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(54) **SUBMERGED FLOATING RAIL TRANSIT SYSTEM**

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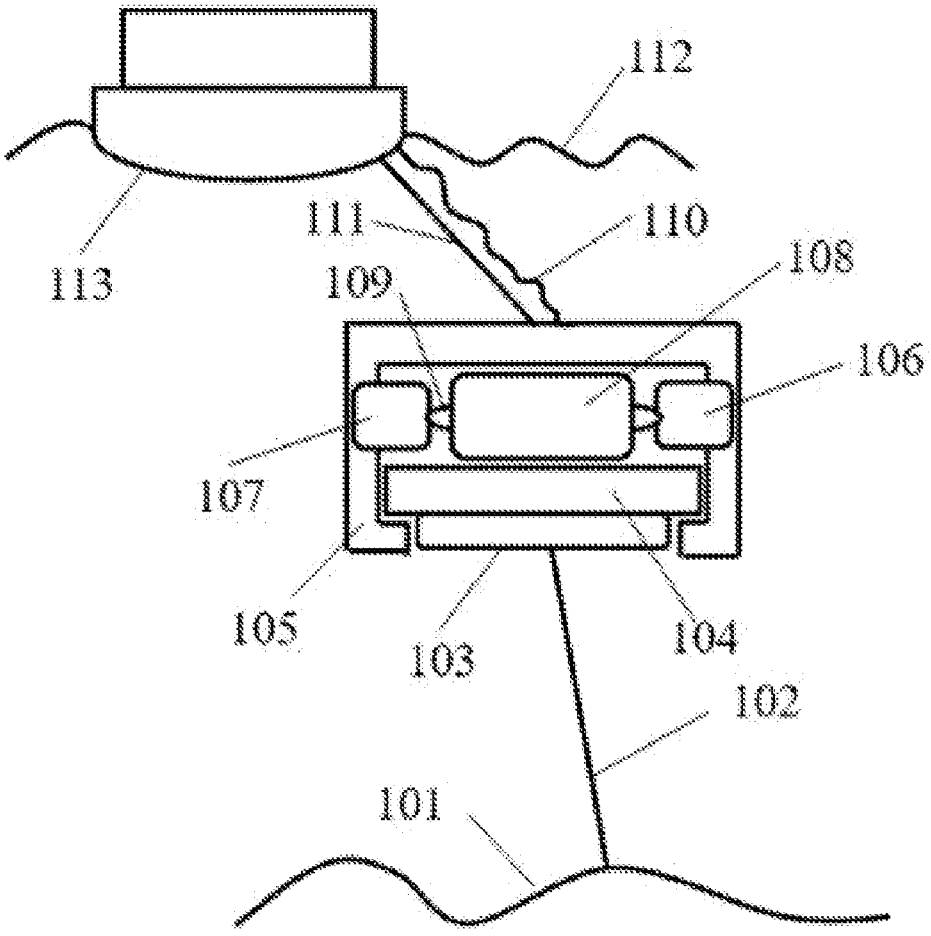
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(57) **ABSTRACT**

A submerged floating rail transit system comprises a first rope (**102**), a buoyancy tank (**103**), a rail (**104**), a gear (**108**), a driving mechanism, a cable (**110**) and a second rope (**111**); wherein one end of the first rope is anchored to the water ground (**101**), and the other end of the first rope is connected with the buoyancy tank; the rail is provided on the buoyancy tank, the gear is engaged with the toothed rail of the rail, and a driving mechanism is provided on the rail; the driving mechanism drives the gear to move along the extending direction of the rail; the driving mechanism comprises a shell (**105**), a first motor (**106**), a second motor (**107**) and a rotating shaft (**109**); one end of the second rope is connected with the shell, and the other end of the second rope is connected with a ship (**113**) on the water surface (**112**); the first motor and the second motor rotate in the same direction to drive the gear to rotate, thus generating traction force, so that the driving mechanism moves along the extending direction of the rail, and the driving mechanism pulls the ship to move through the second rope. The submerged floating rail transit system solves the problem of low efficiency of submerged transportation in the prior art and realizes efficient transportation on the water surface.



