

"A SHOCK ABSORPTION ASSEMBLY FOR A SPREADER"

This invention relates to a shock absorption assembly for use with a cargo container handling spreader.

A spreader is a lifting frame which is attached to a crane or a fork lift and is designed to lock onto a cargo container such as an ISO (International Standards Organisation) container. Each container has four corner castings situated at the four corners of the container's upper surface. The corner castings are engaged by twistlock mechanisms carried on the spreader which enable the containers to be lifted safely. Spreaders having telescopic arms are known which are able to be adjusted to pick up containers of various sizes and weights. These spreaders are provided on quayside cranes to load and unload container ships. These spreaders are also used with gantry cranes and other lifting and transporting machines in container marshalling yards.

Spreaders are subjected to high shock and stress loads during engaging, lifting, disengaging and setting down operations. These shocks greatly contribute to the component failures experienced by the spreaders. This adversely affects the reliability of spreaders, necessitates extra maintenance of spreaders and reduces the life of spreaders.

It is an object of the present invention to provide a shock absorption assembly which seeks to overcome the above-mentioned disadvantages.

Accordingly, the present invention provides a shock absorption assembly for use with a cargo container handling

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spreader comprising an engagement means for engaging with and locking onto a cargo container corner casting; mounting means for mounting the engagement means on a spreader, the engagement means being journaled to the mounting means to allow rotation of the engagement means with respect to the mounting means, the mounting means being moveable with respect to the spreader; and shock absorber means to absorb forces caused by movement of the mounting means with respect to the spreader.

Preferably the engagement means is journaled to the mounting means to prevent lateral or longitudinal movement of the engagement means with respect to the mounting means.

In order that the present invention may be more readily understood, an embodiment thereof is now described, by way of example, with reference to the accompanying drawings, in which:

FIGURE 1 is a perspective view of one end of a spreader housing two shock absorption assemblies embodying the present invention (General Arrangement showing one end of RAM Spreader);

FIGURE 2 is a detailed perspective view of the left hand corner of the spreader of Figure 1, the spreader casing being cut away to show the shock absorption assembly embodying the present invention (Twistlock Corner Shock Absorbers showing positions of main and intermediate shock absorbers);

FIGURE 3 is an end view, partly in cross-section of the left hand corner of the spreader of Figure 1 showing a



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shock absorption assembly embodying the present invention (Sectional Details showing shock absorbing devices in twistlock corner for RAM Spreader);

FIGURE 4 is a side view, partly in cross-section, of the left hand corner of the spreader of Figure 1 showing a shock absorption assembly embodying the present invention (Sectional Details showing shock absorbing devices in twistlock corner for RAM Spreader);

FIGURE 5 shows the shock absorption assembly of Figure 3 when correctly engaging a corner casting on a container (Impact Force Transmission showing force on corner box being transmitted through tie rods to the main shock absorber and intermediate shock absorber);

FIGURE 6 shows the shock absorption assembly of Figure 3 when incorrectly engaging a corner casting of a container (Impact Force Transmission showing force on twistlock shaft being transmitted through the twistlock mounting plate and tie rods to the main shock absorber and the intermediate shock absorber);

FIGURE 7 is a cross-sectional view of a floating twistlock mechanism for use with the present invention ("Floating" Twistlock); and

FIGURE 8 is a perspective view of a shock absorption assembly embodying the present invention positioned between an arm and a main body of a spreader (Centre Body Shock Absorbers showing positions of main and intermediate centre body shock absorbers).

Referring to Figure 1, a spreader 1 for use with a quayside crane or the like comprises a main body 2 for

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attachment to the quayside crane or the like and a pair of telescopic arms 3 which extend from the main body 2 of the spreader 1. The arms 3 extend horizontally from the main body 2 in a side-by-side relationship and are substantially parallel to one another. The arms terminate in a single horizontal end beam 4 which is perpendicular to the pair of telescopic arms 3. The other end of the spreader 1, which is not shown in Figure 1, corresponds.

The end beam 4 is hollow and houses, at each end of the end beam 4, a twistlock mechanism 5 for engaging a corner casting of a container to be lifted. Figure 2 shows the twistlock mechanism 5 housed within the left hand end of the end beam 4 shown in Figure 1. The end beam 4 has an upper surface 4A and a lower surface 4B.

Referring to Figures 2, 3 and 4, the twistlock mechanism 5 is secured in the corner of the end beam 4 by means of a twistlock mounting plate 6 enclosed in the corner of the end beam 4.

