(51) International Patent Classification:
B65D 88/12 (2006.01) B65D 90/00 (2006.01)
B60P 7/08 (2006.01) B60P 7/13 (2006.01)

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(54) Title: A TWIST LOCK ASSEMBLY AND SYSTEM

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(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,"

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(57) Abstract: A twist lock engagement system comprising a twist lock assembly mounted to a corner casting of a first container, said twist lock assembly engageable with a top corner casting of a second container through rotation of a casting engaging foot of said twist lock assembly; a switch mounted adjacent to a top corner casting of said first container, said switch and twist lock assembly in communication; wherein activation of said switch results in the rotation of said foot.
Declarations under Rule 4.17:
— of inventorship (Rule 4.17(iv))
A TWIST LOCK ASSEMBLY AND SYSTEM

Field of the Invention

The invention relates to infrastructure for the manipulation of intermodal containers. In particular, the invention relates to systems and methods for engaging and disengaging containers for loading and unloading container ships.

Background

A twist lock is a standard device for forming the connection between containers. The twist lock is arranged to selectively engage and disengage the corner castings associated with said containers through inserting a "foot" of a twist lock into an aperture of the casting then rotating the foot to create an interference fit. A release member is associated with the twist lock device to manually release the twist lock from the castings through rotation of the foot.

The foot is resiliency held in the locking position at an angle of between 45° and 90° rotation from the unlocking position. The release member counters this resilient bias to the locking position in order to rotate the foot to the unlocking position.

The foot is shaped such that when pressed against the peripheral edges of the aperture on the castings, the upward force against the foot also applies a horizontal component against the resilient bias and so rotates the foot to the unlocking position. On full
insertion into the aperture, the foot springs back through the resilient bias to automatically lock in place.

When the intermodal containers are placed on the ship, each of the containers are typically engaged through twist lock devices and so each container needs to be released before the top most container can be removed. This will involve someone having to individually and manually release each twist lock before the container can be removed.

It would therefore be useful to have a twist lock that didn't require manual release.

Summary of Invention

In a first aspect the invention provides a twist lock assembly for an intermodal container; the assembly comprising a housing; a foot projecting from a first face of the housing; said foot rotatable between a locked position and a Unlocked position, the foot resiliently biased to rotate from the unlocked position to the locked position and; first and second release members each for selectively rotating the foot from the container locked position to the unlocked position.

Therefore, by providing a twist lock assembly having a second release member allows a mechanism to be used to facilitate the automatic release of the twist lock according to the present invention in addition to the conventional manual release.
In one embodiment of the present invention, the second release member may be in communication with a switch on an upper casting of the container such that on operation of the switch, the second release member is activated so as to rotate the foot from the locking position to the unlocking position.

In a further embodiment, the means of communication may be a cable attached to the switch such that operation of the switch creates a tensile force in the cable so as to operate the second release member.

In a further embodiment, the switch may be a button or other depression member such as a lever whereby pushing down on the depression member operates the second release member to release the twist lock. For instance a cable may be mounted between the second release member and the depression member with a pulley arrangement such that a downward application of force on the depression member pulls the cable downwards which translates to an upward tensile force on the second release member.

In a further embodiment the second release member may be the actual cable mounted between the twist lock and the depression member.

In an alternative embodiment, the means of communication may be a rod mounted between the second release member and the switch. Where the switch is a depression member in order for the rod to apply a tensile force to the second release member, a pivotal member intermediate the rod and the switch may be mounted so that depression of the switch leads to a lifting of the rod.
In one embodiment the twist lock assembly according to the present invention may be fixed to the container possibly fixed within a corner casting. Alternatively the twist lock assembly may be movable relative to the container, for instance, to be retractable.

In the case of the retraction, the twist lock assembly may be movable such that the foot no longer projects passed the plane of the bottom face of the container. Thus in this embodiment, when the twist lock assembly is not in use such as when the container is placed on the ground, the twist lock may be retracted such that the foot does not contact the ground.

