MOORING SYSTEMS AND METHODS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of United States Provisional Patent Application No. 63/312,728, filed on February 22, 2022, and entitled “Mooring Systems and Methods,” the entirety of which is incorporated herein by reference and made a part of the present disclosure.

FIELD

[0002] The present disclosure relates to methods, systems, and apparatus for mooring vessels and tensioning mooring lines.

BACKGROUND

[0003] In many applications, floating vessels or structures require mooring, such as in offshore drilling platform applications. Mooring typically includes transport of the vessel and mooring structures to a site and tensioning, securing, cutting, and storing mooring lines.

BRIEF SUMMARY

[0004] A first aspect of the present disclosure provides a fairlead stopper. The fairlead stopper includes a housing assembly, latches coupled with the housing assembly, a chainwheel rotatably coupled with the housing assembly, a chain table coupled with the housing assembly, and a first chain retaining arm. The latches are positioned to latch a chain link of a mooring line to secure a tension on the mooring line. The chainwheel is positioned to receive a tail chain of the secured mooring line from the latches. The chain table is positioned to receive a portion of the tail chain from the chainwheel. The first chain retaining arm is pivotably coupled with the housing assembly in both an open and a closed position of the first chain retaining arm. The first chain retaining arm is pivotably movable, relative to the housing assembly, between the open position and the closed position. In the closed position, the first chain retaining arm is engaged over the chain table and is positioned to secure a portion of the tail chain that is positioned on the chain table while the mooring line is secured by the latches.

[0004a] A second aspect of the present disclosure provides a method of handling a mooring line coupled with a fairlead stopper. The method includes providing a fairlead stopper comprising a housing assembly, latches coupled with the housing assembly, a chainwheel coupled with the housing assembly, a chain table coupled with the housing assembly, a chain deflector coupled with the housing assembly, and a first chain retaining arm pivotably coupled

with the housing assembly in both an open and closed position of the first chain retaining arm. The method also includes, with the first chain retaining arm pivotably coupled with the housing assembly in the open position, latching a mooring line with the latches and directing a tail chain of the mooring line from the latches, over the chainwheel, onto the chain table, and to the chain deflector. The chain deflector deflects a portion of the tail chain of the mooring line to one side of the fairlead stopper. The method further includes, with the mooring line secured by the latches, pivoting the first chain retaining arm from the open position into the closed position such that the first chain retaining arm is engaged over the chain table and over the portion of the tail chain on the chain table to secure that portion of the tail chain onto the chain table.

[0004b] The present disclosure also includes a fairlead stopper. The fairlead stopper includes a housing assembly, latches movably coupled with the housing assembly, a chainwheel rotatably coupled with the housing assembly, and at least one chain retaining arm coupled with the housing assembly. The at least one chain retaining arm is movable between an open position and a closed position. In the closed position, the at least one chain retaining arm is positioned to secure mooring line passing through the fairlead stopper.

[0005] The present disclosure also includes a method of handling a mooring line coupled with a fairlead stopper. The method includes providing a fairlead stopper having a housing assembly, latches coupled with the housing assembly, a chainwheel coupled with the housing assembly, and at least one chain retaining arm coupled with the housing assembly. The method includes latching a mooring line with the latches. The mooring line extends from the latches to the chainwheel and over the chainwheel. The method includes moving the at least one chain retaining arm into a closed position such that the mooring line is secured between the at least one chain retaining arm and another portion of the fairlead stopper.

[0006] The present disclosure also includes a vessel. The vessel includes a hull and a sea-fastening brace coupled with the hull. A fairlead stopper is coupled with the sea-fastening brace. The sea-fastening brace extends from the hull to position the fairlead at an angle relative to the hull.

CLAIMS

What is claimed is:

1. A fairlead stopper, the fairlead stopper comprising:

a housing assembly;

latches coupled with the housing assembly, wherein the latches are positioned to latch a chain link of a mooring line to secure a tension on the mooring line;

a chainwheel rotatably coupled with the housing assembly, wherein the chainwheel is positioned to receive a tail chain of the secured mooring line from the latches;

a chain table coupled with the housing assembly, wherein the chain table is positioned to receive a portion of the tail chain from the chainwheel;

a first chain retaining arm pivotably coupled with the housing assembly in both an open and a closed position of the first chain retaining arm, wherein the first chain retaining arm is pivotably movable, relative to the housing assembly, between the open position and the closed position, wherein in the closed position the first chain retaining arm is engaged over the chain table and is positioned to secure a portion of the tail chain that is positioned on the chain table while the mooring line is secured by the latches.