The end beam 4 is provided with a downwardly extending hollow leg 7. The leg 7 and the corner of the end beam 4 define a chamber for housing both a shock absorption assembly embodying the present invention and the twistlock assembly 5. The leg 7 is closed by a corner box 8 which fits inside the leg 7 and which is slidable up and down within the leg 7.

The twistlock assembly 5 comprises an elongate twistlock shaft 9 of circular cross-section formed with a rounded arrow head 10 at one end, which head 10 comprises the twistlock head 10. The twistlock head 10 is only as wide as the diameter of the twistlock shaft 9 but the sides 11 of the twistlock head 10 are wider than the diameter of the twistlock shaft 9.

The twistlock shaft 9 is housed within a twistlock guide 12 and is rotatable therein. The twistlock guide 12 has the same cross-section as the twistlock head 10 so that when the twistlock head 10 is aligned with the twistlock guide 12, the twistlock head 10 is flush with the twistlock guide 12 but, when the twistlock head 10 is rotated through 90° with respect to the twistlock guide 12, the sides 11 of the twistlock head 10 become exposed.

The other end of the twistlock guide 12 remote from the twistlock head 10 is supported by the twistlock mounting plate 6. The twistlock shaft 9 extends through the twistlock guide 12 and through the twistlock mounting plate 6 in which the twistlock shaft 9 is journalled by

means of a spherical and annular thrust bearing and washer assembly 13. The twistlock shaft 9 terminates on the other side of the twistlock mounting plate 6 opposite the twistlock head 10 in a split collar 14 to which is secured a twistlock cap 15.

The twistlock cap 15 is provided with an eccentric projection 16 which is best seen in Figure 3. A lug 17 is mounted on the eccentric projection 16 which is engaged by an actuating piston 18 mounted, at its other end, to the twistlock mounting plate 6. Actuation of the piston 18 causes the lug 17 to move through 90° about the centre of the twistlock cap 15 thereby rotating the twistlock head 10 at the other end of the twistlock shaft 9 through 90°. This mechanism comprises the twistlock assembly 5 and allows the twistlock head 10 to engage or disengage a corner casting of a container in response to actuation of the actuating piston 18, which actuation is controlled by a spreader operator.

The twistlock shaft 9 is journalled in the twistlock mounting plate 6 but no lateral or longitudinal movement of the twistlock mounting plate 6 with respect to the twistlock shaft 9 is permitted.

The corner box 8 which closes the end of the end beam leg 7 is formed with an aperture 19 through which the twistlock guide 12 and shaft 9 pass. The twistlock guide 12 and the shaft 9 pass through a closed lower end of the corner box 8 which is herein termed the landing plate 20. Four tie rods 21 (of which two can be seen in Figures 3 and 4) are fixed to and extend from the landing plate 20. The tie rods 21 project through the twistlock mounting plate 6 and terminate at and are fixed to an absorber mounting plate 22.

Between the absorber mounting plate 22 and the upper surface 4A of the end beam 4 a main shock absorber 23 is provided. Accordingly, should the corner box 8 come into contact with any surface likely to produce a shock, the main shock absorber 23 will be deformed to absorb that shock. Two further tie rods 24, shorter than the three previously described tie rods 21, extends from the absorber mounting plate 22 to the region of the twistlock mounting plate 6 to which the actuating piston 18 is fixed.

Should the twistlock head 10 on the twistlock shaft 9 miss its cooperating aperture in the corner casting of a container and accidentally engage the surface of the corner casting or another area of the container, then the twistlock shaft 9 which is pivotly mounted on the twistlock mounting plate 6 pushes against the six tie rods 21, 24, thus causing the absorber mounting plate 22 to compress the main shock absorber 23.

The upper end of the corner box 8 is formed internally with a further plate in spaced relation to the landing plate 20, which further plate is herein termed the intermediate plate 25. The intermediate plate 25 is not located immediately adjacent the upper end of the corner box 8 but is, instead, located slightly within the corner box 8 to define a small recess at the upper end of the corner box 8. This recess is filled with an intermediate shock absorber 26 which is sandwiched between the intermediate plate 25 and the lower surface 4B of the end beam 4 such that, when the landing plate 20 comes into contact with another surface, not only is the main shock absorber 23 deformed to absorb shock but also the intermediate shock absorber 26 is deformed to absorb shock.

Preferably the main and intermediate shock absorbers 23, 26 may be made from materials such as engineering elastomers, both synthetic or natural, or a combination. Alternatively, a hydraulic shock absorber may also be used in absorber 23.

