

Lifting Apparatus

The invention relates to lifting apparatus and especially, apparatus for lifting freight containers.

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Freight containers are generally lifted using a metal frame (commonly known as a "spreader") attached to a hoist. The spreader is lowered by the hoist onto the top surface of a container and engages with the container at each of its four corners. The spreader engages with the container at each of the four corners using pickup elements known as twistlocks. Each twistlock locates in a corresponding hole on each corner of the container. After being located in the holes, the twistlocks are rotated to lock the container to be lifted to the spreader. The spreader can then be lifted by the hoist with the goods container attached. This enables the container to be transferred from one location to another location, such as between a dock and a ship or between two ground locations, such as from a storage position to a ground transportation vehicle.

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Conventionally, the twistlocks are attached to the spreader by providing a screw thread on the opposite end of the twistlock from the end which engages with the container, passing the threaded end through a fixing hole in the spreader and securing the twistlock to the spreader by means of a nut which is screwed onto the threaded end of the twistlock.

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However, there are some disadvantages with this conventional fixing arrangement. In particular, due to the repeated jarring of the spreader, the nut

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is prone to loosening, the threads on the twistlock may become stripped due to the repeated jarring and there is a tendency for the thread to deform due to the jarring forces. If the thread deforms, this can result in it being difficult to remove the twistlock from the spreader, for example, for servicing or replacement.

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One solution at mitigating these problems has been to replace the threaded end of the twistlock with a circumferentially extending recess, which is engaged by a formation on the inside of a split collar, and to retain the split collar in engagement with the recess by placing a retaining cap over the split collar.

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While this mitigates the problems of the conventional nut loosening with the repeated jarring and the problem of deformation of the threads, as it is relatively easy to remove the retaining cap in order to release the collar for removable or replacement of the twistlock, this arrangement also has some disadvantages.

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For example, machining the end of the twistlock to form the recess can reduce the service life of the twistlock.

In accordance with a first aspect of the present invention, lifting apparatus for
20 lifting a freight container comprises a frame and a number of pickup elements coupled to the frame, each pickup element comprising an engagement end adapted to engage with an engagement aperture in a freight container, and a fixing end at the opposite end, the fixing end including at least two formations on the external surface, each formation extending around the fixing end in a
25 direction not parallel to a longitudinal axis of the pickup element, a fixing

member engaged with the formations and a retaining device to retain the fixing member in engagement with the fixing end, the fixing member securing the pickup element to the frame when the fixing end of the pickup element is positioned in a securing position on the frame and the fixing member is
5 engaged with the fixing end.

Preferably, each formation extends continuously around the fixing end.

In one example of the invention, each formation defines a plane, which is
10 substantially perpendicular to the longitudinal axis of the pickup element.

In a second example of the invention, the formations may comprise separate portions of a continuous helically shaped formation.

15 The formations may be recesses formed in the surface of the engagement end, shoulders extending outwardly from the surface of the engagement end, or a combination of recesses and outwardly extending shoulders.

Preferably, the fixing member comprises first and second portions. Typically,
20 when the first and second portions are engaged with the fixing end, the first and second portions, together, extend around the fixing end.

Typically, the retaining device when engaged with the fixing member prevents disengagement of the fixing member with the fixing end by substantially

preventing movement of the fixing member in a direction radially outwards from the longitudinal axis of the pickup elements.

Typically, the retaining device is removable to permit removal of the fixing
5 member from the fixing end and thereby, removal of the pickup element from the frame.

Typically, when the fixing end is in the securing position, the fixing end extends through an aperture, in the frame that is bigger than the fixing end but is smaller
10 than combined the size of the fixing member and the fixing end when the fixing member is engaged with the fixing end. Therefore, engagement of the fixing member with the fixing end prevents withdrawal of the fixing end from the aperture in the frame.

15 Preferably, the pickup element is substantially cylindrical and typically, the formations extend circumferentially around the fixing end.

Preferably, the first and second engagement portions form a split collar type arrangement.

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An example of lifting apparatus in accordance with the invention will now be described with reference to the accompanying drawing, in which:

Figure 1 is a partial cross-sectional view of a section of a spreader
25 showing a twistlock housing.

Figure 1 shows section of a spreader 1 that includes a twistlock housing 2 within which is located a twistlock 3. The twistlock 3 is substantially cylindrical and has a central longitudinal axis 4. The twistlock 3 has a profiled end 5 and a fixing end 6. The profiled end 5 includes a profile 7 that is adapted to be inserted into a lifting aperture in a freight container to be lifted. The lifting aperture has a profile that corresponds to the profile 7. When the twistlock 3 is rotated 90° about the longitudinal axis 4, the profile 7 is rotated within the lifting aperture in the container so that the profile 7 is prevented from being withdrawn from the lifting aperture. Therefore, when the profile 7 is inserted into a lifting aperture in the container and the twistlock 3 is rotated through 90° , the container is effectively secure to the spreader 1.

