direction.

According to a further embodiment of the first aspect of the invention, the elongated shaft element being rotatable in relation to the collar.
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In a preferred embodiment, both the elongated shaft element and the top element are rotationally arranged within the housing and arranged rotationally in relation to the collar part.

20 According to a further embodiment of the first aspect of the invention, the locking mechanism comprises drive means for displacing the elongated shaft in the longitudinal direction.

As describe above, the locking mechanism comprises drive means for performing a
25 longitudinal displacement of the elongated shaft element and/or the top part in relation to the housing such that the top part can move between a position where the locking is disconnected from the module/container to a position where the locking mechanism is connected to the container. The drive means are incorporated into the locking mechanism and arranged for displacement of the elongated shaft element and/or top part.

30 According to a further embodiment of the first aspect of the invention, the mechanism comprises forcing means for creating the rotation.

As described above, the elongated shaft element and/or at least a part of the top part
35 is rotatable arranged in the housing, such that at least the part of the top part after ro-

tation engages the part of the module/container for preventing movement of the module/container in a vertical direction. The rotational movement of the shaft element and/or at least part of the top part is automatically performed by forcing means which are preferably incorporated into the housing of the locking mechanism.

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According to a further embodiment of the first aspect of the invention, the locking mechanism comprises locking means for locking the elongated shaft and/or said top element against longitudinal displacement and/or rotation in relation to the housing.

- 10 In order to prevent unintentional displacement of the elongated shaft element and/or the top part and/or rotational movement of the elongated shaft element and/or the top part, locking means are provided. Such locking means may include, but is not limited to, locking pins protruding into a receiving opening in the elongated shaft element. Other suitable locking means known to the skilled person for preventing displacement
15 or rotation may be incorporated.

- According to a further embodiment of the first aspect of the invention, the locking mechanism, comprises a releasable locking mechanism, such as a ball lock, in an interface between the abutment element and the elongated shaft element, for indexing
20 the collar and the abutment element during engagement with the opening in said part of the equipment module or cargo container.

- The collar and the abutment element are rotatably arranged in relation to the elongated shaft element, the top element and the top element shaft, which is connected to
25 the elongated shaft in a non-rotationally manner. However, when displacing the elongated shaft element and/or the top part in relation to the housing in the longitudinal direction and into engagement with the opening in the part of the module/container, in which the collar part projects into the opening for being in a non-rotationally position in relation to the housing, the releasable locking mechanism, which in a preferred embodiment is a commonly known ball lock, ensures that the collar and the abutment element is kept in a correct position in relation to the elongated shaft element and hereby
30 in a correct position (correct indexing) for insertion through the opening of the part of the equipment module or cargo container.

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According to a further embodiment of the first aspect of the invention, the top part comprises an abutment element having an abutment surface for facing the part of the equipment module or cargo container.

- 5 The top part preferably comprises an abutment element with an upper surface functioning as an abutment surface for abutting the module/container, especially for abutting the part of the equipment module or cargo container. The abutment element may thus function as a support surface for the module/container.

The locking mechanism may be arranged such that the drive means may displace the
10 top element and the abutment surface above the level of the mounting surface.

Thus, the feature is especially advantageous for the operation of loading the module/container onto the mounting surface. The module may be hoisted onto the mounting surface e.g. by cranes which via fixing points at the upper part of the module/container lift the module/container.

- 15 The module/container may however also be hoisted and loaded onto the mounting surface by loading equipment which lifts the module/container from beneath, e.g. by an element or elements engaging the lower surface of the module/container.

In order to retract such lifting element from underneath the module/container, the used locking mechanism is raised such that the abutment surface is above the mounting
20 surface, hereby functioning as a lift, whereby the lifting element(s) may be retracted out from underneath the module/container.

After the lifting element(s) has been retracted, the locking mechanisms are preferably lowered such that that a main part of the module/container rests on the support surface. In this position, the supporting surface may be substantially parallel with the
25 mounting surface.

According to a second aspect of the present invention, the above objects and advantages are obtained by:

- A locking system, comprising at least one locking mechanism according to the
30 invention, and a mounting surface element having an upper surface for facing the equipment module or cargo container, and adapted for connection with the mounting surface, and the housing being connected to said mounting surface element.