The maximum compression of the intermediate shock absorber 26 is governed by the depth of the recess provided at the upper end of the corner box 8. When the intermediate shock absorber 26 is compressed by the landing plate 20 of the corner box 8 contacting a surface then, at maximum compression of the intermediate shock absorber 26, the edges of the corner box 8 will contact the lower surface 4B of the end beam 4 so that no more force will be absorbed by the intermediate shock absorber 26. Similarly, when the twistlock head 10 is incorrectly aligned with a corner casting and is forced into the leg 7 of the end beam 4 compressing the main shock absorber 23, compression of the main shock absorber 23 is limited to the distance between the edge of the corner box 8 at the upper end and the lower surface 4B of the end beam 4 as shown in Figure 3. Maximum compression is shown in Figure 5 which illustrates the twistlock head 10 being accurately located in a container corner casting, all the shocks being caused by the landing plate 20 contacting the corner casting rather than the twistlock head 10 contacting any part of the container corner casting.

Figure 6 shows the twistlock head 10 missing the aperture in a container corner casting and subsequently compressing the main and intermediate shock absorbers 23, 26.

The arrows indicated on Figures 5 and 6 are representative of the transmittal of force through the

respective components of the twistlock and shock absorption assemblies.

As can be seen from Figures 5 and 6, it is not always possible to locate the twistlock head 10 accurately in a respective aperture in a corner casting of a container. Accordingly, it is desirable that the twistlock mechanism 5 is allowed some degree of play in order to maximize the number of occasions upon which the twistlock head 10 can be located in an aperture in a corner casting. For this reason a floating twistlock mechanism 5' may be provided such as the one shown in Figure 7. This twistlock mechanism 5' may be entirely interchangeable with the mechanism 5 shown in Figures 1 to 6.

The rounded arrow-shape of the twistlock head 10 means that, should the twistlock head engage an edge of an aperture of a corner casting, then the twistlock shaft 9 is allowed to rotate about a point just above the twistlock cap 15 so that the twistlock head 10 can slide into the aperture. Play or float may be provided by a pair of thrust washers 13 which secure the twistlock guide 12 and shaft 9 to the twistlock mounting plate 6. The washers 13 are of a diameter slightly greater than that of the twistlock shaft 9, thereby allowing lateral movement of the shaft 9 with respect to the mounting plate 6. Similarly, at the twistlock head 10 end of the twistlock shaft 9, the twistlock guide 12 may be provided with a necked portion 12' which allows movement of the twistlock shaft 9 within the aperture 19 in the landing plate 20 of the corner box 8. Preferably, the amount of float is limited to a maximum of 8 mm in any direction from the true centre line of the twistlock shaft 9. Together with the other three twistlocks on a spreader, the spreader can accommodate minor deformities, defects and inaccuracies in the

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manufactured corner castings and containers may thus be more easily engaged with the spreader. By providing a certain degree of float in the twistlock mechanism 5', engagement of the twistlocks in the corner castings becomes a faster operation since it requires less accuracy in the positioning of the spreader.

Figure 8 shows a spreader body shock absorber assembly 30 which provides shock absorption between the main body 2 of the spreader 1 and a telescopic arm 3 of the spreader 1.

A shock absorber 31 is mounted on the main body 2 of the spreader 1 by a mounting plate 32, the other end of the shock absorber 31 being attached to an arm plate 33. An intermediate shock absorber 34 is provided on the arm plate 33 and is sandwiched between the arm plate 33 and a wear pad 35 which contacts the telescopic arm 3. The telescopic arm 3 is slidable over the wear pad 35. This shock absorber assembly 30 enables some of the shock imparted by the container onto the spreader 1 to be absorbed between the telescopic arms 3 and the main body 2 of the spreader 1, thus reducing the magnitude of any shocks transmitted to the main body 2 of the spreader 1.

Some spreaders 1 are produced for lifting twin 20-foot ISO containers. Such spreaders 1 may also incorporate shock absorption assemblies according to the present invention.

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CLAIMS:

1. A shock absorption assembly for a cargo container handling spreader comprising: engagement means for engaging with and locking onto a cargo container corner casting; mounting means for mounting the engagement means on a spreader, the engagement means being journaled to the mounting means to allow rotation of the engagement means with respect to the mounting means, the mounting means being moveable with respect to the spreader; and shock absorber means to absorb forces caused by movement of the mounting means with respect to the spreader.
2. A shock absorption assembly according to Claim 1, wherein the shock absorber means comprises a shock absorber located between the spreader and the mounting means.
3. A shock absorption assembly according to Claim 2, wherein an absorber mounting means is fixedly mounted to the engagement mounting means, the shock absorber being located between the absorber mounting means and the spreader.
4. A shock absorption assembly according to any preceding claim, wherein the assembly is housed in an end beam of a spreader.
5. A shock absorption assembly according to any preceding claim, wherein a landing plate is provided through which a part of the engagement means passes, an intermediate shock absorber being provided between the landing plate and the spreader for further shock absorption.



