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(54) System and lifting unit for lifting loads of varying weight

System und Hebeeinheit zum Heben von Lasten unterschiedlichen Gewichts

Système et unité de levage de charges de poids variable

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Description

Technical field of the invention

[0001] The present invention relates to cranes with a beam.

Background of the invention

[0002] An offshore wind farm usually comprises a cluster of some hundreds wind turbines. The large number is necessary to be able efficiently to transfer the generated electricity from the farm to the shore. It has appeared that a rather intense maintenance of the offshore wind turbines is necessary. Otherwise one or more of the turbines are likely to get broke, which results in the wind farm no longer being able to yield a profitable return on investment. With present wind farms, it has become common practice to visit each turbine once, sometimes twice a month for inspection and preventive maintenance. From time to time periodic actions need to be taken, like changing the oil in the gear box of the electrical generator or replacing some critical moving parts. In the case of defects, repairs need to be carried out.

For this visitation of the turbines, the service engineers, together with their tools and spare parts, are delivered to the turbines by small shuttle vessels. The service engineers access the turbine via a latter onto an access platform mounted on the nacelle tower or on the monopile/tripod/jacket foundation. In order to board heavy equipment and spare parts, one or more cranes/davits are mounted on this access platform. Most of the lifts are of loads of less than 1 ton. However, from time to time, heavier loads occur. The cranes/davits therefore need to be able to lift loads of more than e.g. 3 tons. Such cranes/davits are much more costly than cranes/davits capable of lifting up to e.g. 1 ton, which will increase the costs of the entire project.

[0003] CN201151466 discloses a marine boat raft and landing lifting machine, which comprises a hoisting device, a guide wheel, a boom, a main wire rope, a lowering control wire rope, a lowering control switch, a boat raft and landing winch, a hydraulic assembly, a lifting machine chamber, an operation device, a revolving device and a derricking cylinder.

[0004] It is therefore desirable to provide a solution, which can solve the lifting of the few high duty loads.

Summary of the invention

[0005] One aspect relates to a system for lifting loads of varying weight comprising:

- a crane, such as a davit, comprising a beam, and a winch and wire assembly; and
- a lifting unit comprising a frame and a winch and wire assembly;

wherein either the crane or the lifting unit further comprises an auxiliary winch and wire assembly for mounting the lifting unit to the crane beam.

In the present context, the term "wire" is intended to be understood in the broadest sense, and include cable, wire cable, chain, rope and wire rope.

[0006] Disclosed herein is a system for lifting loads of varying weight. The system comprises a slightly modified crane/davit, and a lifting unit. By sharing one or more lifting units with a higher lifting capacity than the cranes within the offshore wind farm, the costs of the entire offshore wind farm will be reduced. The lifting unit is constructed to be attached to any crane in the need of performing a high-load lift with few modifications to a normal crane/davit, of course, supported that the crane structure can withstand the higher load. The system allows for an easy coupling and uncoupling of the lifting unit.

The crane/davit comprises a beam, and a winch and wire assembly; and the lifting unit comprises a frame and a winch and wire assembly. Either the crane and/or the lifting unit comprises an auxiliary winch and wire assembly for mounting the lifting unit to the crane beam.

When the auxiliary winch and wire assembly is positioned on the lifting unit, the lifting unit can be moved into place, preferably beneath the crane beam, by attaching the auxiliary wire to the crane and rewinding the auxiliary wire until the correct position of the lifting unit is obtained.

In the situation where the auxiliary winch and wire assembly is positioned on the crane, the lifting unit can be moved into place, preferably beneath the crane beam, by attaching the auxiliary wire to the lifting unit and rewinding the auxiliary wire until the correct position of the lifting unit is obtained.

Davit cranes are perfect for permanent or portable power. These cranes consist of an angled beam which pivots over a vertical axis. They can have fixed or adjustable booms/beams, and are available in portable as well as stationary units. Davit cranes incorporate a hand operated or electric winch and wire assembly for load handling.

[0007] In one or more embodiments, the crane and/or lifting unit winch and wire assembly is electronic.

[0008] In one or more embodiments, the crane and/or lifting unit winch and wire assembly comprises a motor and/or gear unit.

[0009] In one or more embodiments, the crane and/or lifting unit winch and wire assembly comprises a motor and/or a gear.

[0010] In one or more embodiments, wherein when the lifting unit further comprises an auxiliary winch and wire assembly for mounting the lifting unit to the crane beam, the crane comprises fastening means for releasable attachment of the auxiliary wire.

[0011] In one or more embodiments, wherein when the crane further comprises an auxiliary winch and wire assembly for mounting the lifting unit to the crane beam, the lifting unit comprises fastening means for releasable attachment of the auxiliary wire.