The locking mechanism as described above, is preferably removably associated with a
35 mounting surface element having an upper surface for facing the equipment module or cargo container and adapted for connection with the mounting surface. The housing is

preferably removably mounted to the mounting surface element via suitable connection means such as e.g. bolts or other suitable connection means, but may in the alternative be non-removably connected to the mounting surface element such as e.g. by welding. Arranging a locking system comprising at least one locking mechanism and a mounting surface element provides a system which is easily connectable with the mounting surface in a removably manner.

The locking system comprises in one embodiment one locking mechanism and a mounting surface element, and in a further embodiment a further number of locking mechanisms. The locking system may comprise 2, 3, 4 or even a further number of locking mechanisms connected to the mounting surface element.

Providing the mounting surface element with more than one locking mechanism is advantageous when connecting multiple modules/containers next to each other. When arranging stacked modules/containers in close proximity on a mounting surface, the accessibility of the commonly known locking mechanisms, such as known twist locks, is extremely limited and associated with severe health risk. By arranging the mounting surface element with multiple locking mechanism, the modules/containers can be mounted on, and connected to the mounting surface with minimum intermediate distance and without human involvement.

According to a further embodiment of the second aspect of the invention, the mounting surface element (34) has a downwards tapered circumferential side edge.

The mounting surface element preferably comprises a circumferential side edge which is downwards tapered. The downwards tapered shape eases the installation of the system and arranges the locking system at a precise defined position within or on the mounting surface.

According to a further embodiment of the second aspect of the invention, the top part being longitudinal displaceable between two positions, a first retracted position where the top element is arranged substantially non-projecting from the upper surface of the mounting element and a second projecting position in which the top element projects from the upper surface.

The locking system is hereby suitable to be installed, removably or permanently, into the mounting surface in which the locking mechanism can be in at least two positions, a first position where the top part is disengaged with a part of the equipment module or

cargo container and a second position, where the top part is engaged with a part of the equipment module or cargo container.

In a basic embodiment, the automatic locking mechanism moves from the first position to the second position once the module/container has been correctly positioned on the mounting surface, such that the part(s) of the equipment module or cargo container for connection aligns correctly with the locking mechanism(s). Preferably, the module/container comprises a part for connection at each corner, where the part(s) are preferably arranged as standard ISO container corners. Each module/container may comprise fewer or more of such connection parts, for interconnection with a corresponding number of automatic locking mechanisms arranged in or on the mounting surface.

Once the top part has projected into the part of the module/container for interconnection, the module/container is prevented from unintentionally moving across the mounting surface.

As further described above, in order to retract the lifting elements when loading the modules/container from underneath the module/container, the locking mechanisms are raised such that the abutment surface is above the mounting surface, hereby functioning as a lift, whereby the lifting element(s) may be retracted out from underneath the module/container.

According to a further possible embodiment, the mounting surface element comprises means for lifting the locking system out of the mounting surface.

In order for the locking system to be lifted out of or into the mounting surface, the locking system may comprise lifting means, such as a hoisting eye, or other suitable means for lifting/lowering the locking system out of or into the mounting surface.

According to a third aspect of the present invention, the above objects and advantages are obtained by:

A method for operating a locking mechanism or locking system according to the invention, comprising the following steps:

- providing the locking mechanism in a mounting surface, the locking mechanism being arranged in a substantially non-projecting position in relation to the mounting surface,
- arranging an equipment module or container at a specific location on said mounting surface, said equipment module or container comprising a part for interconnection with said locking mechanism,

- displacing said elongated shaft element and said top part in a direction towards said equipment module or container, such that at least part of said top part projects into said part of said equipment module or container.

5 According to a further embodiment of the second aspect of the invention, the locking mechanism being longitudinal displaceable, such that the abutment element extends above the mounting surface, for lifting the equipment module or container a distance above the mounting surface.

10 Fig. 1 is a perspective view of the automatic locking mechanism, without housing, in a retracted position.

Fig. 2 is a perspective view of the automatic locking mechanism, without housing, in an extended position.

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Fig. 3A is a perspective view of the locking system in a retracted position, and part of a module container.