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6. A shock absorption assembly according to Claim 5, wherein a part of the engagement means extends out of the end beam and through a corner box which is slidably mounted with respect to the end beam, which corner box carries the intermediate shock absorber and wherein a surface of the corner box comprises the landing plate.

7. A shock absorption assembly according to Claim 6, wherein the absorber mounting means, the twistlock mounting means and the corner box are fixedly connected by tie rods.

8. A shock absorption assembly according to any preceding claim, wherein the engagement means comprises a twistlock mechanism.

9. A shock absorption assembly according to Claim 8, wherein the twistlock assembly has a twistlock shaft, the twistlock shaft being rotatably mounted with respect to the mounting means and being pivotable by a limited amount with respect to the mounting means to provide a degree of float for a twistlock head of the twistlock mechanism.

10. A shock absorbtion assembly according to any preceding claims wherein the engagement means is journaled to the mounting means to prevent lateral or longitudinal movement of the engagement means with respect to the mounting means.

11. A shock absorption assembly for a cargo container handling spreader having telescopic arms comprising a shock absorber fixedly mounted at one end to a main body of a spreader and slidably mounted at the other end to a telescopic arm of the spreader for absorption of forces transmitted through the telescopic arm to the main body of the spreader.



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12. A shock absorption assembly substantially as herein before described with reference to and as shown in the accompanying drawings.

13. Any novel feature or combination of features disclosed herein.



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AMENDED CLAIMS

[received by the International Bureau on 29 March 1996 (29.03.96);
original claims 1-13 replaced by amended claims 1-14 (3 pages)]

1. A shock absorption assembly for a cargo container handling spreader comprising: engagement means for engaging with and locking onto a cargo container corner casting; mounting means for mounting the engagement means on a spreader, the engagement means being journalled to the mounting means to allow rotation of the engagement means with respect to the mounting means, the mounting means being moveable with respect to the spreader; actuation means for rotating the engagement means, the actuation means being mounted on the mounting means; and shock absorber means to absorb forces caused by movement of the mounting means with respect to the spreader.
2. A shock absorption assembly according to Claim 1, wherein the shock absorber means comprises a shock absorber located between the spreader and the mounting means.
3. A shock absorption assembly according to Claim 2, wherein an absorber mounting means is fixedly mounted to the engagement mounting means, the shock absorber being located between the absorber mounting means and the spreader.
4. A shock absorption assembly according to any preceding claim, wherein the assembly is housed in an end beam of a spreader.
5. A shock absorption assembly according to any preceding claim, wherein a landing plate is provided through which a part of the engagement means passes.



6. A shock absorption assembly according to Claim 5, wherein an intermediate shock absorber is provided between the landing plate and the spreader for further shock absorption.

7. A shock absorption assembly according to Claim 5 or 6, wherein a plurality of rods are fixed to and extend from the landing plate and terminate at and are fixed to the mounting means.

8. A shock absorption assembly according to Claim 6, wherein a part of the engagement means extends out of the end beam and through a corner box which is slidably mounted with respect to the end beam, which corner box carries the intermediate shock absorber and wherein a surface of the corner box comprises the landing plate.

9. A shock absorption assembly according to Claim 8, wherein the absorber mounting means, the twistlock mounting means and the corner box are fixedly connected by tie rods.

10. A shock absorption assembly according to any preceding claim, wherein the engagement means comprises a twistlock mechanism.

11. A shock absorption assembly according to Claim 10, wherein the twistlock assembly has a twistlock shaft, the twistlock shaft being rotatably mounted with respect to the mounting means and being pivotable by a limited amount with respect to the mounting means to provide a degree of float for a twistlock head of the twistlock mechanism.



12. A shock absorption assembly according to any preceding claims wherein the engagement means is journaled to the mounting means to prevent lateral or longitudinal movement of the engagement means with respect to the mounting means.

13. A shock absorption assembly for a cargo container handling spreader having telescopic arms comprising a shock absorber fixedly mounted at one end to a main body of a spreader and slidably mounted at the other end to a telescopic arm of the spreader for absorption of forces transmitted through the telescopic arm to the main body of the spreader.

14. A shock absorption assembly substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

