

CYLINDRICAL COMPOSITE BRIDGE ANTI-COLLISION DEVICE

Field of Invention

The present invention relates to a bridge or wharf anti-collision device, and in particular, to an anti-collision device which is made of a composite, low in cost, high in elasticity, and corrosion resistant, and specifically, to a cylindrical composite bridge anti-collision device which is used to reduce ship (floating ice) collision disasters and applicable to piers of bridges of various types, wharfs, and water (ocean) architecture such as an oil production platform.

Related Art

Ship-bridge collision accidents take place all over the world constantly, and the frequency of the Ship-bridge collision accident is far greater than what we imagined. Casualties, property damages, and environmental damages caused by the ship-bridge collision accident are horrendous. Many ship-bridge collision accidents result in a loss of tens of thousands of dollars, or even results in casualties, a loss of millions, tens of millions, or even billions of dollars, and many indirect losses are hard to calculate.

Many facts show that the bridge accident mainly results from destruction in a lower structure of a bridge, therefore, it is necessary to improve pier crashworthiness, which may be divided into two aspects specifically, namely, active anti-collision and passive anti-collision. The active anti-collision is to improve the anti-collision capability of a pier through bridge structure design, where a pier is usually designed to be very large, which is neither economic nor beautiful, and the navigation capacity of a waterway is affected. The passive anti-collision is to improve the anti-collision capability of a pier through setting an anti-collision protection system, and is a widely used anti-collision solution due to its great flexibility, where many schemes may be adopted and comprehensively compared according to actual conditions.

After years of research and application, there have been many types of pier anti-collision facilities in the domestic and overseas, but the basic principle is to design based on energy absorption and momentum buffering, and each anti-collision facility has its own characteristics and conditions of usage. However, currently frequently used manners such as a pile group manner, a thin-shell sand-building cofferdam manner, and an artificial island manner are

generally applicable to places where water is shallow and geological situation is good. Although these manners work once for all, the waterway may still be affected, and these manners are often given up due the high cost or insufficient conditions. The steel casing energy dissipation facilities dissipate energy through steel plastic deformation, but it is generally subjected to a single impact, and is difficult to repair after collision damage; the body of a ship is vulnerable to injury during collision at the same time; the steel is usually put into the water so that it may be easily corroded, which results in high maintenance cost. Given that many problems exist in the currently used anti-collision facilities, this patent intends to introduce the crashworthiness of a structure of a fiber reinforced composite material to the field of bridge anti-collision.

SUMMARY OF THE INVENTION

For problems of a bad anti-collision effect, high cost, and great repairing difficulty of an existing bridge anti-collision device, the object of the present invention is to provide a cylindrical composite bridge anti-collision device which is low in cost, high in elasticity, and corrosion resistant, and is capable of fully absorbing collision energy, delaying collision time, and standing collision for many times.

The object of the present invention is implemented through the following technical solutions.

A cylindrical composite bridge anti-collision device includes an anti-collision unit, where the anti-collision unit is formed of a cylindrical shell and a filling material body filled in the cylindrical shell. The anti-collision unit includes straight cylindrical anti-collision members and curved cylindrical anti-collision members, nonadjacent straight cylindrical anti-collision members are connected in series or connected in parallel through connection rods to form a strip anti-collision device, straight cylindrical anti-collision members which are adjacent and connected to each other, or a straight cylindrical anti-collision member and a curved cylindrical anti-collision member, or curved cylindrical anti-collision members are fixedly connected through a flange arranged on the cylindrical shell and by use of bolts to form an annular or C-shaped anti-collision structure. The inside of the anti-collision unit is provided with a movable device.

The cylindrical shell is formed of an outer cylindrical shell, or formed of an outer cylindrical shell, an inner cylindrical shell and a filling material body between the outer cylindrical shell and the inner cylindrical shell, or formed of an outer cylindrical shell, an intermediate cylindrical shell, an inner cylindrical shell and a filling material body between the outer cylindrical shell and the inner cylindrical shell.

A flange arranged along a circumferential direction of an end of the cylindrical shell is arranged on the cylindrical shell, and the flange is located at the inside of and/or the outside of the outer cylindrical shell and/or the inner cylindrical shell.