[0012] Any type of fastening means for fastening a wire may be used, depending on the type of wire end (e.g. hook or eye) to be fastened/attached.

[0013] It may be an advantage that not only the auxiliary wire hold the lifting unit and crane beam in position. A part of the fastening means may be positioned on the lifting unit, while the rest is positioned on the crane, such as on the crane beam.

[0014] In one or more embodiments, the crane and/or the lifting unit further comprises fastening means for releasable attachment of the lifting unit frame to the crane beam.

[0015] It may be an advantage to first lock/fasten one end of the lifting unit for a more precise positioning of the lifting unit onto the crane beam. In order to do so, the lifting unit will preferably have to be pivoted into place.

[0016] Hence, in one or more embodiments, at least one of the fastening means for releasable attachment of the lifting unit to a crane beam is adapted for pivotable attachment of one end of the lifting unit.

[0017] It may also be an advantage to use the crane wire and/or the lifting unit wire in the positioning of the lifting unit onto the crane beam. This is especially advantageous when first locking/fastening one end of the lifting unit to the crane beam.

[0018] In one or more embodiments, the lifting unit frame further comprises fastening means for releasable attachment of the crane wire.

[0019] In one or more embodiments, the crane further comprises fastening means for releasable attachment of the lifting unit wire.

[0020] A second aspect relates to lifting unit comprising a frame, a winch and wire assembly, and an auxiliary winch and wire assembly for mounting the lifting unit to a crane beam.

[0021] In one or more embodiments, the lifting unit further comprises fastening means for releasable attachment of the lifting unit to a crane beam.

[0022] In one or more embodiments, at least one of the fastening means for releasable attachment of the lifting unit to a crane beam is adapted for pivotable attachment of one end of the lifting unit.

[0023] In one or more embodiments, the lifting unit further comprises fastening means for releasable attachment of a crane wire.

Brief description of the figures

[0024]

Figure 1 shows a lifting unit in accordance with various embodiments of the invention;
Figure 2 shows a crane in accordance with various embodiments of the invention;
Figures 3-6 show an example of coupling a lifting unit and a crane into a system for lifting loads of varying weight in accordance with various embodiments of the invention;

Figures 7-8 show a system for lifting loads of varying weight in accordance with various embodiments of the invention, where the crane has a beam that can be luffed up and down.

Detailed description of the invention

[0025] In the following, the principle of connecting a lifting unit to a crane beam is exemplified. Figure 1 shows a lifting unit, and Figure 2 shows the crane onto which the lifting unit is to be connected.

[0026] Referring to Figure 1, the lifting unit 300 is shown with a winch and wire assembly mounted on a frame 304. The winch and wire assembly comprises a winch 310 and a gear and motor unit 312 to unwind and rewind the lifting unit wire 302.

It is an advantage to use the crane wire in the positioning of the lifting unit onto the crane beam. The lifting unit 300 is therefore adapted for attachment to a crane wire by fastening means 314.

An auxiliary winch and wire assembly 306 for mounting the lifting unit to a crane beam is also mounted on the frame 304. The lifting unit 300 is adapted for pivotable attachment of one end to a crane beam by fastening means 308A. After attachment of fastening means to the crane beam, fastening means 308B will be drawn into position by the auxiliary winch and wire assembly 306.

[0027] Referring to Figure 2, the crane 200 is shown with a crane beam 202. Only the crane wire 204 is shown of the crane winch and wire assembly. Since the auxiliary winch and wire assembly is positioned on the lifting unit, the lifting unit can be moved into place, preferably beneath the crane beam, by attaching the auxiliary wire to the crane and rewinding the auxiliary wire until the correct position of the lifting unit is obtained. The auxiliary wire with a wire hook at its end can be attached to fastening means 208, here shown as an eyebolt. Fastening means 206A is adapted to engage with fastening means 308A to provide pivotable attachment of one end of the lifting unit with the crane beam.

[0028] In Figure 3, the crane wire 204 is attached to the fastening means 314 (lifting eye) on the lifting unit 300. The crane wire 204 is partly rewound such that the lifting unit 300 is hanging with fastening means 308A in close proximity to fastening means 206A. In Figure 4, the lifting unit has been turned 180 degrees, and the auxiliary wire 307 has been attached to fastening means 208. In Figure 5, the crane wire 204 is rewound such that the fastening means 308A is pivotably engaged with fastening means 206A. Finally, in Figure 6, the auxiliary wire 307 is rewound such that the fastening means 308B is engaged with fastening means 206B, and the lifting unit 300 is in position under the crane beam 202.