Fig. 3B is a perspective view of the locking mechanism in a retracted position, and part
20 of a module container.

Fig. 4A is a perspective view of the locking system in a retracted position, and part of a module container arranged on the locking system.

25 Fig. 4B is a perspective view of the locking mechanism in a retracted position, and part of a module container arranged proximate the locking mechanism.

Fig. 5A is a perspective view of the locking system in an extended position, and part of a module container arranged on the locking system.

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Fig. 5B is a perspective view of the locking mechanism in an extended position, and part of a module container arranged proximate the locking mechanism.

Fig. 6A is a perspective view of the locking system in an extended position, and part of
35 a module container arranged on the locking system being interlocked.

Fig. 6B is a perspective view of the locking mechanism in an extended position, and part of a module container arranged proximate the locking mechanism being interlocked.

Fig. 7A is a perspective view of the locking system in an extended and locked position,
5 and part of a module container arranged on the locking system.

Fig. 7B is a perspective view of the locking mechanism in an extended and locked position, and part of a module container arranged proximate the locking mechanism.

10 Fig. 8A is a perspective view of the locking system in a further extended and locked position, and part of a module container arranged being lifted in relation to the locking system.

Fig. 8B is a perspective view of the locking mechanism in a further extended and locked
15 position, and part of a module container being lifted by the locking mechanism.

Fig. 9 is a perspective view of a locking system comprising two locking mechanisms.

Fig. 10 is a perspective view of a locking system comprising four locking mechanisms.
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Fig. 11 is a perspective exploded view of a locking mechanism, without a housing.

The present invention will now be described more fully hereinafter with reference to
25 the accompanying drawings, in which exemplary embodiments of the invention are shown. The invention may, however, be embodied in different forms and should not be construed as limited to the embodiments set forth herein. Rather, these embodiments are provided so that this disclosure will be thorough and complete and will fully convey the scope of the invention to those skilled in the art. Like reference numerals refer to like
30 elements throughout. Like elements will thus not be described in detail with respect to the description of each figure.

Fig. 1 is a perspective view of the automatic locking mechanism 10, without the housing 12, in a retracted position. The locking mechanism 10 comprises a housing 12 (not
35 shown) where only the housing bottom 12' is shown. The locking mechanism 10 com-

prises an elongated shaft element 14 and a top part 16 which in the illustrated embodiment comprises a conical-shaped top element 18, a collar 22 and an abutment element 38 having an upper abutment surface 40, suitable for abutting the underside of a part 36 of the module/container. The conical-shaped top element 18 and the collar 22 are
5 illustrated with an elongated form, such that the top element 18 and the collar 22 can protrude into a corresponding opening 36' in the part of the module/container such as a ISO container corner. The part 36 of the module/container may be arranged differently from such ISO container corner.

The locking mechanism 10 comprises drive means 24, of which only a small part is
10 shown. The drive means 24 may be any suitable means for displacing the longitudinal shaft element 14 and the top part 16 in a longitudinal direction in relation to the housing 12, such as hydraulic, electrical, pneumatic or mechanical means and may preferably by arranged as a driven piston, such as a hydraulic piston.

The locking mechanism 10 further comprises forcing means 26, 26', shown as a rack
15 and pinion mechanism, which is arranged to rotate the elongated shaft element 14 around an axis substantially parallel with the longitudinal direction of the shaft element 14. The top element 14 is in the shown embodiment interconnected with the elongated shaft element 14 via a top element shaft 20 (see fig. 11) which extends rotatably through the collar 22 and the abutment element 38, such that rotation of the elongated shaft
20 element 14 causes a rotation of the top element 18.

In the shown embodiment, the elongated shaft element 14 is oval-shaped in the longitudinal direction, which oval-shape corresponds to an opening through the forcing means 26 shown as a pinion, such that activation of the forcing means 26 by the forcing means 26', shown as a rack, the rotational movement of the rack is transferred to the
25 elongated shaft element 14. The forcing means 26, 26' are preferably supported in the housing 12 (not shown). The oval-shape of the elongated shaft element may comprise two substantially parallel sides and the opposed rounded sides.

