

CLAIMS:

1. A mooring robot for releasably fastening a vessel to a dock or to a second vessel, the mooring robot comprising:
 - a) a base to be attached to said dock or second vessel;
 - 5 b) an attachment element configured to be releasably engageable with a surface of said vessel; and
 - c) at least two linkages dependent from the base and together supporting the attachment element and configured to retract and extend to allow movement of the attachment element in a direction (herein after "transverse direction")
10 towards and away from the base respectively; each linkage comprising a base arm and an attachment arm pivotably connected together at a revolute intermediate joint, the base arm pivotably connected to the base at a revolute base joint and the attachment arm pivotably connected to the attachment element at a revolute attachment joint, wherein the three joints each define a
15 rotational axis that are spaced apart and parallel to each other wherein the rotational axes of the joints of a first linkage of the at least two linkages are not parallel to rotational axes of the joints of at least one second linkage of the at least two linkages.
2. The mooring robot as claimed in claim 1, wherein the mooring robot
20 comprises a moving arrangement configured to extend and/or retract the attachment element in the transverse direction.
3. The mooring robot as claimed in claim 1 or 2, wherein the mooring robot comprises three, four, five, or six linkages.
4. The mooring robot as claimed in claim 1 or 2, wherein the robot comprises
25 two linkages only; the first linkage and the second linkage.
5. The mooring robot as claimed in any one of the preceding claims, wherein an angle between the intermediate rotational axis of the first linkage is at 90 degrees to the intermediate rotational axis of the second linkage (i.e the rotational axes are orthogonal each other).
- 30 6. The mooring robot as claimed in any one of the preceding claims, wherein only the linkages transfer the weight of the attachment element to said dock or second vessel.

7. The mooring robot as claimed in any one of the preceding claims, wherein the moving arrangement is a powered actuating arrangement.
8. The mooring robot as claimed in claim 7, wherein the moving arrangement is engaged between the base and one of the attachment arm or attachment element.
- 5 9. The mooring robot as claimed in any one of the preceding claims, wherein the attachment element comprises an engagement element configured to engage a surface of the vessel, and the engagement element is a vacuum pad, vacuum cup or cups, hook device, a charging connection, or other engagement feature configured to releasably engage with said vessel.
- 10 10. A mechanism for engaging or fending of a vessel to a dock or to a second vessel, the mechanism including:
- a. a base to be attached to the dock or second vessel;
 - b. an element contactable to said vessel;
 - c. at least two linkages intermediate the base and element to form a sarrus
 - 15 mechanism in combination with the base and element, the sarrus mechanism allowing extending and retracting movement of the element in a transverse direction respective to the base, wherein a first linkage comprises rotational axes non-parallel like rotational axes of second linkage; and
 - d. a moving arrangement for driving and/or resisting movement of the frame in
 - 20 said transverse direction.
11. The mechanism as claimed in claim 10, wherein each linkage of the at least two linkages comprises a respective base arm and an attachment arm.
12. The mechanism as claimed in claim 10 or 11, wherein each linkage comprises three revolute joints to allow rotation between the base and base arm; the base arm
- 25 and the attachment arm; and the attachment arm and the element.
13. The mechanism as claimed in claim 12, wherein each revolute joint comprises a rotational axis, and the three rotational axes of a linkage are parallel to each other and wherein the rotational axes of the three revolute joints of the first linkage are not parallel to the rotational axes of the three revolute joints on the second linkage.
- 30 14. The mechanism as claimed in any one of claims 10 to 13, wherein the moving arrangement is hydraulic actuator configured to drive the element in the transverse direction, or the moving arrangement is an energy absorber.

15. The mechanism as claimed in any one of claims 10 to 14, wherein the linkages support at least a weight of themselves and at least a partial amount of weight of the element, or the full amount of the element.
16. The mechanism as claimed in any one of claims 10 to 15, wherein the
5 mechanism comprises a frame intermediate the linkages and the element.
17. A mechanism for a fender between a vessel and dock or second vessel, or a mooring robot for releasably fastening a vessel to a dock or to a second vessel, the mechanism comprising:
- a) a base to be attached to said dock or second vessel;
 - 10 b) an element configured to be either a fender element or an attachment element releasably engageable with a surface of said vessel; and
 - c) at least two linkages dependent from the base and together and at least partially supporting the element and configured to retract and extend to allow movement of the element in a direction (herein after "transverse direction")
15 towards and away from the base respectively; each linkage comprising a base arm and an attachment arm pivotably connected together at a revolute intermediate joint, the base arm pivotably connected to the base at a revolute base joint and the attachment arm pivotably connected to the element at a revolute attachment joint, wherein the three joints each define a rotational axis
20 that are spaced apart and parallel to each other wherein the rotational axes of the joints of a first linkage of the at least two linkages are not parallel to rotational axes of the joints of at least one second linkage of the at least two linkages.
18. The mechanism as claimed in claim 17, wherein the mechanism comprises a
25 moving arrangement configured to extend and/or retract the attachment element in the transverse direction.
19. The mechanism as claimed in claim 17 or 18, wherein the robot comprises two linkages; the first linkage and the second linkage.
20. The mechanism as claimed in any one of claims 17 to 19, wherein an angle
30 between the intermediate rotational axis of the first linkage is at 90 degrees to the intermediate rotational axis of the second linkage (i.e the rotational axes are orthogonal each other).

21. The mechanism as claimed in any one of claims 17 to 20, wherein only the linkages transfer the weight of the element to said dock or second vessel.
22. The mechanism as claimed in any one of claims 17 to 21, wherein at least one linkage is biased to retract the element under gravity.
- 5 23. The mechanism as claimed in any one of claims 17 to 22, wherein the moving arrangement is a powered actuating arrangement.
24. The mechanism as claimed in claim 23, wherein the moving arrangement is an energy absorber, and/or the moving arrangement is an energy absorber and one or more selected from a rubber absorber, pneumatic absorber, and foam absorber.
- 10 25. The mechanism as claimed in claim 23 or 24, wherein the moving arrangement is engaged between the base, and one or both of the attachment arm and element.
26. The mechanism as claimed in any one claims 17 to 25, wherein the element comprises an engagement element configured to engage a surface of the vessel, and
- 15 the engagement element is a vacuum pad, vacuum cup or cups, hook device, a charging connection, or other engagement feature configured to releasably engage with said vessel.
27. A mechanism for a fender between a vessel and dock or second vessel, or a mooring robot for releasably fastening a vessel to a dock or to a second vessel, the
- 20 mechanism comprising:
- a) a base to be attached to said dock or second vessel;
 - b) an element to be contactable with a surface of said vessel;
 - c) at least two linkages dependent from the base and together at least partially supporting the element and configured to retract and extend to allow
- 25 movement of the element in a direction (herein after "transverse direction") towards and away from the base respectively; each linkage comprising a base arm and an attachment arm pivotably connected together at a revolute intermediate joint, the base arm pivotably connected to the base at a revolute base joint and the attachment arm pivotably connected to the element at a
- 30 revolute attachment joint; and
- wherein movement of the element towards and/or away from the base follows a straight path.