CLAIMS

1. An all around towing system (33) for a tug (31) comprising:

a heavy plate (40) mounted on a deck (32) of the tug;

an upper rail segment (42) and a lower rail segment (44) disposed on the upper and lower surfaces towards an outer edge of the heavy plate, respectively;

a carriage (46) movable along the upper and lower rail segments;

a set of bearing wheels (47, 48) arranged for guiding the carriage along the upper and lower rail segments;

characterized in that the heavy plate further comprises respective upper and lower grooves (43, 45) on the upper and lower surfaces of the heavy plate and in that the upper and lower rail segments are respectively mounted in the upper and lower grooves of the heavy plate.

2. The around towing system (33) according to any one of the preceding claims, wherein the upper and lower rail segments (42, 44) are bolted in the upper and lower grooves (43, 45), respectively.

3. The all around towing system (33) according to any one of the preceding claims, wherein the upper and lower rail segments (42, 44) are bolted through holes in the heavy plate (40) to the rail segments on the opposing top and bottom surfaces.

4. The all around towing system (33) according to any one of claims 2 and 3, further comprising bolt connections formed between the upper and lower rail segments and the heavy plate are positioned at between 15% to 40% of the width of the upper and lower rail segments measured from the inner curvature of the upper and lower rail segments (42, 44).

5. The all around towing system (33) according to any one of the preceding claims, wherein ~~the~~ a carriage (46) has at least two rigid parts (61, 62) connected to each other.

6. The all around towing system (33) according to claim 5, wherein the carriage (46) has at least two guiding structures (59) suitably disposed on the two rigid parts (61, 62) of the carriage (46) for connection to a split towline (60) and a towline (35) for towing an object.

7. The all around towing system (33) according to claim 6, wherein the guiding structures (59) are arranged and disposed on the carriage at a distance of at least 20% of the carriage length measured from half length of the carriage (46).

8. The all around towing system (33) according to claims 6 or 7, wherein the towline (35) is connected to the split towline (60) which forms a triangle connection (34) with a maximum split angle of 60°.

9. The all around towing system (33) according to any one of claims 6 to 8, wherein the split towline (60) has two ends passing through the guiding structures (59) and the ends are connected to each other at half length of the carriage (46) forming a closed loop triangle.

10. The all around towing system (33) according to any one of claims 6 to 8, wherein the split towline (60) has two ends passing through the guiding structures (59) and the ends are connected by means of a release system.

11. The all around towing system (33) according to any one of claims 6 to 10, wherein the guiding structures (59) have a fixed curved smooth surface.

12. The all around towing system (33) according to any one of claims 6 to 10, wherein the guiding structures (59) have a rolling surface.

13. The all around towing system (33) according to any one of claims 5 to 12, wherein the carriage (46) has two rigid parts (61, 62) which are connected by a marginally flexible structure (63).

14 The all around towing system (33) according to any one of claims 5 to 12, wherein the carriage (46) has two rigid parts (61, 62) with a plurality of flexible blocks (65) mounted between the rigid parts.

15. The all around towing system (33) according to any one of the preceding claims, wherein the set of bearing wheels comprises:

at least two upper main bearing wheels (47) arranged and disposed on the upper surfaces of the carriage for guiding the carriage along the upper rail segment (42);

at least two lower main bearing wheels (48) arranged and disposed on the lower surfaces of the carriage for guiding the carriage along the lower rail segment (44);

16 The all around towing system (33), according to claim 15, wherein the upper main bearing wheels (47) are arranged and disposed on the upper and inner half surface of the carriage for guiding the carriage (46) along the inner side of the upper rail segment (42).

17. The all around towing system (33), according to any one of claims 15 to 16, wherein the lower main bearing wheels (48) are arranged and disposed on the lower and inner half surface of the carriage for guiding the carriage along the inner side of the lower rail segment (44).

18. The all around towing system (33) according to any one of claims 15 to 17, wherein each of the upper main bearing wheels (47) is provided with a flange (49).

19. The all around towing system (33) according to any one of claims 15 to 18, wherein each of the lower main bearing wheels (48) is provided with a flange (50).

20. The all around towing system (33) according to any one of claims 15 to 19, further comprising at least two upper wheels (53) arranged and disposed on the upper and outer half surface of the carriage (46) for guiding the carriage along the outer side of the upper rail segment (42).

21. The all around towing system (33) according to any one of claims 15 to 20, further comprising at least two lower wheels (54) arranged and disposed on the lower and outer half surface of the carriage (46) for guiding the carriage along the outer side of the lower rail segment (44).

22. The all around towing system according to claim 20, wherein the additional upper wheel (53) is provided with a flange (55).

23. The all around towing system (33) according to claim 21, wherein the additional lower wheel (54) is provided with a flange (56).

24. The all around towing system (33) according to claims 20 and 21, wherein the additional upper and lower wheels (53, 54) are fitted with an eccentric bushing.

25. The all around towing system (33) according to any one of claims ~~13~~ 15 to 24, wherein the upper main bearing wheels (47) and lower main bearing wheels (48) have a vertical rotation axis of 90 degrees perpendicular to the heavy plate (40).

26. The all around towing system (33) according to any one of claims 15 to 25, wherein each upper main bearing wheel (47) is arranged with its flange (49) on the upper side of the upper main bearing wheel aligning with the upper side of the upper rail segment (42)

27. The all around towing system (33) according to any one of claims 15 to 26, wherein each lower main bearing wheel (48) is arranged with its flange (50) on the lower side of the lower main bearing wheel aligning with the lower side of the lower rail segment (44).

28. The all around towing system (33) according to any one of claims 15 to 27, wherein the upper main bearing wheels (47~~, 51~~) and lower main bearing wheels (48) are distributed evenly along the upper and lower surfaces of the carriage (46).

29. The all around towing system (33) according to any one of the preceding claims, wherein the heavy plate (40) has a circular shape.

30 The all around towing system (33) according to any one of claims 1 to 28, wherein the heavy plate (40) has an oval or elliptical shape.

31. The all around towing system (33) according to any one of the preceding claims, wherein the upper and lower rail segments (42, 44) have a circular profile.

32. The all around towing system (33) according to any one of the preceding claims, wherein the upper and lower rail segments (42, 44) have an oval or elliptical circular profile.

33. The all around towing system (33) according to any one of the preceding claims, wherein the inner and outer diameters of the circumference of the upper rail segment (42) and lower rail segments (44) are equivalent in that the upper and lower rail segments are laterally aligned to each other.

34. The all around towing system (33) according to any one of the preceding claims, wherein the diameter of the outer edge of the upper groove (43) has a smaller diameter than the inner edge of the lower groove (45).

35. The all around towing system (33) according to any one of the preceding claims, wherein the length of the carriage is at least 5% of the outer circumference of the rail segments (42, 44).

36. The all around towing system (33) according to any one of the preceding claims, wherein the length of the carriage is in the range of 10% to 20% of the outer circumference of the rail segments (42, 44).