The locking mechanism 10 further comprises locking means 28, illustrated as two pins arranged in the housing 12 (not shown) with an intermediate distance corresponding
30 approximately to the diameter of the elongated shaft element 14 at the narrowest part. The shape of the elongated shaft element 14 and the locking means may be arranged differently, as long as the locking means 28 allows the elongated shaft element 14 to be displaced in relation to the locking means 28.

During the longitudinal displacement of the elongated shaft element 14, the shaft element 14 displaces in relation to the locking means 28 which, when the locking mechanism is in an extended position, aligns with a shaft recess 30 at a specific location on
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the elongated shaft element. Hereby the shaft element 14 is able to rotate 360 degrees as the largest diameter of the recess part is smaller than the distance between the pins. The cone-shaped top element comprises an opening, such that the top part may be used as a connection point for a lift or crane, for lifting the locking mechanism in relation to the mounting surface.

Fig. 2 is a perspective view of the automatic locking mechanism 10, without the housing 12, in an extended position.

The locking mechanism 10 shown in figure 2 corresponds to the locking mechanism 10 shown in fig. 1. The figure shows the movements of the locking mechanism 10 from a retracted to an extended position, in which the top element 18 projects into the part of the module/container (not shown) and interlocks therewith.

First, the drive means 24 acts upon the elongated shaft element 14 for displacing the elongated shaft element 14 and top part 16 in a longitudinal direction, as indicated by the vertical arrow. After the drive means has displaced the elongated shaft element 14, the top element 18 projects into the part 36 of the module/container.

Second, once the top element 18 has projected into the part 36 of the module/container, the forcing means 26, 26', are driven, e.g. by a hydraulic force, causing a rotational movement of the elongated shaft element 14 and the therewith interconnected top part 18, which hereby interlocks with the part 36 of the module/container. The oval-shaped collar 22, which is connected to the abutment element 38, projects into a corresponding opening 36' (see fig. 3A, 3B) of the part 36 of the module/container and is hereby prevented from rotating together with the elongated shaft element 14.

Between the circumferential side of the abutment element 38 and an inner side of the housing 12 (not shown), the locking mechanism 10 comprises suitable sealing means, such as O-rings, to prevent dirt, water and/or moisture to enter the locking mechanism.

Fig. 3A is a perspective view of the locking system 10' in a retracted position, and the part 36 of a module container, and fig. 3B is a perspective view if the locking mechanism in a retracted position, and the part 36 of a module container.

Figure 3B shows a different embodiment of the locking mechanism, compared to the one in figures 1-2, but figure 3A is representative for both embodiments.

In figure 3B, the drive means 24' comprises a rack and pinion mechanism acting on a lower threaded part of the elongated shaft element, instead of a movable piston.

The rack is rotatably fixed to the housing 12 and may be rotated by a displacement of the rack, which causes the threaded part of the elongated shaft element 14 to displace

in a longitudinal direction. The forcing means 26, 26' shown in fig. 4B functions similarly to the forcing means 26, 26' of fig. 1-2 but may comprise a locking mechanism 28', arranged as a displaceable locking pin, which projects through part of the forcing means 26 and into an opening in the elongated shaft element. Hereby, the elongated shaft element is prevented from rotating. The locking means 28' may be driven by any suitable force, such as hydraulic, electrical, pneumatic or mechanical means.

Figure 3A shows the locking system 10' comprising a locking mechanism 10 as shown in figs. 1-2 or 3, and a mounting surface element 34, which is arranged to be mounted into a mounting surface, such as the deck of a ship, a truck or freight train etc.

10 The embodiment in figs. 3A and 3B corresponds to each other, only without the housing 12 and mounting surface element shown in fig. 3B. In the shown situation, the locking mechanism 10 is in a retracted position, where the top element 18 does not project above the mounting surface element. In an alternative embodiment, the top element 18 and the collar may project above the mounting surface element during the lowering of an equipment module, shown only by the illustration of the part 36 of the module/con-

15 tainer.

Fig. 4A is a perspective view of the locking system 10' in a retracted position, and the part 36 of a module container arranged on the locking system 10', and fig. 4B is a perspective view of the locking mechanism 10 in a retracted position, and the part 36 of a module container arranged proximate the locking mechanism 10.

