



Claims

1. Device (50) for handling an inter-box connector (52), the device (54) comprising:
5 Indexing means (54) for identifying positions of the inter-box connector (52) automatically,
Manipulation means (56) for mounting or dismounting the inter-box connector (52), and
Transportation means (58) connected to both the indexing means (54) and
10 the manipulation means (56) for moving the manipulation means (56) to the identified positions of the inter-box connector (52).
2. The device (50) of Claim 1, wherein
The indexing means (54) comprises a camera (60) for perceiving and
15 analysing the inter-box connector (52).
3. The device (50) of Claim 1 or 2, wherein
The index means (54) further comprises a distance reader (62) for detecting
the positions of the inter-box connector (52).
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4. The device (50) of any of the preceding Claims, wherein
The manipulation means (56) comprises a gripper (64) for holding the inter-box connector (52) and a twister (66) for rotating the inter-box connector (52).
- 25 5. The device (50) of Claim 4, wherein
The gripper (64), the twister (66), or both of them (64, 66) are pneumatically powered.
6. The device (50) of any of the preceding Claims, wherein
30 The manipulation means (56) further comprises a position sensor (68) for determining a cone (70) of the inter-box connector (52).
7. The device (50) of any of the preceding Claims, wherein



The indexing means (54) and the manipulation means (56) are installed together such that the transportation means (58) is configured to move the indexing means (54) and the manipulation means (56) simultaneously.

- 5 8. The device (50) of any of the preceding Claims, wherein
 The indexing means (54), the manipulation means (56) and the transportation means (58) are connected to a robot controller (72) such that the device (50) becomes a robotic arm (74).
- 10 9. The device (50) of Claim 8, wherein
 The robot controller (72) is configured to analyse images of inter-box connectors received by the camera (60) for differentiating various types of inter-box connectors (52)
- 15 10. The device (50) of Claim 8, wherein
 the manipulation means (56) comprises an end effector (76) of the robotic arm (74).
- 20 11. The device (50) of any of the preceding Claims, wherein
 The indexing means (54) is fault-tolerant that the device (50) is configured to detect mounting holes (78) on an Intermodal freight container (80) with various orientations, angles, distances, lighting conditions or a combination of any of these conditions.
- 25 12. Station (80) for handling an inter-box connector (52) comprising:
 The device (50) according to any of the preceding claims; and
 A platform (90) for mounting the device (50).
- 30 13. Station (80) of Claim 11, wherein
 The platform (90) comprises an open area (98) for receiving a box (100) or inter-box connectors (52).
14. 14. The station (80) of Claim 11 or 12 further comprising
 A holder (96) for transporting the station (80).

15. The station (80) of Claim 14, wherein
The holder (96) comprises two slots (98) for receiving forks (100) of a forklift (102).

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16. The station (80) of any of the Claims 13 to 15 further comprising
An inter-box storage (82) for receiving dismantled inter-box connectors (84).

- 10 17. The station (80) of Claim 11, wherein
The storage (82) comprises at least one floor (86) with perforations (88) for holding the dismantled inter-box connectors (84).

- 15 18. The station (80) of Claim 17, wherein
The perforations (88) of the at least one floor (86) are placed in close proximity such that dismantled inter-box connectors (84) of neighbouring perforations (88) provides about 100 millimetres distances between cones (70) of the dismantled inter-box connectors (84).

- 20 19. A shipping port (92) for handling shipping containers (94) comprising:
The device (50) according to any of the Claims 1 to 10.

- 25 20. The shipping port (92) of Claim 19 comprising
Two of the devices (50) that face each other with a distance in-between for allowing a shipping container (94) passing through in-between.

- 30 21. The shipping portion (92) of Claim 19 or 20 comprising
Four of the devices (50) that are separated into two groups (104) placed on opposite sides for allowing a shipping container (94) passing through in-between the two groups (104).

22. The shipping port (92) of any of the Claims 19 to 21 comprising
Six of the devices (50) that are separated into two groups (104) placed on opposite sides for allowing a shipping container (94) passing through in-between the two groups (104).

23. The shipping port (92) of any of the preceding Claims 19 to 21 comprising
The station (80) according to any of the Claims 12 to 18.
- 5 24. The shipping port (92) of Claim 23 comprising
Two of the stations (80) that face each other with a distance in-between for
allowing a shipping container (94) passing through in-between them (80).
- 10 25. The shipping port (92) of Claim 23 or 24 comprising
Four of the stations (80) that are separated into two groups (104) placed at
opposite sides for allowing a shipping container (94) passing through in-
between the two groups (104).
- 15 26. The shipping port (92) of any of the Claims 23 to 25 comprising
Six of the stations (80) that are separated into two groups (104) placed on
opposite sides for allowing a shipping container passing through in-between
the two groups (104).
- 20 27. A spreader (102) for lifting shipping containers comprising:
Hoisting mechanism (108) on a frame (106) of the spreader (102) for lifting
the spreader (102); and
The device (50) according to any of the preceding Claims 1 to 11.
- 25 28. A wharf transportation vehicle (110) comprising:
A frame (112) for supporting a shipping container (94) and
The device (50) according to any of the preceding Claims 1 to 11 at an end
(114) of the frame (112) for handling inter-box connectors (52).
- 30 29. Method (120) of making a device (50) for handling an inter-box connector (52),
the method (120) comprising:
Providing (122) an indexing means (54) for identifying positions of the inter-
box connector (52) automatically,
Adding (124) a manipulation means (56) for mounting or dismounting the
inter-box connector (52), and

Connecting (126) a transportation means (58) to both the indexing means (54) and the manipulation means (56) for moving the manipulation means (56) to the identified positions of the inter-box connector (52).

- 5 30. Method (120) of installing a device (50) for handling an inter-box connector (52), the method (120) comprising:
- Presenting (128) the device (50), the device (50) comprising:
 - 10 o Indexing means (54) for identifying positions of the inter-box connector (52) automatically,
 - o Manipulation means (56) for mounting or dismounting the inter-box connector (52), and
 - o Transportation means (58) connected to both the indexing means (54) and the manipulation means (56) for moving the manipulation means (56) to the identified positions of the inter-box connector (52);
 - 15 and
 - Mounting (130) the device (50) at a site (132) for handling inter-box connectors (52).
- 20 31. Method of using a device (50) for handling an inter-box connector (52), the method (120) comprising:
- Offering (128) the device (50), the device (50) comprising:
 - 25 o Indexing means (54) for identifying positions of the inter-box connector (52) automatically,
 - o Manipulation means (56) for mounting or dismounting the inter-box connector (52), and
 - o Transportation means (58) connected to both the indexing means (54) and the manipulation means (56) for moving the manipulation means (56) to the identified positions of the inter-box connector (52);
 - and
 - 30 - Installing or removing an inter-box connector (52) from a shipping container (94).