[0029] Figures 7-8 show a system for lifting loads of varying weight in accordance with various embodiments of the invention, where the lifting unit 300 is mounted on a beam 202 that can be luffed up and down.

References

[0030]

100 System for lifting loads of varying weight
 200 Crane
 202 Crane beam
 204 Crane wire
 206 Fastening means
 208 Fastening means
 300 Lifting unit
 302 Lifting unit wire
 304 Frame
 306 Auxiliary winch and wire assembly
 307 Auxiliary wire
 308 Fastening means
 310 Winch
 312 Gear and motor unit
 314 Fastening means

Claims

1. A system (100) for lifting loads of varying weight comprising:
 - a crane (200), such as a davit, comprising a beam (202), and a winch and wire assembly; and
 - a lifting unit (300) comprising a frame (304) and a winch and wire assembly; **characterized in that** either the crane (200) or the lifting unit (300) further comprises an auxiliary winch and wire (307) assembly (306) for mounting the lifting unit (300) to the crane beam (202).
2. A system (100) according to claim 1, wherein when the lifting unit (300) comprises said auxiliary winch and wire (307) assembly (306) for mounting the lifting unit (300) to the crane beam (202), and wherein the crane (200) comprises fastening means (208) for releasable attachment of the auxiliary wire (307).
3. A system (100) according to claim 1, wherein when the crane (200) comprises said auxiliary winch and wire assembly for mounting the lifting unit (300) to the crane beam (202), the lifting unit (300) comprises fastening means for releasable attachment of the auxiliary wire.
4. A system (100) according to any one of the claims 1-3, wherein the crane (200) and/or the lifting unit (300) further comprises fastening means (308A, 308B, 314) for releasable attachment of the lifting unit frame (304) to the crane beam (202).
5. A system (100) according to claim 4, wherein at least one of the fastening means (308A, 308B, 314) for

releasable attachment of the lifting unit frame (304) to the crane beam (202) is adapted for pivotable attachment of one end of the lifting unit (300).

6. A system (100) according to any one of the claims 1-5, wherein the lifting unit frame (304) further comprises fastening means (314) for releasable attachment of the crane wire (204).
7. A system (100) according to any one of the claims 1-6, wherein the crane (200) further comprises fastening means for releasable attachment of the lifting unit wire (302).
8. A lifting unit (300) comprising a frame (304), a winch and wire assembly, **characterized by** further comprising an auxiliary winch and wire assembly (306) for mounting the lifting unit (300) to a crane beam (202).
9. A lifting unit (300) according to claim 8, further comprising fastening means (308A, 308B) for releasable attachment of the lifting unit (300) to a crane beam (202).
10. A lifting unit (300) according to claim 9, wherein at least one of the fastening means (308A) for releasable attachment of the lifting unit (300) to a crane beam (202) is adapted for pivotable attachment of one end of the lifting unit (300).
11. A lifting unit (300) according to any one of the claims 8-10, further comprising fastening means (314) for releasable attachment of a crane wire (204).

Patentansprüche

1. System (100) zum Heben von Lasten unterschiedlichen Gewichts, umfassend:
 - einen Kran (200), wie zum Beispiel einen Davit, der einen Lastarm (202) und eine Winden- und Seilanordnung umfasst; und
 - eine Hubeinheit (300), die einen Rahmen (304) und eine Winden- und Seilanordnung umfasst, **dadurch gekennzeichnet, dass** entweder der Kran (200) oder die Hubeinheit (300) ferner eine Hilfswinden- und -seil-(307)-Anordnung (306) zum Anbringen der Hubeinheit (300) an dem Kranlastarm (202) umfasst.
2. System (100) nach Anspruch 1, wobei, wenn die Hubeinheit (300) die Hilfswinden- und -seil-(307)-Anordnung (306) zum Anbringen der Hubeinheit (300) an dem Kranlastarm (202) umfasst, und wobei der Kran (200) Befestigungsmittel (208) zur lösbaren Befestigung des Hilfsseils (307) umfasst.