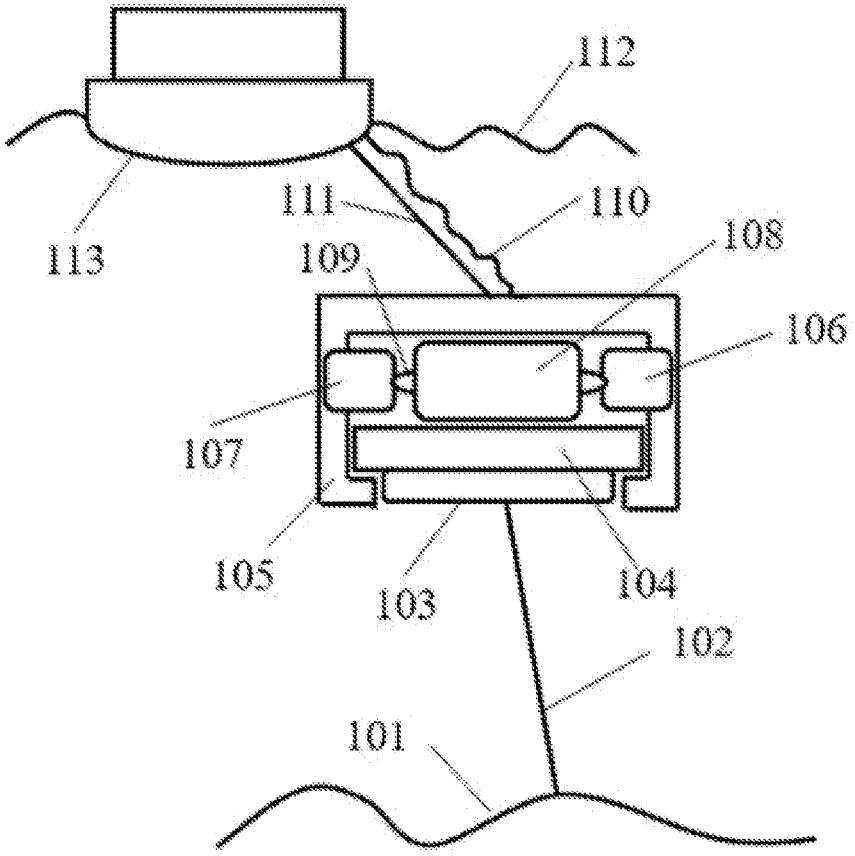


FIG. 1

SUBMERGED FLOATING RAIL TRANSIT SYSTEM

CROSS REFERENCE TO RELATED APPLICATION(S)

[0001] This patent application claims the benefit and priority of Chinese Patent Application No. 201910057203.7 filed in China National Intellectual Property Administration on Jan. 22, 2019, and entitled as "Submerged Floating Rail Transit System", the disclosure of which is incorporated by reference herein in its entirety as part of the present application.

TECHNICAL FIELD

[0002] The present disclosure relates to the technical field of rail transit, in particular to a submerged floating rail transit system.

BACKGROUND ART

[0003] The ocean area on the earth accounts for 71%, and even more than three quarters if the area of lakes and rivers is added. In order to move on the earth surface, human beings cut a road when confronted by mountains, build a bridge when confronted by rivers, dig tunnels and build high-speed railways; in order to move on the water, various ships are invented. However, generally speaking, because human activities are concentrated on land, most of the traffic focuses on land. Water surface, such as oceans, lakes and rivers, is still the biggest factor hindering traffic.

[0004] In order to facilitate water transportation, subsea tunnels and cross-sea bridges have been built, such as the English Channel subsea tunnel in Europe, the Hangzhou Bay Cross-sea Bridge in China and the Guangdong-Hong Kong-Macao Cross-sea Bridge in the Pearl River Estuary. The water surface will be transformed into hard ground through tunnel bridges to realize convenient transportation. In recent years, the Bohai Bay Cross-sea Tunnel has aroused extensive heated discussion, and Qiongzhou Strait, which connects Hainan, is still in the debate of whether it is a bridge or a tunnel.