In a further embodiment, the twist lock assembly may be mounted in a purpose formed casting; said casting and twist lock in sliding engagement. Said twist lock assembly may be movable from a projecting position, whereby the foot projects from the casting so as to engage another container, to a retracted position such that the foot no longer projects from the container.

In one embodiment the sliding engagement between the casting and the twist lock assembly may include an arrangement of rails within the casting and projections on the twist lock assembly corresponding with said rails so as to promote sliding contact. In this embodiment, the casting and twist lock assembly may further include engagement portions such that in the projecting position, the twist lock is selectively fixed in place and in the retracted portion, the twist lock assembly is similarly fixed in place.
In a further embodiment, movement from the projecting position to the retracting position may involve a two part process whereby the twist lock assembly moves to an intermediate position representing a change in directing. Such a change in direction may provide an opportunity to slide the twist lock assembly to a more favourable position in which to retract the twist lock. For instance, if a void into which the twist lock assembly can retract cannot be positioned directly above the corner at which the twist lock engages, then a two part process of moving the twist lock to a more favourable position whereby a void can be positioned may be of additional benefit.

In a third aspect, the invention provides a twist lock engagement system comprising a twist lock assembly mounted to a corner casting of a first container, said twist lock assembly engageable with a top corner casting of a second container through rotation of a casting engaging foot of said twist lock assembly; a switch mounted adjacent to a top corner casting of said first container, said switch and twist lock assembly in communication; wherein activation of said switch results in the rotation of said foot.

In general, the system includes a twist lock assembly, a selective switch to operate the twist lock assembly having a cable intermediate the switch and the twist lock assembly.

The system may further include a probe mounted to a spreader such that on engagement between the spreader and the container, the probe activates the switch so as to activate the twist lock assembly.
In one embodiment the probe may be selectively extendable such that an operator of the spreader may select to extend the probe and so activate the twist lock assembly or otherwise not activate the probe so as to maintain the twist lock assembly in the immediate state. To maintain the twist lock assembly in the immediate state may be useful if the operator wishes to move multiple containers at one time or perhaps if the twist lock assembly has retracted within the casting and so operation is not required. Further, in instances where the spreader engages other containers not having the twist lock assembly, having the probe selectively extendable allows the spreader to not interfere with conventional containers or otherwise to extend the probe for use with containers having the system according to the present invention installed.

In one embodiment the system or the twist lock assembly according to another aspect of the present invention may be fabricated along with the container and so be integral with the container. Alternatively, existing containers may be retrofit with the twist lock assembly and/or the system according to the further aspect of the present invention.

**Brief Description of Drawings**

It will be convenient to further describe the present invention with respect to the accompanying drawings that illustrate possible arrangements of the invention. Other arrangements of the invention are possible and consequently, the particularity of the accompanying drawings is not to be understood as superseding the generality of the preceding description of the invention.
Figure 1 is an elevation view of an automatic twist lock system according to one embodiment of the present invention;

Figures 2A to 2D are various views of the system of Figure 1 installed in a container;

Figures 3A to 3C are detailed views of the system as shown in Figure 2A;

Figures 4A to 4C are various views of a twist lock assembly in the locked position according to one embodiment of the present invention;

Figures 5A to 5D are various views of the twist lock assembly of Figure 4A in the unlocked position;

Figures 6A to 6D are various views of a twist lock assembly according to a further embodiment of the present invention;

Figure 7A is a sectional view of a twist lock assembly in the projected position according to one embodiment of the present invention;

Figure 7B is a sectional view of the twist lock assembly of Figure 7B in the retracted position and;

Figures 8A to 8E are sequential views of a twist lock assembly according to a further embodiment of the present invention.
Detailed Description

Figure 1 shows an automatic twist lock system according to one embodiment of the present invention for activating a twist lock assembly using a remotely placed switch. In this embodiment the system is shown in a form ready for installation to a container. To this end the twist lock assembly has a first release member and a second release member. The second release member is attached to a means of communication, in this case a transmission line or transmission member. The transmission line, or member, may be a cable or rod. Whilst both a cable and rod can transmit a tensile force to operate the second release member, use of a rod also allows a compressive force to be used to operate the twist lock assembly. The embodiment of Figure 1 shows the transmission line to be a rod. A switch or in this case a pin is connected to the rod through a pivot arm and so is in spaced relation to the twist lock assembly.