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The embodiment in fig 4A and 4B corresponds to each other, only without the housing 12 and mounting surface element shown in fig. 4B. In figs. 4A and 4B, only a bottom of the part 36 of the module/container is shown for illustrative purpose. As shown in figs.

25 4A and 4B, the equipment module, indicated only by the part 36, is lowered onto the mounting surface element 34.

Fig. 5A is a perspective view of the locking system 10' in an extended position, and the part 36 of a module container arranged on the locking system 10', and fig. 5B is a perspective view of the locking mechanism 10 in an extended position, and the part 36 of a module container arranged proximate the locking mechanism 10.

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The embodiment in figs. 5A and 5B corresponds to each other, only without the housing 12 and mounting surface element shown in fig. 5B. In the shown situation, the drive means 24' displaces the elongated shaft element 14 and the top part 16, including the top element 18 in a longitudinal direction, into an extended position, where the top element 18 projects through the opening 26' of the part 36 of the module/container. The

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collar 22 also projects through the opening 36', and the abutment surface 40 of the abutment element 38 abuts/supports the underside of the part 36 of the module/container.

5 Fig. 6A is a perspective view of the locking system 10' in an extended position, and the part 36 of a module container arranged on the locking system 10' being interlocked, and fig. 6B is a perspective view of the locking mechanism 10 in an extended position, and the part 36 of a module container arranged proximate the locking mechanism 10 being interlocked.

10 The embodiment in figs. 6A and 6B corresponds to each other, only without the housing 12 and mounting surface element shown in fig. 6B.

Figure 6A and 6B show the forcing means being actuated, hereby causing a rotation of the elongated shaft element 14 and the top element 18, which hereby interlocks with the part 36 of the module/container.

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Fig. 7A is a perspective view of the locking system 10' in an extended and locked position, and the part 36 of a module container arranged on the locking system 10', and fig. 7B is a perspective view of the locking mechanism 10 in an extended and locked position, and the part 36 of a module container arranged proximate the locking mechanism

20 10.

The embodiment in figs. 7A and 7B corresponds to each other, only without the housing 12 and mounting surface element shown in figs. 7B. In figs. 7A and 7B, the locking mechanism has interlocked with the module/container, and the locking means 28' are actuated, whereby the elongated shaft element 14 and the top element 18 are prevented

25 from rotating out of engagement with the container.

Fig. 8A is a perspective view of the locking system 10 in a further extended and locked position, and the part 36 of a module container being arranged lifted in relation to the locking system 10', and fig. 8B is a perspective view of the locking mechanism 10 in a further extended and locked position, and the part 36 of a module container being lifted by the locking mechanism 10.

30 As described earlier in the application, when loading or unloading modules/container onto the mounting surface with lifting equipment, such as a lift or crane, the lifting equipment may need to be withdrawn from underneath the module container.

In figures 8A and 8B, is shown a situation where the module/container needs to be unloaded with lifting means which needs to support the lower surface of the module/container.

The elongated shaft element 14 and the top part 16 is displaced in the longitudinal direction, whereby the lifting surface 40 of the abutment element 38, functions as a lift, whereby the module/container is being lifted a predetermined distance above the mounting surface, such that the lifting equipment can extend underneath the module/for lifting. Before lifting, the locking means 28' are retracted and the forcing means 26, 26' are actuated, whereby the top element 18 rotates out of engagement with the part 36 of the module/container. Hereafter, the module may be lifted from the locking system 10'.

The same procedure in reverse applies when the module/container is to be loaded onto the mounting surface.

Fig. 9 is a perspective view of a locking system 10' comprising two locking mechanisms 10, and fig. 10 is a perspective view of a locking system 10' comprising four locking mechanisms 10.

Fig. 11 is a perspective exploded view of a locking mechanism, without a housing.