The outside of the flanges adjacent and connected to each other is provided with a hoop arranged along a circumferential direction of the cylindrical shell.

A perfusion hole is arranged on the cylindrical shell, and the perfusion hole is arranged along a radial direction of the cylindrical shell.

The cylindrical shell is made of one of a light wood or foam composite sandwich pipe, a composite sand sandwiched pipe, plastic, and a metal skeleton with the surface layer wound with a composite; the cylindrical shell is made of one of glass fiber cloth, carbon fiber cloth, basalt fiber cloth, and aramid fiber cloth, and resin, where the glass fiber cloth is one of biaxial cloth, multi-axial cloth, gridding cloth and fiber felt, and the resin is one of unsaturated polyester, vinyl resin, phenolic resin, epoxy resin and inorganic resin.

The filling material body is a buffering and energy consuming material or a combination of a buffering and energy consuming material and a hollow device or one of concrete and a hollow latticed body.

The buffering and energy consuming material is made of one or several of polyurethane foam, polyurethane elastomer, polyphenyl foam, PVC foam, PMI foam, polyimide foam, sand, a mixture of polyphenyl particle foam and sand, polyphenyl particle mortar, rubber particles, rubber blocks, haydite, pebbles, coal gangue powder, foamed aluminum, liquid, air-entrained foam concrete, foam, a pipe material, a round ball and Mao bamboo; the hollow device is made of one of a closed steel pipe, a composite winding pipe, a composite pultrusion pipe, a plastic pipe, Mao bamboo, plastic hollow balls, composite hollow balls, and metal hollow balls.

The connection rod includes a cable, a stainless steel chain, a mooring rope, and a steel strand; the bolt includes a metal bolt, a polytetrafluoroethylene bolt, a plastic bolt and a

composite bolt; the movable device includes a universal wheel, a nylon or metal roller, and a polytetrafluoroethylene sliding plate.

The straight cylindrical anti-collision member includes a straight cylindrical anti-collision member with a constant cross-section and a straight cylindrical anti-collision member with a variable cross-section.

Compared with the prior art, the present invention has the following advantages:

1. The cylindrical shell of the present invention uses a fibre reinforced composite material which has strong corrosion resistance and excellent mechanical properties, and may be adapted to various severe environments in river water and sea water, thereby reducing the maintenance cost; when the cylindrical shell is used and if a ship collides with a pier, because the cylindrical shell with a cylindrical cross-section is made of an elastic composite and has great deformability, the cylindrical shell can be compressed by 1/2 diameter without destroy.

2. The cylindrical shell of the present invention may be set to be single-layered, double-layered or multi-layered according to conditions, that is, only an outer cylindrical shell is arranged or a combination of the outer cylindrical shell and an inner cylindrical shell is provided or one or more intermediate cylindrical shells are arranged between the outer cylindrical shell and the inner cylindrical shell. A filling material body is also arranged between the outer cylindrical shell and the inner cylindrical shell. The closely installed filling material body has certain buffering and energy absorbing and binding capabilities, may bind the outer cylindrical shell and the inner cylindrical shell to form an integrity, may deform greatly, and has good buffering performance; the arranged intermediate cylindrical shell can effectively spread the collision load, and form three-way constraints to the foam buffering material, thereby implementing multi-level fortification.

3. The filling material body in the cylindrical shell of the present invention has great stiffness, can guarantee that no great deformation occurs in the inner cylindrical shell, thereby further limiting deformation of the outer cylindrical shell, guaranteeing that it will not be split; the filling material body mainly is a granular material such as sand and haydite, which consumes much energy through friction.

4. Independent anti-collision units of the present invention are connected to form an integrity through a flange and bolts, and can be installed fast and conveniently; each unit can be

replaced conveniently after destruction. The anti-collision unit is characterized by strong self-floating capability, good buffering performance, and low elastic modulus, and is simple in structure, low in cost and easy in installation and maintenance, and therefore, the ship can be effectively protected from local damage.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a schematic diagram of a connection cross section of an anti-collision unit of the present invention, where FIG. 1 (a) is a schematic diagram of a connection cross section of an anti-collision unit provided with an outer cylindrical shell, an inner cylindrical shell and an intermediate cylindrical shell, FIG. 1 (b) is a schematic diagram of a connection cross section of an anti-collision unit provided with an outer cylindrical shell, and an inner cylindrical shell, and FIG. 1 (c) is a schematic diagram of a connection cross section of an anti-collision unit of a single-layered cylindrical shell;