The twist lock assembly includes a foot for locking into a corner casting of a container. The system operates by depressing the pin which lifts the cable or rod and so activates the second release member. The arrangement within the twist lock assembly is such that on activation of the second release member, the foot is rotated from a locking position to an unlocking position. In this embodiment the twist lock assembly has the foot resiliently biased to the locking position and so operation of the second release member requires overcoming the resilient force biasing the foot to this position.
Figures 2A to 2D show one embodiment of the system in Figure 1, according to the present invention. Here the system has been installed into a container 40 with the pin 10 located adjacent a top corner casting 52. This embodiment uses a rod instead of a cable, with the rod encapsulated within a capping 42 and finally the twist lock assembly 5 located in a bottom corner casting 65. Here the foot 35 projects from the corner casting 65 so as to engage with a second container 50 and the corresponding top corner casting 55.

In particular Figure 2A shows a spreader 45 in engagement with the top container 40 and lowering the container 40 onto the bottom container 50. As is typical for a twist lock device, the foot 35 is shaped to progressively rotate to the unlocked position as it contacts the peripheral edges of the aperture of a casting 55 corresponding to a second container 50 onto which the first container 40 is placed. Thus, operation of the system is not required in engaging the top container 40 with the lower container 50.

For disengaging the container, in this embodiment the spreader 45 includes a projection 43 which selectively extends so as to depress the pin 10. Thus depression of the pin 10 applies a tensile force to the second release member 20 to rotate the foot from the locked position to the unlocked position ready for removal. Hence through operation of the projection from the spreader 45, it is not required for personnel to manually unlock each twist lock in order to separate two engaged containers.

Figures 3A to 3C provide detailed views of the system on installation.
Figure 3A shows the pin 10 within a specific housing 60 and the relationship between the rod 15 and the pivot lever 30. Figure 3B shows how a depression force 70 to the pin 10 rotates the pivot lever 30 so as to raise the rod 15. This subsequently leads to a rotation 75 of the foot 35.

Figures 4A to 4C show one embodiment of a twist lock assembly 80 according to the present invention. In particular it shows one embodiment of the arrangement within the twist lock assembly 80 in order to achieve rotation of the foot 90 on activation of the second release member 110. It will be appreciated that the second release member in alternative embodiments may in fact be the rod and so combining the two elements of second release member and transmission line/rod. Further, in the case of the rod and the second release member being combined into a single stiff member, this allows for both a tensile and compressive force to be applied, in order to operate the twist lock assembly.

The twist lock assembly 80 comprises two portions 82, 83 which form a housing within which the mechanism functions. Here the twist lock assembly 80 includes a first release member 85, similar to the release member for conventional twist lock devices. The second release member 110 is connected to an L-shaped pivotal member 120 which is arranged to rotate on lifting the second release member 110. The L-shaped pivotal member 120 is connected to a lug 130 which is in communication with the foot 90. This lug 130 is further connected to a member 115 to which the first release member 185 is also connected. Thus activation of the second release member and subsequently
the L-shaped pivotal member 120 has the same effect as activating the first release member 85 whereby rotation of the foot 90 is caused on application of a tensile force.

In Figures 4A to 4C, it will be noted that the foot 90 is in the locked position which is resiliently biased by a spring 135 in series with the first release member 85. It will be seen that in order to rotate the foot 90, a sufficient force will be required to also overcome the resilient bias applied by the spring 135.

In a further embodiment of the present invention, the twist lock assembly 80 is also retractable so as to withdraw the foot within the container so as to place the container on a flat surface. By retracting the twist lock assembly 80, the foot 90 therefore is withdrawn so as to not interfere with placement of the container.