2. The fairlead stopper of claim 1, further comprising:

a chain deflector coupled with the housing assembly, wherein the chain table is positioned to direct mooring line to the chain deflector, and wherein the chain deflector is configured to deflect mooring line to one side of the fairlead stopper.

3. The fairlead stopper of claim 1, wherein the chain table comprises a first chain plate coupled with a second chain plate, wherein the first and second chain plates define a trough that is positioned to receive a portion of the tail chain of the mooring line from the chainwheel.

4. The fairlead stopper of claim 2, wherein the chain deflector comprises a baffle, wherein the baffle defines at least one chain deflector trough, and wherein the at least one chain deflector trough is positioned to deflect a portion of the tail chain of the mooring line to one side of the fairlead stopper.

5. The fairlead stopper of claim 4, wherein the at least one chain deflector trough comprises a first chain deflector trough positioned to deflect a portion of the tail chain of the mooring line to a first side of the fairlead stopper and a second chain deflector trough positioned to deflect a portion of the tail chain of the mooring line to a second side of the fairlead stopper.

6. The fairlead stopper of claim 1, comprising:

a second chain retaining arm pivotably coupled with the housing assembly, wherein the second chain retaining arm is pivotably movable, relative to the housing assembly, between an open position and a closed position, wherein in the closed position the second chain retaining arm is engaged over the chainwheel and positioned to secure a portion of the tail chain that is passing over the chainwheel while the mooring line is secured by the latches.

7. The fairlead stopper of claim 1, further comprising a sea-fastening bracket, wherein the sea-fastening bracket is selectively couplable with the housing assembly to secure the fairlead stopper to a vessel.

8. The fairlead stopper of claim 1, wherein the chain retaining arm is lockable in the open position during transport of the fairlead stopper and during tensioning of the mooring line, and is lockable in the closed position after the mooring line is tensioned and latched by the latches.

9. The fairlead stopper of claim 1, wherein the chain retaining arm remains pivotably coupled with the housing assembly before, during, and after the tensioning of the mooring line.

10. The fairlead stopper of claim 1, wherein, in the closed position, the first chain retaining arm is locked to the chain table.

11 The fairlead stopper of claim 1, comprising:

a strut coupled with the housing assembly;

wherein the strut is configured to react to forces imparted onto the fairlead stopper.

12. A method of handling a mooring line coupled with a fairlead stopper, the method comprising:

providing a fairlead stopper comprising a housing assembly, latches coupled with the housing assembly, a chainwheel coupled with the housing assembly, a chain table coupled with the housing assembly, a chain deflector coupled with the housing assembly, and a first chain retaining arm pivotably coupled with the housing assembly in both an open and closed position of the first chain retaining arm;

with the first chain retaining arm pivotably coupled with the housing assembly in the open position, latching a mooring line with the latches and directing a tail chain of the mooring line from the latches, over the chainwheel, onto the chain table, and to the chain deflector, wherein the chain deflector deflects a portion of the tail chain of the mooring line to one side of the fairlead stopper; and

with the mooring line secured by the latches, pivoting the first chain retaining arm from the open position into the closed position such that the first chain retaining arm is engaged over

the chain table and over the portion of the tail chain on the chain table to secure that portion of the tail chain onto the chain table.

13. The method of claim 12, further comprising:

coupling the fairlead stopper with a vessel;

coupling a sea-fastening brace between the fairlead stopper and the vessel or between a first portion of the fairlead stopper and a second portion of the fairlead stopper;

wherein the sea-fastening brace extends to position the fairlead at an angle relative to the vessel.

14. The method of claim 12, further comprising:

coupling a wave-reaction bar with a vessel;

coupling the fairlead stopper with the wave-reaction bar; and

reacting forces imparted onto the fairlead stopper with the wave-reaction bar.

15. The method of claim 12, comprising, after pivoting the first chain retaining arm into the closed position, cutting a portion of the tail chain extending from the chain table beyond the first chain retaining arm; wherein, after cutting the portion of the tail chain, the first chain retaining arm prevents or resists pulling of the tail chain toward the chainwheel.