[0005] Whether a bridge is built on the water surface or a tunnel is excavated under the water, it is a huge investment project, which cannot give full play to the advantages of the water surface. The advantage of water surface is buoyancy, and shipping is the lowest cost mode of transportation. However, due to the limitation of speed, shipping is not the most efficient. This is because the propeller pushes the water forward so as to push ships to move, but from the perspective of momentum conservation, in order to push the ship forward, it is necessary to apply force and water through the propeller, and water flows under the action of thrust because it is a fluid. Therefore, according to the law of conservation of energy, the forward movement of ships will inevitably lead to backward flow of water, which is not an efficient way of energy utilization. Human beings have also tried this, such as the rope crossing the river, the ferryman stepping on the boat and pulling the rope with his hand, such as supporting the boat with bamboo poles in shallow water, and letting the boatman pull the boat with the rope on the river bank, etc., but all of which have the problem of low efficiency.

SUMMARY

[0006] Based on this, the purpose of the present disclosure is to provide a submerged floating rail transit system to solve the problem of low efficiency of submerged transportation in the prior art.

[0007] In order to achieve the above purpose, the present disclosure provides a submerged floating rail transit system, comprising a first rope, a buoyancy tank, a rail, a gear, a driving mechanism, a cable and a second rope;

[0008] wherein one end of the first rope is anchored to the water ground, and the other end of the first rope is connected with the buoyancy tank;

[0009] the rail is provided on the buoyancy tank, the gear is engaged with the toothed rail of the rail, a driving mechanism is provided on the rail, and the driving mechanism drives the gear to move along the extending direction of the rail;

[0010] the driving mechanism comprises a shell and a first motor, a second motor and a rotating shaft which are provided in the shell; the first motor and the second motor are both fixedly connected with the inner wall of the shell; and the gear is connected with the first motor and the second motor through the rotating shaft, respectively;

[0011] one end of the cable is electrically connected with a generator on the ship, and the other end of the cable is electrically connected with the first motor and the second motor, respectively, and the first motor and the second motor are powered by the generator;

[0012] one end of the second rope is connected with the shell, and the other end of the second rope is connected with a ship on the water surface; the first motor and the second motor rotate in the same direction to drive the gear to rotate, so that the driving mechanism moves along the extending direction of the rail, and the driving mechanism drives the ship to move through the second rope.

[0013] Preferably, the toothed rail of the rail are in a horizontal tooth structure.

[0014] Preferably, balls are provided at the contact part between the shell and the rail, and the shell slides on the rail through the balls.

[0015] Preferably, the first motor and the second motor are symmetrically provided on the inner wall of the shell.

[0016] According to the specific embodiment provided by the present disclosure, the present disclosure discloses the following technical effects.

[0017] The present disclosure discloses a submerged floating rail transit system, which comprises a first rope, a buoyancy tank, a rail, a gear, a driving mechanism, a cable and a second rope; wherein one end of the first rope is anchored to the water ground, and the other end of the first rope is connected with the buoyancy tank; the rail is provided on the buoyancy tank, the gear is engaged with the toothed rail of the rail, and a driving mechanism is provided on the rail; the driving mechanism drives the gear to move along the extending direction of the rail; the driving mechanism comprises a shell, a first motor, a second motor and a rotating shaft; one end of the second rope is connected with the shell, and the other end of the second rope is connected with a ship on the water surface; the first motor and the second motor rotate in the same direction to drive the gear to rotate, thus generating traction force, so that the driving mechanism moves along the extending direction of the rail, and the driving mechanism pulls the ship to move through the second rope. The above system of the present disclosure

solves the problem of low efficiency of submerged transportation in the prior art and realizes efficient transportation on the water surface.

BRIEFT DESCRIPTION OF THE DRAWINGS

[0018] In order to explain the embodiment of the utility model or the technical scheme in the prior art more clearly, the drawings used in the embodiment will be briefly introduced hereinafter. Obviously, the drawings in the following description are only some embodiments of the utility model. For those skilled in the art, other drawings can be obtained according to these drawings without paying creative labor.