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List of reference numbers

- 10 Automatic locking mechanism
- 10' Locking system
- 25 12 Housing
- 12' Housing bottom
- 14 Elongated shaft element
- 16 Top part
- 18 Top element
- 30 20 Top element shaft
- 22 Collar
- 24, 24', 24'' Drive means
- 26, 26' Forcing means
- 28, 28' Locking means
- 35 30 Shaft recess
- 32 Releasable locking mechanism
- 34 Mounting surface element

- 36 Module/container part
- 36' Module part opening
- 38 Abutment element
- 40 Abutment surface

CLAIMS

1. An automatic locking mechanism (10) for the interconnection of an equipment module or cargo container to a mounting surface, said locking mechanism (10) comprising
5 a housing (12), an elongated shaft element (14) and a top part (16) for interconnection with a part (36) of said equipment module or cargo container, wherein said shaft element (14) and top part (16) are longitudinal displaceable within said housing (12).
2. The automatic locking mechanism (10) according to claim 1, wherein said shaft element (14) and at least part of said top part (16) are arranged rotatable in relation to an
10 axis substantial parallel with said direction of longitudinal displacement.
3. The automatic locking mechanism (10) according to claim 1 or claim 2, wherein said top part (16) comprises a rotatable top element (18), such as a cone-shaped top element, for interconnection with said part (36) of said equipment module or cargo container, such as an ISO container corner, of said equipment module or cargo container,
15 by said rotation.
4. The automatic locking mechanism (10) according to claim 3, wherein said top part
20 (16) comprises a collar part (22), extending between said top element (18) and said elongated shaft element (14), said collar part (22) being arranged for engagement with an opening (36') in said part (36) of said equipment module or cargo container in a non-rotationally manner.
- 25 5. The automatic locking mechanism (10) according to claim 4, wherein said elongated shaft element (14) being rotatable in relation to said collar (22).
6. The automatic locking mechanism (10) according to any of the preceding claims wherein said locking mechanism (10) comprises drive means (24, 24') for displacing
30 said elongated shaft (14) in said longitudinal direction.
7. The automatic locking mechanism (10) according to any of claims 2-6, wherein said locking mechanism (10) comprises forcing means (26, 26') for creating said rotation.
- 35 8. The automatic locking mechanism (10) according to any of the preceding claims wherein said locking mechanism (10) comprises locking means (28) for locking said

elongated shaft (14) and/or said top element (18) against longitudinal displacement and/or rotation in relation to said housing (12).

9. The automatic locking mechanism (10) according to any of the preceding claims,
5 wherein said locking mechanism comprises a releasable locking mechanism (32), such as a ball lock, in an interface between said abutment element (38) and said elongated shaft element (14), for indexing said collar (22) and said abutment element (38) during engagement with said opening (36') in said part (36) of said equipment module or cargo container.
- 10
10. The automatic locking mechanism (10) according to any of claims 2-9, wherein said top part (16) comprises an abutment element (38) having an abutment surface (40) for facing said part (36) of said equipment module or cargo container.
- 15 11. A locking system (10'), comprising at least one locking mechanism (10) according to any of claims 1-10, and a mounting surface element (34) having an upper surface for facing said equipment module or cargo container, and adapted for connection with said mounting surface, said housing (12) being connected to said mounting surface element (34).
- 20 12. The locking system (10') according to claim 11, wherein the mounting surface element (34) has a downwards tapered circumferential side edge.
13. The locking system (10') according to claim 11 or 12, wherein said top part (16)
25 being longitudinally displaceable between two positions, a first retracted position where said top element (18) is arranged substantially non-projecting from said upper surface of said mounting element and a second projecting position in which said top element (18) projects from said upper surface.
- 30 14. A method for operating a locking mechanism (10) according to any of claims 1-10 or a locking system (10') according to any of claims 11-13, comprising the following steps:
- providing said locking mechanism (10) in a mounting surface, said locking mechanism (10) being arranged in a substantially non-projecting position in
35 relation to said mounting surface,

- arranging an equipment module or container at a specific location on said mounting surface, said equipment module or container comprising a part (36) for interconnection with said locking mechanism (),
- displacing said elongated shaft element (14) and said top part (16) in a direction towards said equipment module or container, such that at least part of said top part (16) projects into said part of said equipment module or container.

15. The method according to claim 14, wherein said locking mechanism (10) being longitudinally displaceable, such that said abutment element (38) extends above said mounting surface, for lifting said equipment module or container a distance above said mounting surface.