To this end the twist lock assembly 80 includes a dual action latch 105 having lugs 95, 100 projecting from two faces of the assembly 80.

The latch 105 is resiliently biased by a spring loaded follower 125 which tends to project the latch forward so as to project the lugs 95, 100 from the faces. On application of a force to the latch 105, the latch will pivot allowing the lugs 95, 100 to retract into the body of the assembly 80.

The latch 105 functions to hold the assembly 80 in place with the first lug 95 projecting from a forward face corresponding to a ridge within the corner casting (not shown) so as to prevent the assembly 80 from a retracted position within the casting.
The second lug 100 acts to prevent the twist lock assembly 80 from moving horizontally along rails within the casting.

Thus both lugs act to selectively allow the passage of the assembly from a retracted position to a projecting position within the casting.

Figures 5A to 5D show the operation of the twist lock assembly 80 on application of a tensile force 140 to the second release member 110.

Lifting the second release member 110 rotates the L-shaped member 120 which in turn rotates 150 the foot 90 so as to move the foot from the locked position to the unlocked position. As discussed the application of the tensile force 140 to the second release member is as a result of the pin being activated for the purpose of remotely unlocking the twist lock assembly 80.

Figures 6A to 6D show a second embodiment of the twist lock assembly 155 having a foot 195 projecting from the housing. A first release member 182 operates against a spring 190 to keep the foot 195 in the locked position. The second release member (not shown) is mounted at a coupling point 181 to a rotatable member 180. On operation of the member 180, the twist lock is also operated so as to rotate the foot 195. Figures 6C and 6D show the result of applying a tensile load 200 to the member 180 so as to rotate 205 the member against the mechanism within the twist lock and so compressing 210 the spring 190 in order to rotate 215 the foot 195.
Figures 7A and 7B show the flexibility of the system according to one embodiment. Here the twist lock assembly 220 is movable from a projecting position 225 into a void 245 so as to retract the assembly 220 into the casting 235.

To facilitate the movement, the twist lock assembly 220 includes a first resiliently biased lug 230 which is selectively projectable from the assembly 220 and corresponds to a first engagement portion, in this case ridge 231, within the casting as shown in Figure 7A. In this position the lug 230 prevents the horizontal movement of the assembly 220 and so allowing the assembly to project from the casting 235.

Figures 7B shows the other extreme whereby the assembly 220 is fully retracted within the casting 235 and so filling the void 245.

The casting as shown in Figures 7A and 7B is purpose built for the system and includes horizontal rails 240 and vertical rails 250 to allow a two step process in the movement of the assembly 220 from the projected position 225 to the retracted position 245. Thus horizontal movement represents the first step and is facilitated by rail 240 to intermediate position whereby the assembly 220 then moves upwards along a vertical rail 260 until fully retracted.

Figures 8A to 8E show the system as shown in Figures 7A to 7B in sequential steps from the projected position to the fully retracted position.
Figure 8A shows the resiliently biased lug 230 in contact with the ridge 231 and so preventing horizontal movement.

Figure 8B shows the result of releasing the lug 230 which permits horizontal movement to 65 along the horizontal rail 240.

Figure 8C shows the final movement to the intermediate position of the assembly 220 prior to moving upwards 275 along the vertical rail 260 as shown in Figure 8D.

Finally Figure 8E shows the assembly 220 filling the retracted void 245 and so fully retracting the twist lock assembly. The second resiliently biased lug 255 is then allowed to extend so as to contact a second engagement portion, in this case the peripheral end of the vertical rail 260 and so preventing the downward motion of the twist lock assembly 220. Thus in this position the twist lock assembly 220 is in a selectively releasable position within the casting 235 and fully retracted so as to prevent interference of the foot should the container be placed on the ground.
Claims:

1. A twist lock engagement system comprising;
   a twist lock assembly mounted to a corner casting of a first container, said twist lock assembly engageable with a top corner casting of a second container through rotation of a casting engaging foot of said twist lock assembly;
   a switch mounted adjacent to a top corner casting of said first container, said switch and twist lock assembly in communication;
   wherein activation of said switch results in the rotation of said foot.

