

RESERVE CCOPY

PATENT SPECIFICATION

DRAWINGS ATTACHED

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1,165,520



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COMPLETE SPECIFICATION

A floating conduit, in particular for single buoy moorings.

We, SHELL INTERNATIONALE RESEARCH MAATSCHAPPIJ N.V., a company organized under the laws of The Netherlands, of 30 Carel van Bylandtlaan, The Hague, the Netherlands, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a floating conduit in particular for use with single buoy moorings for loading or unloading ships.

In recent years single buoy moorings, such as for example described in applicant's U.K. Patents 977,451; 1,031,492; 1,017,894 have come into use for loading and unloading tankers. These single buoy moorings are normally provided with long floating hoses, which are adapted to make a fluid connection between the tanker and the single buoy mooring, so that loading or unloading can take place.

These hoses, which are made of rubber or of a similar flexible material, are very long and have a large diameter so that they are very expensive indeed. Furthermore since these hoses are permanently floating on the sea surface they are easily damaged in the case of rough weather. Damage to a hose, would not only make it necessary to replace the expensive hose, but would moreover cause as well delays in the loading or unloading of a tanker.

It is an object of the invention to propose a new floating conduit, which is less expensive than and more resistant to damage than the usual floating hoses.

Therefore the floating conduit according to the invention comprises a series of rigid pipes, each pipe having a float integral with said pipe, the successive rigid pipes being interconnected by hoses so as to form the conduit.

In an attractive embodiment of the in-

vention the float of the rigid pipe comprises a layer of foamed plastics arranged around the said pipe. This foamed plastics is preferably polyurethane foam which has been put on the rigid pipe by a spraying method.

The invention will be further explained with reference to the drawings, wherein:

Figure 1 shows a longitudinal cross-section of a first embodiment of the invention.

Figure 2 shows a side view of the embodiment according to Figure 1.

Figure 3 shows a longitudinal cross-section of a modified embodiment of the invention.

Figure 4 shows a longitudinal cross-section of a further modified embodiment of the invention.

Figure 5 shows a longitudinal cross-section of another modified embodiment of the invention.

Figure 6 shows a side view of an embodiment wherein the rigid pipes are interconnected by a hose and by a universal joint.

In the figures the rigid metal pipes are indicated by the reference number 1 and their flanges are indicated by the reference number 2. In figures 1, 2, 3, 4 and 6 each rigid pipe 1 is provided with a float which is integral with said pipe 1 and which comprises a layer of foamed plastics 3, such as polyurethane foam, which has been put on the rigid pipe 1 by a conventional spraying method. The outer surface of the layer of foamed plastics 3 is suitably provided with a protective layer 4 comprising glasscloth impregnated with an epoxy resin.

Between each pair of rigid pipes 1 a hose is arranged, which is generally indicated by the reference number 5, said hose being provided in a conventional manner with metal flanges 6 which are connected to the flanges 2 by bolts (not shown).

In figures 1 and 2 the hose 5 comprises

[Price 4s. 6d.]

Price 5s. 6d.

a conventional flexible conduit, for example made of rubber or of a similar material, which is provided with a number of annular floats 7 of foamed plastics which are arranged around the hose 5.

In the embodiment according to figure 3 the hose 5 is provided with a float 8 which is integral with the hose 5, said float 8 comprising a layer of foamed plastics or of foamed rubber which has been put around the hose 5 as separate prefabricated sheets or by foaming by means of a spraying method. The outer surface of said float 8 may be provided with a protective layer 9 of abrasion-resistant rubber or polyurethane.

In the embodiments according to figures 4 and 5 the hose 5 is not provided with any floats, since sufficient buoyance is provided by the floats of the rigid pipes 1.

In the embodiment according to figure 5 the rigid pipes 1 are provided with floats differing from the floats according to the other figures. In this embodiment, each rigid pipe 1 is surrounded by a metal pipe 10, which is spaced from the metal pipe 1, so that a chamber 11 is formed which is closed in an air-tight manner by plates 12 at its ends. Said chambers 11 act as floats and provide the buoyancy of the conduit.

The embodiment according to figure 6 is in principle the same as the embodiments according to figures 1-5, the main difference being that each pair of rigid pipes is additionally interconnected by a universal joint. This universal joint, which is a cardan joint of a type known as such, comprises a ring 13, two pairs of pins 14 and two pairs of forks 15, each pair of forks 15 being connected to the end of a rigid pipe. Each pair of forks 15 is rotatably connected to the ring 13 by means of the pins 14. Instead of the universal joint as described other suitable types of universal joints may of course be used.

As explained above the hose 5 may be provided with floats or a float made of foamed plastics. Instead it is possible to provide the hose 5 with sufficient buoyancy by means of (an) air chamber(s) (not shown). The air is then trapped between the outer cover of the hose and the inner body of the hose 5. By pressurizing the air chamber it provides buoyancy to float the hose when the hose is filled with oil or water.

The polyurethane foam on the metal pipes may be put on the metal pipes 1 by foaming, for example by a spraying method. Instead the polyurethane foam may consist of prefabricated scales, which are put around the metal pipes 1.

WHAT WE CLAIM IS:—

1. A floating conduit, in particular for single buoy moorings, comprising a series of rigid pipes, each pipe having a float integral with said pipe, the successive rigid pipes being interconnected by hoses so as to form the conduit.

2. The floating conduit as claimed in claim 1, wherein the float of the rigid pipe comprises a layer of foamed plastics arranged around the said pipe.