The fixing end 6 includes three circumferentially extending recesses 8, 9, 10 that are engaged by a split collar, which includes two collar sections 11, 12. However, alternatively, the recesses could be formed by one or more helically extending recesses in the engagement end 6, and the split collar sections 11, 12 would have mutually engaging formations. The two collar sections 11, 12 are retained in engagement with the recesses 8, 9, 10 by a retaining cap 13 which is held in position by a retaining bolt 14. The retaining cap 13 also includes an arm section 15, which is coupled to a piston rod 26 of a hydraulic piston 16 by a securing bolt 17. The other end of the hydraulic piston 16 is coupled by a securing bolt 18 to a mounting member 19 on the spreader 1.

The inner surfaces of the split collar sections 11, 12 are formed with three shoulders 20, 21, 22 which engage with the recesses 8, 9, 10 in the fixing end 6.

5 In use, the fixing end 6 of the twistlock 3 is inserted through an aperture 23 in a cross member 24 within the twistlock housing 2. After insertion of the fixing end 6 through the aperture 23, the split collar sections 11, 12 are engaged with the fixing end 6, as shown in Figure 1, and the retaining cap 13 positioned over the fixing end and split collar sections 11, 12 and secured in position using the bolt
10 14. The piston rod 26 of the hydraulic piston 16 is then coupled to the arm 15 of the retaining cap 13 using the securing bolt 17.

Prior to engagement of the split collar sections 11, 12 with the fixing end 6, a bearing 25 is located around the fixing end 6 adjacent to the cross member 24,
15 such that the bearing 25 is located between the split collar sections 11, 12 and the upper surface of the cross member 24.

When the profiled end 7 is inserted into a lifting aperture in the container, the hydraulic piston 16 is actuated to extend the piston rod 26. This generates
20 movement of the arm 15 in an arc around the central axis 4 to rotate the twistlock 3. The movement of the piston rod 26 is controlled (or limited) to ensure that the twistlock 3 only rotates approximately 90° .

If it is necessary to remove the twistlock 3, for example for servicing or
25 replacement, the securing bolt 17 is removed to disengage the piston rod 26

from the arm 15, the retaining bolt 14 is removed and the cap 13 is removed from the split collar sections 11, 12. This permits the split collar sections 11, 12 to be removed from the fixing end 6 and the fixing end 6 to be withdrawn from the aperture 23.

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The invention has the advantage that by providing a number of recesses 8, 9, 10 the surface area over which the twistlock 3 is supported by the split collar sections 11, 12 is increased. This increases the fatigue life of the twistlock 3, while still permitting the twistlock 3 to be easily removed and minimising the problems associated with conventional arrangements for securing twistlocks to spreaders.

CLAIMS

1. Lifting apparatus for lifting a freight container comprises a frame and a number of pickup elements coupled to the frame, each pickup element
5 comprising an engagement end adapted to engage with an engagement aperture in a freight container, and a fixing end at the opposite end, the fixing end including at least two formations on the external surface, each formation extending around the fixing end in a direction not parallel to a longitudinal axis of the pickup element, a fixing member engaged with the formations and a
10 retaining device to retain the fixing member in engagement with the fixing end, the fixing member securing the pickup element to the frame when the fixing end of the pickup element is positioned in a securing position on the frame and the fixing member is engaged with the fixing end.
- 15 2. Apparatus according to claim 1, wherein each formation extends continuously around the fixing end.
3. Apparatus according to claim 1 or claim 2, wherein each formation defines a plane that is substantially perpendicular to the longitudinal axis of the
20 pickup element.
4. Apparatus according to claim 1 or claim 2, wherein the formations comprise separate portions of a continuous helically shaped formation.

5. Apparatus according to any of the preceding claims, wherein at least one of the formations is a recess.
6. Apparatus according to any of the preceding claims, wherein there are at least three formations.
7. Apparatus according to any of the preceding claims, wherein the fixing member comprises first and second portions.
8. Apparatus according to claim 7, wherein when the first and second portions are engaged with the fixing end, the first and second portions, together, extend around the fixing end.
9. Apparatus according to any of the preceding claims, wherein the retaining device, when engaged with the fixing member, prevents disengagement of the fixing member with the fixing end by substantially preventing movement of the fixing member in a direction transverse to the longitudinal axis of the pickup elements.
10. Apparatus according to claim 9, wherein the retaining device is removable to permit removal of the fixing member from the fixing end and thereby, removable of the pickup element from the frame.
11. Apparatus according to any of the preceding claims, wherein when the fixing end is in the securing position, the fixing end extends through an aperture,

in the frame that is bigger than the fixing end but is smaller than the combined size of the fixing member and the fixing end when the fixing member is engaged with the fixing end.

- 5 12. Apparatus according to any of the preceding claims, wherein the pickup element is substantially cylindrical and the formations extend circumferentially around the fixing end.

- 10 13. Apparatus according to any of the preceding claims, wherein the first and second engagement portions form a split collar type arrangement.