FIG. 2 is a schematic structural diagram of a cross section of an anti-collision unit of the present invention, where FIG. 2 (a) is a schematic structural diagram of a cross section of an anti-collision unit filled with a buffering and energy consuming material and provided with an outer cylindrical shell, an inner cylindrical shell and an intermediate cylindrical shell, FIG. 2 (b) is a schematic structural diagram of a cross section of an anti-collision unit filled with a buffering and energy consuming material and provided with an outer cylindrical shell, and an inner cylindrical shell, FIG. 2 (c) is a schematic structural diagram of a cross section of an anti-collision unit only filled with a buffering and energy consuming material in a single-layered cylindrical shell, FIG. 2 (d) is a schematic structural diagram of a cross section of an anti-collision unit filled with a buffering and energy consuming material and a hollow pipe with a large diameter in a single-layered cylindrical shell, and FIG. 2 (e) is a schematic structural diagram of a cross section of an anti-collision unit filled with a buffering and energy consuming material and several hollow pipes or hollow balls with a small diameter in a single-layered cylindrical shell;

FIG. 3 is a schematic structural diagram of an anti-collision unit of the present invention, where FIG. 3 (a) is a schematic structural diagram of a cross section of an anti-collision unit filled with a buffering and energy consuming material and provided with an outer cylindrical

shell, an inner cylindrical shell and an intermediate cylindrical shell, FIG. 3 (b) is a schematic structural diagram of a multi-layered straight cylindrical anti-collision member provided with perfusion holes, FIG. 3 (c) is a schematic structural diagram of a straight cylindrical anti-collision member of a single-layered cylindrical shell whose outside is provided with a socketed flange, FIG. 3 (d) is a schematic structural diagram of a multi-layered curved cylindrical anti-collision member, and FIG. 3 (e) is a schematic structural diagram of a curved cylindrical anti-collision member of a single-layered cylindrical shell whose outside is provided with a socketed flange;

FIG. 4 is a schematic structural diagram of a connection of an anti-collision unit of the present invention, where FIG. 4 (a) is a schematic structural diagram of horizontal installation of the anti-collision unit, and FIG. 4 (b) is a schematic structural diagram of vertical installation of the anti-collision unit;

FIG. 5 is a schematic diagram of an installation and use state of an anti-collision unit on a bridge pier column or bearing platform of the present invention, where FIG. 5 (a) is a top view of an installation structure of an anti-collision member with a constant cross-section, FIG. 5 (b) is a top view of an installation structure of a C-shaped anti-collision member, FIG. 5 (c) is a top view of an installation structure of an anti-collision member with a variable cross-section, FIG. 5 (d) is a top view of an installation structure of an anti-collision member with a constant cross-section of a corner 120 degrees, FIG. 5 (e) is a top view of an installation structure of a multi-layered anti-collision unit provided with perfusion holes, and FIG. 5 (f) is a schematic diagram of an installation structure of a double-layered anti-collision unit; and

FIG. 6 is a schematic diagram of a combined anti-collision body formed of multiple groups of anti-collision units of the present invention, where FIG. 6 (a) is a front sectional view in which multiple groups of anti-collision units are installed around a bridge bearing platform, FIG. 6 (b) is a front sectional view of a combined anti-collision body formed three vertically arranged anti-collision units, and FIG. 6 (c) is a top view of installation of a combined anti-collision body.

1-anti-collision unit; 2-cylindrical shell; 3-filling material body; 4-straight cylindrical anti-collision member; 5-curved cylindrical anti-collision member; 6-connection rod; 7-flange; 8-bolt; 9-movable device; 10-outer cylindrical shell; 11-inner cylindrical shell; 12-intermediate

cylindrical shell; 13-hoop; 14-perfusion hole; 15-buffering and energy consuming material; 16-hollow device; 17-composite clamp plate; 18-bearing platform.

DESCRIPTION OF EMBODIMENTS

The present invention is further described with reference to the accompanying drawings and the embodiments.

As shown in FIG. 1, a cylindrical composite bridge anti-collision device includes an anti-collision unit 1, where the anti-collision unit 1 is formed of a cylindrical shell 2 and a filling material body 3 filled in the cylindrical shell 2. The cylindrical shell 2 is formed of an outer cylindrical shell 10, or formed of an outer cylindrical shell 10, an inner cylindrical shell 11 and a filling material body 3 between the outer cylindrical shell 10 and the inner cylindrical shell 11, or formed of an outer cylindrical shell 10, an intermediate cylindrical shell 12, an inner cylindrical shell 11 and a filling material body 3 between the outer cylindrical shell 10 and the inner cylindrical shell 11. A flange 7 arranged along a circumferential direction of an end of the cylindrical shell 2 is arranged on the cylindrical shell 2, and the flange 7 is located at the inside of and/or the outside of the outer cylindrical shell 10 and/or the inner cylindrical shell 11. When the cylindrical shell 2 only has the outer cylindrical shell 10, the flange 7 is usually a socketed flange and located at the outside of the cylindrical shell 10; when the cylindrical shell 2 is double-layered or multi-layered, that is, has the outer cylindrical shell 10, the inner cylindrical shell 11 or also has the intermediate cylindrical shell 12, flanges 7 are located at the outside of the inner cylindrical shell 11 and the inside of the outer cylindrical shell 10, and at this time, the outside of the flanges 7 adjacent and connected to each other is provided with a hoop 13 arranged along a circumferential direction of the outer cylindrical shell 10. In order to facilitate filling the filling material body 3, perfusion holes 14 may be arranged on the cylindrical shell 2, where the perfusion holes 14 are arranged along a radial direction of the cylindrical shell 2. The cylindrical shell 2 is made of one of a light wood or foam composite sandwich pipe, a composite sand sandwiched pipe, plastic, and a metal skeleton with the surface layer wound with a composite; the cylindrical shell is made of one of glass fiber cloth, carbon fiber cloth, basalt fiber cloth, and aramid fiber cloth, and resin, where the glass fiber cloth is one of biaxial cloth, multi-axial cloth, gridding cloth and fiber felt, and the resin is one

of unsaturated polyester, vinyl resin, phenolic resin, epoxy resin and inorganic resin. The filling material body 3 is a buffering and energy consuming material 15 or a combination of a buffering and energy consuming material 15 and a hollow device 16 or one of concrete and a hollow latticed body. The buffering and energy consuming material 15 is made of one or several of polyurethane foam, polyurethane elastomer, polyphenyl foam, PVC foam, PMI foam, polyimide foam, sand, a mixture of polyphenyl particle foam and sand, polyphenyl particle mortar, rubber particles, rubber blocks, haydite, pebbles, coal gangue powder, foamed aluminum, liquid, air-entrained foam concrete, foam, a pipe material, a round ball and Mao bamboo. When liquid is adopted as the buffering and energy consuming material 15, a certain number of perfusion holes 14 may be arranged on the surface of the cylindrical shell 2, so that the buffering and energy consuming material 15 enters and exits from the cylindrical shell 2 easily, and when the buffering and energy consuming material 15 cannot fill the cylindrical shell 2 fully, a closed cylindrical shell 2 may be used; when the density of the buffering and energy consuming material 15 is greater than the density of the water, a hollow device 16 may be filled in the buffering and energy consuming material 15, where the hollow device 16 is made of one of a closed steel pipe, a composite winding pipe, a composite pultrusion pipe, a plastic pipe, Mao bamboo, plastic hollow balls, composite hollow balls, and metal hollow balls.

The anti-collision unit 1 includes straight cylindrical anti-collision members 4 and curved cylindrical anti-collision members 5, nonadjacent straight cylindrical anti-collision members 4 are connected in series or connected in parallel through connection rods 6 to form a strip anti-collision device, where the connection rod 6 may use one of a cable, a stainless steel chain, a mooring rope, and a steel strand; straight cylindrical anti-collision members 4 which are adjacent and connected to each other, or a straight cylindrical anti-collision member 4 and a curved cylindrical anti-collision member 5, or curved cylindrical anti-collision members 5 are fixedly connected through the flange 7 arranged on the cylindrical shell 2 and by use of bolts 8 to form an annular or C-shaped anti-collision structure; the bolt 8 arranged along a circumferential direction of the flange 7 with spacing is a metal bolt, a polytetrafluoroethylene bolt, a plastic bolt and a composite bolt. Because a complete anti-collision device needs to contact a to-be-protected device such as a pier and change with the change of the water level, and in order to implement dipping and heaving of the anti-collision device, the inside of the

anti-collision unit 1 is provided with a movable device 9, where the movable device 9 includes a universal wheel, a nylon or metal roller, and a polytetrafluoroethylene sliding plate. Considering that the risks of each side of the pier being collided are different, the straight cylindrical anti-collision member 4 may be made into a straight cylindrical anti-collision member with a constant cross-section and a straight cylindrical anti-collision member with a variable cross-section. The cross-section shape of the cross-section may be circular, or oval, semi-circular, polygonal, and another cross-section shape which is suitable to adopt the winding process.

Embodiment 1

A cylindrical composite bridge anti-collision device of the present invention is shown in FIG. 1 (a). A cylindrical shell 2 of an anti-collision unit 1 is formed by an outer cylindrical shell 10, an inner cylindrical shell 11 and two layers of intermediate cylindrical shells 12. Each part of the cylindrical shell 2 is made of glass fiber and unsaturated polyester resin, where a straight cylindrical anti-collision member 4 is prepared via a winding process, and a curved cylindrical anti-collision member 5 is prepared via a hand lay-up process; polyurethane foam is perfused between the outer cylindrical shell 10 and the inner cylindrical shell 11 to serve as a buffering and energy consuming material 15, so that each part of the cylindrical shell 2 is bound to form an integrity; after the anti-collision device is installed around the pier, haydite is filled in the inner cylindrical shell 11 through a perfusion hole 7 to serve as the buffering and energy consuming material 15; bolts 8 are used to connect a flange 7 at the outside of the inner cylindrical shell 11 and a flange 7 at the inside of the outer cylindrical shell 10, and then a smooth cylindrical shell is formed through binding at the outside of a joint of the outer cylindrical shell 10 via the hand lay-up process.

Embodiment 2

A cylindrical composite bridge anti-collision device of the present invention is shown in FIG. 1 (b). A cylindrical shell 2 of an anti-collision unit 1 is formed by an outer cylindrical shell 10 and an inner cylindrical shell 11. Each part of the cylindrical shell 2 is made of glass fiber and vinyl resin, where a straight cylindrical anti-collision member 4 is prepared via a winding process, and a curved cylindrical anti-collision member 5 is prepared via a hand lay-up process after cutting and assembling the straight cylindrical anti-collision member 4 according

to an angle; coal gangue powder mixed with a polyurethane foaming material is perfused between the outer cylindrical shell 10 and the inner cylindrical shell 11 to serve as a buffering and energy consuming material 15, and a mixture of sand particles and haydite is perfused into an inner cylindrical shell 3 in advance to serve as the buffering and energy consuming material 15; bolts 8 are used to connect a flange 7 at the outside of the inner cylindrical shell 11, an annular hoop 13 is arranged at a joint of the outer cylindrical shell 10, and fiber cloth is used to manually paste two sides of the hoop 13 and a contact place of the outer cylindrical shell 10 to form a smooth cylindrical shell 2.

Embodiment 3

A cylindrical composite bridge anti-collision device of the present invention is shown in FIG. 4 (a). A cylindrical shell 2 of a single-layered straight cylindrical anti-collision member 4 uses basalt fiber cloth and vinyl resin to form a composite tube via a winding process, where two ends of the cylindrical shell 2 is spherical, numerous PE hollow balls with a small diameter are filled in an outer cylindrical shell 10 to serve as a hollow device 16, reclaimed rubber particles are closely filled between the outer cylindrical shell 10 and the hollow device 16 to serve as a buffering and energy consuming material 15, and then several composite straight cylindrical anti-collision members 4 are connected in series to form a horizontal anti-collision body through connection rods 6. The cylindrical composite bridge anti-collision device is particularly applicable to the need of wharf anti-collision.

Embodiment 4

A cylindrical composite bridge anti-collision device of the present invention is shown in FIG. 5 (a). A cylindrical shell 2 is made of glass fiber and unsaturated polyester resin, where a straight cylindrical anti-collision member 4 is prepared via a winding process, and a curved cylindrical anti-collision member 5 is prepared via a hand lay-up process; the straight cylindrical anti-collision member 4 and the curved cylindrical anti-collision member 5, each of them is a single-layered cylindrical shell 2, are filled with polyphenyl foam mortar, which serves as a buffering and energy consuming material 15; at this time, multiple segments of straight cylindrical anti-collision members 4 and curved cylindrical anti-collision members 5 may surround a pier bearing platform 18 to be connected by using socketed flanges 7 and bolts 8 to form a rectangle annular structure, and a nylon roller is arranged at the inside where

multiple segments of straight cylindrical anti-collision members 4 contact the pier bearing platform 18, where the nylon roller serves as a movable device 9; and a polytetrafluoroethylene sliding plate is installed at the inside of a place where the socketed flanges 7 contact the pier bearing platform 18, where the polytetrafluoroethylene sliding plate serves as the movable device 9.

Embodiment 5

A cylindrical composite bridge anti-collision device of the present invention is shown in FIG. 6. A single-layered cylindrical shell 2, that is, an outer cylindrical shell 10 uses glass fiber cloth, sand sandwiched cloth and epoxy resin to prepare a composite sand sandwiched pipe, where a straight cylindrical anti-collision member 4 and a curved cylindrical anti-collision member 5 are prepared via a winding process; a composite winding pipe with a large diameter and two closed ends is filled in the outer cylindrical shell 10 to serve as a hollow device 16, and coarse sand is closely filled between the hollow device 16 and the outer cylindrical shell 10 to serve as a buffering and energy consuming material 15; the straight cylindrical anti-collision member 4 with a variable cross-section and the curved cylindrical anti-collision member 5 with a variable cross-section are connected around a pier bearing platform 18 through a socketed flange 7 and bolts 8, thereby forming a complete rectangle annular structure with a variable cross-section, and then a paulownia wood sandwiched composite clamp plate 17 is used to form multiple anti-collision devices into an anti-collision body vertically.

The composite bridge anti-collision device of the present invention is prepared via a winding forming process, and the specific procedure is exemplified as follows:

a: prepare a large wood, steel or glass reinforced plastic mold, and prepare and connect a flange at the mold via a vacuum infusion process or a hand lay-up process;

b: prepare a set of cylindrical mold, wind a continuous glass fiber cotton tape, which is infused by unsaturated polyester resin glue solution, around a core mold and flanges at two ends via a winding process according to a certain angle at the mold, and then obtain a cylindrical product having a flange after curing and demoulding, where the diameters of the cylindrical products are different;

c: cut some of straight cylindrical anti-collision members into 3 segments of components with an angle, assemble the components, wind or manually paste the glass fiber cloth at the

inside and outside at the same time so as to form a curved cylindrical anti-collision member;

d: install a movable device at the straight cylindrical member and the curved cylindrical member, and open a hole at the straight cylindrical anti-collision member and the curved cylindrical anti-collision member;

e: inset a cylindrical shell with a small diameter into a cylindrical shell with a great diameter so as to serve as an inner cylindrical shell, and perfuse foam between the two layers of cylindrical shells to serve as a buffering and energy consuming material;

f: transport the straight cylindrical anti-collision member with two closed ends and the curved cylindrical anti-collision member with two closed ends to the site, pre-assemble a completed annular anti-collision ring at a shore or shoal area, disassemble it into 1/2 circular anti-collision units to surround the pier, connect the 1/2 circular anti-collision units to form a composite anti-collision system through the flange and bolts, and hooping and a lay-up manner may be used at a joint of adjacent outer cylindrical shells so as to connect the outer cylindrical shells and form a smooth cylindrical shell;

g: fill a filling material such as haydite to the inner cylindrical shell through a perfusion hole to serve as a weight material and a friction energy dissipation particle material.

The part that is not related in the present invention is the same as the prior art or may be implemented by the prior art.