3. The floating conduit as claimed in claim 2, wherein the foamed plastics is polyurethane foam.

4. The floating conduit as claimed in claim 3, wherein the polyurethane foam has been put on the rigid pipe by a spraying method.

5. The floating conduit as claimed in any one of the claims 2-4, wherein the outer surface of the foamed plastics is covered with a protective layer comprising glass-cloth impregnated with an epoxy resin.

6. The floating conduit as claimed in any one of the claims 1-5, wherein the rigid pipe is made of metal.

7. The floating conduit as claimed in claim 6, wherein the rigid pipe is made of steel.

8. The floating conduit as claimed in claim 1, comprising a second pipe, which is made of metal and which is concentrically arranged around the rigid pipe, and which is also made of metal, so as to form a gas-tight chamber giving the assembly the desired buoyancy.

9. The floating conduit as claimed in any one of the claims 1-8, wherein each hose is provided with flanges at its ends, which flanges are connected, for example by bolts, to flanges at the ends of each rigid pipe.

10. The floating conduit as claimed in any one of the claims 1-9, wherein each hose is provided with a number of annular floats of foamed plastics, arranged around the hose.

11. The floating conduit as claimed in any one of the claims 1-9, wherein each hose is provided with a float which is integral with the hose.

12. The floating conduit as claimed in



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a conventional flexible conduit, for example made of rubber or of a similar material, which is provided with a number of annular floats 7 of foamed plastics which are arranged around the hose 5.

In the embodiment according to figure 3 the hose 5 is provided with a float 8 which is integral with the hose 5, said float 8 comprising a layer of foamed plastics or of foamed rubber which has been put around the hose 5 as separate prefabricated sheets or by foaming by means of a spraying method. The outer surface of said float 8 may be provided with a protective layer 9 of abrasion-resistant rubber or polyurethane.

In the embodiments according to figures 4 and 5 the hose 5 is not provided with any floats, since sufficient buoyance is provided by the floats of the rigid pipes 1.

In the embodiment according to figure 5 the rigid pipes 1 are provided with floats differing from the floats according to the other figures. In this embodiment, each rigid pipe 1 is surrounded by a metal pipe 10, which is spaced from the metal pipe 1, so that a chamber 11 is formed which is closed in an air-tight manner by plates 12 at its ends. Said chambers 11 act as floats and provide the buoyancy of the conduit.

The embodiment according to figure 6 is in principle the same as the embodiments according to figures 1-5, the main difference being that each pair of rigid pipes is additionally interconnected by a universal joint. This universal joint, which is a cardan joint of a type known as such, comprises a ring 13, two pairs of pins 14 and two pairs of forks 15, each pair of forks 15 being connected to the end of a rigid pipe. Each pair of forks 15 is rotatably connected to the ring 13 by means of the pins 14. Instead of the universal joint as described other suitable types of universal joints may of course be used.

As explained above the hose 5 may be provided with floats or a float made of foamed plastics. Instead it is possible to provide the hose 5 with sufficient buoyancy by means of (an) air chamber(s) (not shown). The air is then trapped between the outer cover of the hose and the inner body of the hose 5. By pressurizing the air chamber it provides buoyancy to float the hose when the hose is filled with oil or water.

The polyurethane foam on the metal pipes may be put on the metal pipes 1 by foaming, for example by a spraying method. Instead the polyurethane foam may consist of prefabricated scales, which are put around the metal pipes 1.

WHAT WE CLAIM IS:—

1. A floating conduit, in particular for single buoy moorings, comprising a series of rigid pipes, each pipe having a float integral with said pipe, the successive rigid pipes being interconnected by hoses so as to form the conduit.

2. The floating conduit as claimed in claim 1, wherein the float of the rigid pipe comprises a layer of foamed plastics arranged around the said pipe.

3. The floating conduit as claimed in claim 2, wherein the foamed plastics is polyurethane foam.

4. The floating conduit as claimed in claim 3, wherein the polyurethane foam has been put on the rigid pipe by a spraying method.

5. The floating conduit as claimed in any one of the claims 2-4, wherein the outer surface of the foamed plastics is covered with a protective layer comprising glass-cloth impregnated with an epoxy resin.

6. The floating conduit as claimed in any one of the claims 1-5, wherein the rigid pipe is made of metal.

7. The floating conduit as claimed in claim 6, wherein the rigid pipe is made of steel.

8. The floating conduit as claimed in claim 1, comprising a second pipe, which is made of metal and which is concentrically arranged around the rigid pipe, and which is also made of metal, so as to form a gas-tight chamber giving the assembly the desired buoyancy.

9. The floating conduit as claimed in any one of the claims 1-8, wherein each hose is provided with flanges at its ends, which flanges are connected, for example by bolts, to flanges at the ends of each rigid pipe.

10. The floating conduit as claimed in any one of the claims 1-9, wherein each hose is provided with a number of annular floats of foamed plastics, arranged around the hose.

11. The floating conduit as claimed in any one of the claims 1-9, wherein each hose is provided with a float which is integral with the hose.

12. The floating conduit as claimed in

claim 11, wherein said float comprises foamed rubber or plastics arranged around the hose.

13. The floating conduit as claimed in claim 12, wherein the outer surface of the foamed rubber or plastics on the hose is covered with a protective layer comprising abrasion-resistant rubber or polyurethane.

14. The floating conduit as claimed in any one of the claims 1-13, wherein the rigid pipes are moreover interconnected by a universal joint, such as a cardan joint.

15. A floating conduit, in particular for

single buoy moorings, substantially as described and as shown in the accompanying drawings.

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