[0019] FIG. **1** is a schematic structural diagram of a submerged floating rail transit system according to an embodiment of the present disclosure.

[0020] In the figures, **101**, water ground, **102**, first rope, **103**, buoyancy tank, **104**, rail, **105**, shell, **106**, first motor, **107**, second motor, **108**, gear, **109**, rotating shaft, **110**, cable, **111**, second rope, **112**, water surface, **113**, ship, **114**, track side wall, **115**, track lower edge.

DETAILED DESCRIPTION OF THE EMBODIMENTS

[0021] In the following, the technical scheme in the embodiment of the utility model will be described clearly and completely with reference to the drawings in the embodiment of the utility model. Obviously, the described embodiments are only some embodiments of the utility model, rather than all of the embodiments. Based on the embodiments in the utility model, all other embodiments obtained by those skilled in the art without paying creative labor belong to the protection scope of the utility model.

[0022] The purpose of the present disclosure is to provide a submerged floating rail transit system to solve the problem of low efficiency of submerged transportation in the prior art.

[0023] In order to make the above objects, features and advantages of the utility model more obvious and understandable, the utility model will be further explained in detail with reference to the attached drawings and specific embodiments.

[0024] FIG. **1** is a structural schematic diagram of a submerged floating rail transit system according to an embodiment of the present disclosure. As shown in FIG. **1**, the submerged floating rail transit system of the present disclosure comprises a first rope **102**, a buoyancy tank **103**, a rail **104**, a gear **108**, a driving mechanism, a cable **110** and a second rope **111**.

[0025] One end of the first rope **102** is anchored to the water ground **101**, and the other end of the first rope **102** is connected with the buoyancy tank **103**.

[0026] The rail **104** is provided on the buoyancy tank **103**, the gear **108** is engaged with the toothed rail of the rail **104**, a driving mechanism is provided on the rail **104**, and the driving mechanism drives the gear **108** to move along the extending direction of the rail **104**;

[0027] Specifically, the rail **104** is carried by the buoyancy tank **103**. The buoyancy of the buoyancy tank **103** is slightly larger than the gravity of the rail **104** above the buoyancy tank **103**, and the buoyancy tank **103** is anchored to the water ground **101** by the first rope **102**, so that the rail **104** is suspended underwater without affecting the water surface traffic and being disturbed by the water surface waves. The suspension depth of the rail **104** can be set according to hydrological conditions such as local water depth, water surface ship draft and wave size. It is preferably that the suspension depth is smaller when navigation conditions are met.

[0028] The driving mechanism comprises a shell **105** and a first motor **106**, a second motor **107** and a rotating shaft **109** which are provided in the shell **105**; the first motor **106** and the second motor **107** are both fixedly connected with the inner wall of the shell **105**; and the gear **108** is connected with the first motor **106** and the second motor **107** through the rotating shaft **109**, respectively.

[0029] Preferably, the first motor **106** and the second motor **107** are symmetrically provided on the inner wall of the shell **105**.

[0030] Specifically, the driving mechanism is buckled upside down on the suspended rail **104**, the shell **105** is buckled on the rail **104**, the first motor **106** and the second motor **107** are fixedly connected to the shell, and the first motor **106** and the second motor **107** are symmetrically placed left and right, and are connected with a gear **108** through a rotating shaft **109**.

[0031] One end of the cable **110** is electrically connected with a generator on the ship **113**, and the other end of the cable **110** is electrically connected with the first motor **106** and the second motor **107**, respectively, and the first motor **106** and the second motor **107** are powered by the generator;

[0032] Specifically, the fuel engine on the ship **113** drives the generator to generate electricity, thereby supplying power to the first motor **106** and the second motor **107**.

[0033] One end of the second rope **111** is connected with the shell **105**, and the other end of the second rope **111** is connected with a ship **113** on the water surface **112**; the first motor **106** and the second motor **107** rotate in the same direction to drive the gear **108** to rotate. The gear **108** is engaged with the toothed rail of the rail **104**, thereby generating traction force, so that the driving mechanism moves along the extending direction of the rail **104**. The driving mechanism drives the ship **113** to move through the second rope **111**.