2. The system according to claim 1 wherein said switch is a depressible pin, and communication with the twist lock assembly is through a transmission member mounted intermediate the switch and a release member of the twist lock assembly, said release member arranged to selectively rotate the foot, such that depression of the switch results in the transmission member activating the release member and so rotating the foot.

3. The system according to claim 2 wherein said transmission member and second release member form a single unitary element, such that both tensile and compressive force can be applied by the switch in order to rotate the foot.

4. The system according to claim 2 wherein the transmission member is a cable connected at a first end to the switch and a second end to the release member,
with the cable passing through a pulley adjacent to the switch such that a
depression of the switch causes an upward force on the cable.

5. The system according to claim 2 wherein the transmission member is a rod
connected at a first end to the switch through a pivotal member, and a second
end to the release member, such that a depression of the switch causes the
pivotal member to apply an upward force on the rod.

6. The system according to any one of the preceding claims, further including a
projection mounted to a spreader, said projection aligned to activate the switch
on the spreader engaging the container.

7. The system according to claim 6 wherein the projection provides a depression
force to depress the switch.

8. The system according to claim 6 or 7 wherein projection is selectively
extendable such that the switch is selectively operable through selective
extension of the projection.

9. The system according to any one of the preceding claims, wherein the corner
casting includes rails corresponding to projections projecting from said twist
lock assembly such that said twist lock assembly is in sliding engagement with
the casting.
10. The system according to claim 9 wherein the twist lock assembly is movable from a projecting position whereby the foot projects from the casting, to a retracted position whereby the foot is fully retracted within the casting.

11. The system according to claim 10, wherein the twist lock assembly includes a first resiliently biased lug for selectively engaging a first engagement portion within the casting, such engagement preventing movement of the twist lock assembly whilst in the projecting position.

12. The system according to claim 10 or 11, wherein the twist lock assembly includes a second resiliently biased lug for selectively engaging a second engagement portion within the casting, such engagement preventing movement of the twist lock assembly whilst in the retracted position.

13. A twist lock assembly for an intermodal container; the assembly comprising
a housing;
a foot projecting from a first face of the housing;
said foot rotatable between a locked position and an unlocked position, the foot resiliently biased to rotate from the unlocked position to the locked position and;

first and second release members each for selectively rotating the foot from the container locked position to the unlocked position.
14. The twist lock assembly according to claim 13 wherein the second release member is located on a second face of the housing, said second phase opposed to the first face.

15. The twist lock assembly according to claim 13 or 14 wherein said second release member is in communication with a switch, said switch located remotely from the twist lock assembly, such that operation of the switch applies a tensile force to the second release member in order to activate the twist lock assembly.

16. The twist lock assembly according to any one of claims 13 to 15 wherein said twist lock assembly is mountable to a corner casting of said intermodal container.

17. The twist lock assembly according to claim 15 or claim 16 wherein said switch is located within a top corner casting of said intermodal container.
INTERNATIONAL SEARCH REPORT

International application No. PCT/SG2011/000085

A. CLASSIFICATION OF SUBJECT MATTER

Int. Cl.
B65D 88/12 (2006.0) B60P 7/08 (2006.01) B65D 90/00 (2006.01) B60P 7/13 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, EPDOC: IPC B65D 88/12, B65D 90/00, B60P 7/08, B60P 7/13, B65D 2 1/ and Keywords (large, lock, twist, pin, link, rail, slide) & like terms. ESP ACE and Google Patents with similar keywords.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 70 14234 B2 (WALKER) 21 March 2006 see column 6, line 22-column 8, line 37; figures 1-7e</td>
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<td>X</td>
<td>US 3980 185 A (CAIN) 14 September 1976 see column 1, line 55-column 2, line 60; figures 1-9</td>
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Date of the actual completion of the international search
19 April 2011

Date of mailing of the international search report
28 Apr M

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This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX