

DESCRIPTION

DETACHABLE DEEP SUBMARINE CABLE ROLLING WINCH

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TECHNICAL FIELD

[0001] The present invention belongs to the field of subsea resource development technologies, and more particularly, relates to a submarine cable rolling winch for storing, transporting and construction laying.

BACKGROUND

[0002] The operating range of the current ocean engineering equipment spreads from shallow water to deep water and ultra-deep water, and products are developed from fixing platforms to floating facilities and underwater production systems, and the deep-water operating feature thereof is very apparent. While deep-water operating faces three big challenges, i.e., a system for rolling and unrolling winch, dynamic response of marine environments as well as positioning and control technologies.

[0003] a marine system for rolling and unrolling winch comprises a winch, a coiled wire rope or submarine cable, a heave compensator, a supporting rack and an accessory equipment. As an important device for offshore scientific investigation and construction, the system for rolling and unrolling winch has been improved and upgraded deeply, including the optimal design of the physical dimension relative to the carrying capacity, efficiency improved by a driving manner, and functions expanded from fishing, freight hoisting to deep submarine cable and pipeline laying.

[0004] At present, a single deep optical cable for communications is frequently laid for dozens of kilometers, and it becomes an excellent approach to store, transport and lay a rolling winch. With respect to a wire rope, not only the mechanical property of the submarine

optical cable in the winch during multilayered coiling and accumulating process is considered, but also the macroscopic and microscopic security performances of various units in a cable conductor under an extrusion effect are protected. Engineering problems during the manufacturing, storing and construction laying of the rolling and unrolling winch comprise cable layer squashing, flange fracture, flange edge attrition and squashing as well as twisting and "birdcage" accidents during the submarine cable construction. These accidents relate to the structural design of a winch capstan and a submarine cable distribution technology. Once the structural imperfection of the winch is neglected or the cable storing method is incorrect, the entire submarine cable may be abandoned possibly, and the charges for maintenance or replacing are as high as millions of dollars.

SUMMARY

[0005] Object of the present invention: with respect to the cable layer squashing, flange fracture, flange edge attrition as well as twisting and armor layer "birdcage" accidents caused by tension coiling of the cable encountered during the deep construction of a conventional winch, detachable hub grooves and flange trapezoidal plates are installed in a rolling winch with conic flanges of the present invention, the cable can be unrolled steadily and transited to an upper layer under lower tension traction, and a winch system may be improved and repeatedly used according to different construction conditions and submarine cable technical parameters.

[0006] Technical solution: a detachable deep submarine cable rolling winch according to the present invention comprises a winch body, wherein a hub of the winch body is covered with a detachable iron sheet with grooves; the inside of a conic flange of the winch body is covered with a detachable iron plate with steps; and the conic flange is a shell structure and fixed to a spindle through trapezoidal wheel disks.

[0007] Preferably, the grooves in the sheet iron are distributed spirally, the depth of the groove is lower than the diameter of the section of the submarine cable by one quarter, and the pitch of the spiral groove is greater than the diameter of the submarine cable.

[0008] Preferably, steps on each layer of the iron plate are matched with the grooves in the

iron sheet and provided with grooves.

[0009] Preferably, the height of the step in the first layer of the bottom surface of the plate iron is greater than one half of the diameter of the submarine cable, the heights of the steps in each layer thereafter are higher than the height of the step in the first layer, and the width of the step is a half of the diameter of the submarine cable.

[0010] Preferably, vertical surface of step in the plate iron is set to deflect inwards, and an angle of declination is 8 to 10 degrees.

[0011] Preferably, the number of the wheel disks at each side of the trapezoidal wheel disks is no less than 8.

[0012] Advantageous effects: compared with a traditional cable winch, the traction tension used during the cable unrolling process is greatly reduced, the probability of embedding the submarine cable in the upper layer to the submarine cable in the lower layer is reduced, and the cable conductor damage caused by the sudden change of a bending radius is greatly reduced especially when the cable is in transition from the bottom layer to the upper layer. Meanwhile, the iron plates with grooves and steps covered on the hub and the flange can be replaced according to different submarine cable using requirements, so that the re-usage rate of the winch is high, and the ability of the flange for resisting lateral deformation is improved.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] Fig. 1 is an entire schematic diagram of the present invention.

[0014] Fig. 2 is a structural schematic diagram of a hub with grooves and a flange with steps.

[0015] Fig. 3 is a schematic diagram for fixing a flange shell and a wheel disk of the present invention.

[0016] Fig. 4 is a structural schematic diagram of a cable unrolling layer of a winch of the present invention.

[0017] Fig. 5 is a structural schematic diagram of a cable unrolling layer of a conventional winch.

DETAILED DESCRIPTION

[0018] Each member in the embodiment will be explained one by one hereinafter.

5 As shown in Fig. 1 to Fig. 3, a detachable deep submarine cable rolling winch comprises a winch body 1, wherein a hub of the winch body 1 is covered with a detachable iron sheet with grooves 2; the inside of a conic flange of the winch body 1 is covered with a detachable iron plate with steps 3; and the conic flange is a shell structure and fixed to a spindle 4 through trapezoidal wheel disks 5.

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[0019] As shown in Fig. 1, the winch body comprises a smooth cylindrical flange and a conic flange. The flange is a shell structure with thin wall, in a funnel shape, supported by the trapezoidal wheel disks 5, and is fixed to the central spindle. The number of the wheel disks 5 at the flange in each side are no less than 8, and the wheel disks are symmetrically distributed and welded between the flange and the spindle. The conic flange and the wheel disk 5 are combined, which may enhance the ability of the winch for resisting lateral deformation during the cable unrolling process, as shown in Fig. 3.

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[0020] Three to four iron plates 3 are at the position of the flange, and are convenient to dismount and adjust azimuth angles. The steps in each layer are designed with grooves in transition from a bottom layer to an upper layer, and the submarine cable twisted to the position of the flange can be directly transited to the upper layer. The height of the step in the first layer of the plate iron 3 at the position of the flange is greater than one half of the diameter of the submarine cable, the heights of the steps in each layer are higher than the height of the step in the first layer, but are smaller than the diameter of the submarine cable, and the width of the step is approximately a half of the diameter of the submarine cable. In order to be matched with a guide roller in front of the winch, and increase the contact area between the cable and the step, the step is designed into a deflected shape, and the vertical bottom thereof is inwards deflected by 8 to 10 degrees, as shown in Fig. 4.

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[0021] The flange of a conventional winch is welded on a hub using a vertical iron plate, as shown in Fig. 5. During the cable unrolling process, the submarine cable is arranged along grooves formed by the submarine cable in the bottom layer; the grooves are easily formed at the flange edge, the submarine cable seated at the grooves is easily embedded into the grooves under the pressure of the submarine cable in the upper layer. While the sheet iron 2 with grooves adopted in the present invention can be divided into a plurality of independent

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parts along the circumference and covered on the hub. The grooves are distributed spirally, the depth of the groove is smaller than the diameter of the submarine cable by one quarter, and the pitch of the spiral groove is a bit greater than the diameter of the submarine cable, which is about 1.05 to 1.10 times of the diameter of the submarine cable, as shown in Fig. 2.

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[0022] Using the winch structure in the present invention can make each circle of submarine cables be fixed during twisting, and particularly, collapse and jamming will not be formed in the transition zone of the position of the flange. Therefore, the entire system becomes a dynamic steady structure, which can be competent to the requirements of severe offshore environments, and can satisfy a high strength load bearing capacity.

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[0023] The technical solutions and advantageous effects of the present invention are further described in details in the above specific embodiments. It will be appreciated that the foregoing description is merely specific embodiments of the present invention, but is not intended to limit the present invention; and any modification, equivalent replacement, improvement and the like made within the spirits and principles of the present invention shall all fall within the protection scope of the present invention.

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CLAIMS

1. A detachable deep submarine cable rolling winch, comprising a winch body (1), wherein a hub of the winch body (1) is covered with a detachable iron sheet with grooves (2); the inside
5 of a conic flange of the winch body (1) is covered with a detachable iron plate with steps (3); and the conic flange is a shell structure and fixed to a spindle (4) through trapezoidal wheel disks (5).
2. The detachable deep submarine cable rolling winch according to claim 1, wherein the
10 grooves in the sheet iron (2) are distributed spirally, the depth of the groove is lower than the diameter of the section of the submarine cable by one quarter, and the pitch of the spiral groove is greater than the diameter of the submarine cable.
3. The detachable deep submarine cable rolling winch according to claim 1, wherein steps on
15 each layer of the iron plate (3) are matched with the grooves in the iron sheet (2) and provided with grooves.
4. The detachable deep submarine cable rolling winch according to claim 1, wherein the
20 height of the step in the first layer of the bottom surface of the plate iron (3) is greater than one half of the diameter of the submarine cable, the heights of the steps in each layer thereafter are higher than the height of the step in the first layer, and the width of the step is a half of the diameter of the submarine cable.
5. The detachable deep submarine cable rolling winch according to claim 1, wherein the
25 vertical surface of the step in the plate iron (3) is set to deflect inwards, and an angle of declination is 8 to 10 degrees.
6. The detachable deep submarine cable rolling winch according to claim 1, wherein the number of the wheel disks at each side of the trapezoidal wheel disks (5) is no less than 8.