[0034] Specifically, the second rope **111** can be a soft traction in the form of a rope or a hard traction in the form of a traction frame, and the driving mechanism drives the ship **113** to move through the second rope **111** through soft traction or hard traction.

[0035] Preferably, the toothed rail of the rail **104** are in a horizontal tooth structure.

[0036] Specifically, the lower surface of the rail **104** is connected with the upper surface of the buoyancy tank **103**, and the toothed rail of the rail **104** are in a horizontal tooth structure, and the rail **104** is engaged with the gear **108** through the horizontal tooth structure.

[0037] Preferably, balls are provided at the contact part between the shell **105** and the rail **104**, and the shell **105** slides on the rail **104** through the balls.

[0038] Specifically, the contact position means that the shell **105** is in contact with the rail side wall **114** and the rail lower edge **115**, balls are provided on the shell **105**, and the shell **105** slides on the rail **104** through the balls.

[0039] The present disclosure provides a submerged floating rail transit system, which combines an efficient rail transport mode on the ground with a ship transport mode on the water surface, draws lessons from the design method of a cable-stayed bridge with large span and deep water and the

fixing mode of an offshore platform, and exerts their respective advantages to realize efficient transportation on the water surface. At the same time, the submerged floating rail transit system will inevitably bring about great changes in the mode of water transportation, break through the restrictions of water areas on transportation, realize more energy-saving and rapid transportation, and have great social and economic value.

[0040] The submerged floating rail transit system provided by the present disclosure is suitable for transportation on rivers, lakes and oceans, and is energy-saving, fast and more efficient.

[0041] The principle and implementation of the present disclosure are illustrated by using specific examples, and the explanations of the above embodiments are only used to help understand the method and core ideas of the present disclosure. At the same time, according to the idea of the present disclosure, there will be some changes in the specific implementation and application scope for those skilled in the art. To sum up, the contents of this specification should not be understood as limiting the present disclosure.

What is claimed is:

1. A submerged floating rail transit system, comprising a first rope (**102**), a buoyancy tank (**103**), a rail (**104**), a gear (**108**), a driving mechanism, a cable (**110**) and a second rope (**111**);

wherein one end of the first rope (**102**) is anchored to the water ground (**101**), and the other end of the first rope (**102**) is connected with the buoyancy tank (**103**);

the rail (**104**) is provided on the buoyancy tank (**103**), the gear (**108**) is engaged with the toothed rail of the rail (**104**), a driving mechanism is provided on the rail (**104**), and the driving mechanism drives the gear (**108**) to move along the extending direction of the rail (**104**);

the driving mechanism comprises a shell (**105**) and a first motor (**106**), a second motor (**107**) and a rotating shaft (**109**) which are provided in the shell (**105**); the first motor (**106**) and the second motor (**107**) are both fixedly connected with the inner wall of the shell (**105**); and the gear (**108**) is connected with the first motor (**106**) and the second motor (**107**) through the rotating shaft (**109**), respectively;

one end of the cable (**110**) is electrically connected with a generator on the ship (**113**), and the other end of the cable (**110**) is electrically connected with the first motor (**106**) and the second motor (**107**), respectively, and the first motor (**106**) and the second motor (**107**) are powered by the generator;

one end of the second rope (**111**) is connected with the shell (**105**), and the other end of the second rope (**111**) is connected with a ship (**113**) on the water surface (**112**); the first motor (**106**) and the second motor (**107**) rotate in the same direction to drive the gear (**108**) to rotate, so that the driving mechanism moves along the extending direction of the rail (**104**), and the driving mechanism drives the ship (**113**) to move through the second rope (**111**).

2. The submerged floating rail transit system according to claim **1**, wherein the toothed rail of the rail (**104**) are in a horizontal tooth structure.

3. The submerged floating rail transit system according to claim **1**, wherein balls are provided at the contact part between the shell (**105**) and the rail (**104**), and the shell (**105**) slides on the rail (**104**) through the balls.

4. The submerged floating rail transit system according to claim **1**, wherein the first motor (**106**) and the second motor (**107**) are symmetrically provided on the inner wall of the shell (**105**).

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