CLAIMS

What is claimed is:

1. A cylindrical composite bridge anti-collision device, comprising an anti-collision unit (1), wherein the anti-collision unit (1) is formed of a cylindrical shell (2) and a filling material body (3) filled in the cylindrical shell (2), characterized in that the anti-collision unit (1) comprises straight cylindrical anti-collision members (4) and curved cylindrical anti-collision members (5), nonadjacent straight cylindrical anti-collision members (4) are connected in series or connected in parallel through connection rods (6) to form a strip anti-collision device, straight cylindrical anti-collision members (4) which are adjacent and connected to each other, or a straight cylindrical anti-collision member (4) and a curved cylindrical anti-collision member (5), or curved cylindrical anti-collision members (5) are fixedly connected through a flange (7) arranged on the cylindrical shell (2) and by use of bolts (8) to form an annular or C-shaped anti-collision structure; the inside of the anti-collision unit (1) is provided with a movable device (9).
2. The cylindrical composite bridge anti-collision device according to claim 1, characterized in that the cylindrical shell (2) is formed of an outer cylindrical shell (10), or formed of an outer cylindrical shell (10), an inner cylindrical shell (11) and a filling material body (3) between the outer cylindrical shell (10) and the inner cylindrical shell (11), or formed of an outer cylindrical shell (10), an intermediate cylindrical shell (12), an inner cylindrical shell (11) and a filling material body (3) between the outer cylindrical shell (10) and the inner cylindrical shell (11).
3. The cylindrical composite bridge anti-collision device according to claim 1 or 2, characterized in that a flange (7) arranged along a circumferential direction of an end of the cylindrical shell (2) is arranged on the cylindrical shell (2), and the flange (7) is located at the inside of and/or the outside of the outer cylindrical shell (10) and/or the inner cylindrical shell (11).
4. The cylindrical composite bridge anti-collision device according to claim 1, characterized in

that the outside of the flanges (7) adjacent and connected to each other is provided with a hoop (13) arranged along a circumferential direction of the cylindrical shell (2).

5. The cylindrical composite bridge anti-collision device according to claim 1, characterized in that a perfusion hole (14) is arranged on the cylindrical shell (2), and the perfusion hole (14) is arranged along a radial direction of the cylindrical shell (2).
6. The cylindrical composite bridge anti-collision device according to claim 1, characterized in that the cylindrical shell (2) is made of one of a light wood or foam composite sandwich pipe, a composite sand sandwiched pipe, plastic, and a metal skeleton with the surface layer wound with a composite; the cylindrical shell (2) is made of one of glass fiber cloth, carbon fiber cloth, basalt fiber cloth, and aramid fiber cloth, and resin, wherein the glass fiber cloth is one of biaxial cloth, multi-axial cloth, gridding cloth and fiber felt, and the resin is one of unsaturated polyester, vinyl resin, phenolic resin, epoxy resin and inorganic resin.
7. The cylindrical composite bridge anti-collision device according to claim 1, characterized in that the filling material body (3) is a buffering and energy consuming material (15) or a combination of a buffering and energy consuming material (15) and a hollow device (16) or one of concrete and a hollow latticed body.
8. The cylindrical composite bridge anti-collision device according to claim 7, characterized in that the buffering and energy consuming material (15) is made of one or several of polyurethane foam, polyurethane elastomer, polyphenyl foam, PVC foam, PMI foam, polyimide foam, sand, a mixture of polyphenyl particle foam and sand, polyphenyl particle mortar, rubber particles, rubber blocks, haydite, pebbles, coal gangue powder, foamed aluminum, liquid, air-entrained foam concrete, foam, a pipe material, a round ball and Mao bamboo; the hollow device (16) is made of one of a closed steel pipe, a composite winding pipe, a composite pultrusion pipe, a plastic pipe, Mao bamboo, plastic hollow balls, composite hollow balls, and metal hollow balls.
9. The cylindrical composite bridge anti-collision device according to claim 1, characterized in

that the connection rod (6) comprises a cable, a stainless steel chain, a mooring rope, and a steel strand; the bolt (8) comprises a metal bolt, a polytetrafluoroethylene bolt, a plastic bolt and a composite bolt; the movable device (9) comprises a universal wheel, a nylon or metal roller, and a polytetrafluoroethylene sliding plate.

10. The cylindrical composite bridge anti-collision device according to claim 1, characterized in that the straight cylindrical anti-collision member (4) comprises a straight cylindrical anti-collision member with a constant cross-section and a straight cylindrical anti-collision member with a variable cross-section.