3. System (100) nach Anspruch 1, wobei, wenn der Kran (200) die Hilfswinden- und -seilanordnung zum Anbringen der Hubeinheit (300) an dem Kranlastarm (202) umfasst, die Hubeinheit (300) Befestigungsmittel zur lösbaren Befestigung des Hilfsseils umfasst. 5
4. System (100) nach einem der Ansprüche 1 - 3, wobei der Kran (200) und/oder die Hubeinheit (300) ferner Befestigungsmittel (308A, 308B, 314) zur lösbaren Befestigung des Hubeinheitsrahmens (304) am Kranlastarm (202) umfasst/umfassen. 10
5. System (100) nach Anspruch 4, wobei mindestens eines der Befestigungsmittel (308A, 308B, 314) zur lösbaren Befestigung des Hubeinheitsrahmens (304) am Kranlastarm (202) zur schwenkbaren Befestigung eines Endes der Hubeinheit (300) ausgeführt ist. 15
6. System (100) nach einem der Ansprüche 1 - 5, wobei der Hubeinheitsrahmen (304) ferner Befestigungsmittel (314) zur lösbaren Befestigung des Kranseils (204) umfasst. 20
7. System (100) nach einem der Ansprüche 1 - 6, wobei der Kran (200) ferner Befestigungsmittel zur lösbaren Befestigung des Hubeinheitsseils (302) umfasst. 25
8. Hubeinheit (300), die einen Rahmen (304) und eine Winden- und Seilanordnung umfasst, **dadurch gekennzeichnet, dass** sie ferner eine Hilfswinden- und -seilanordnung (306) zum Anbringen der Hubeinheit (300) an einem Kranlastarm (202) umfasst. 30
9. Hubeinheit (300) nach Anspruch 8, die ferner Befestigungsmittel (308A, 308B) zur lösbaren Befestigung der Hubeinheit (300) an einem Kranlastarm (202) umfasst. 35
10. Hubeinheit (300) nach Anspruch 9, wobei mindestens eines der Befestigungsmittel (308A) zur lösbaren Befestigung der Hubeinheit (300) an einem Kranlastarm (202) zur schwenkbaren Befestigung eines Endes der Hubeinheit (300) ausgeführt ist. 40
11. Hubeinheit (300) nach einem der Ansprüche 8 - 10, die ferner Befestigungsmittel (314) zur lösbaren Befestigung eines Kranseils (204) umfasst. 45

Revendications

1. Système (100) de levage de charges de poids variable comprenant : 50
 - une grue (200), telle qu'un bossoir, comprenant une barre (202) et un ensemble treuil et câble ; et

- une unité de levage (300) comprenant un châssis (304) et un ensemble treuil et câble ;

caractérisé en ce que :

soit la grue (200) soit l'unité de levage (300) comprend en outre un ensemble (306) treuil et câble (307) auxiliaire pour fixer l'unité de levage (300) à la barre de grue (202).

2. Système (100) selon la revendication 1, dans lequel quand l'unité de levage (300) comprend ledit ensemble (306) treuil et câble (307) auxiliaire pour fixer l'unité de levage (300) à la barre de grue (202) et dans lequel la grue (200) comprend des moyens de fixation (208) pour fixer de façon libérable le câble (307) auxiliaire. 55
3. Système (100) selon la revendication 1, dans lequel lorsque la grue (200) comprend ledit ensemble treuil et câble auxiliaire pour fixer l'unité de levage (300) à la barre de grue (202), l'unité de levage (300) comprend des moyens de fixation pour fixer de façon libérable le câble auxiliaire.
4. Système (100) selon l'une quelconque des revendications 1 à 3, dans lequel la grue (200) et/ou l'unité de levage (300) comprend en outre des moyens de fixation (308A, 308B, 314) pour fixer de façon libérable le châssis d'unité de levage (304) à la barre de grue (202).
5. Système (100) selon la revendication 4, dans lequel au moins un des moyens de fixation (308A, 308B, 314) est conçu pour fixer de façon libérable le châssis d'unité de levage (304) à la barre de grue (202) de façon à fixer de façon pivotable une extrémité de l'unité de levage (300).
6. Système (100) selon l'une quelconque des revendications 1 à 5, dans lequel le châssis d'unité de levage (304) comprend en outre des moyens de fixation (314) pour fixer de façon libérable le câble de grue (204).
7. Système (100) selon l'une quelconque des revendications 1 à 6, dans lequel la grue (200) comprend en outre des moyens de fixation pour fixer de façon libérable le câble d'unité de levage (302).
8. Unité de levage (300) comprenant un châssis (304), un ensemble treuil et câble, **caractérisé en ce qu'**elle comprend en outre un ensemble treuil et câble (306) auxiliaire pour fixer l'unité de levage (300) à une barre de grue (202).
9. Unité de levage (300) selon la revendication 8, comprenant en outre des moyens de fixation (308A,

308B) pour fixer de façon libérable l'unité de levage (300) à une barre de grue (202).

10. Unité de levage (300) selon la revendication 9, dans laquelle au moins un des moyens de fixation (308A) servant à fixer de façon libérable l'unité de levage (300) à une barre de grue (202) est conçu pour fixer de façon pivotable une extrémité de l'unité de levage (300). 5 10
11. Unité de levage (300) selon l'une quelconque des revendications 8 à 10, comprenant en outre des moyens de fixation (314) pour fixer de façon libérable un câble de grue (204). 15

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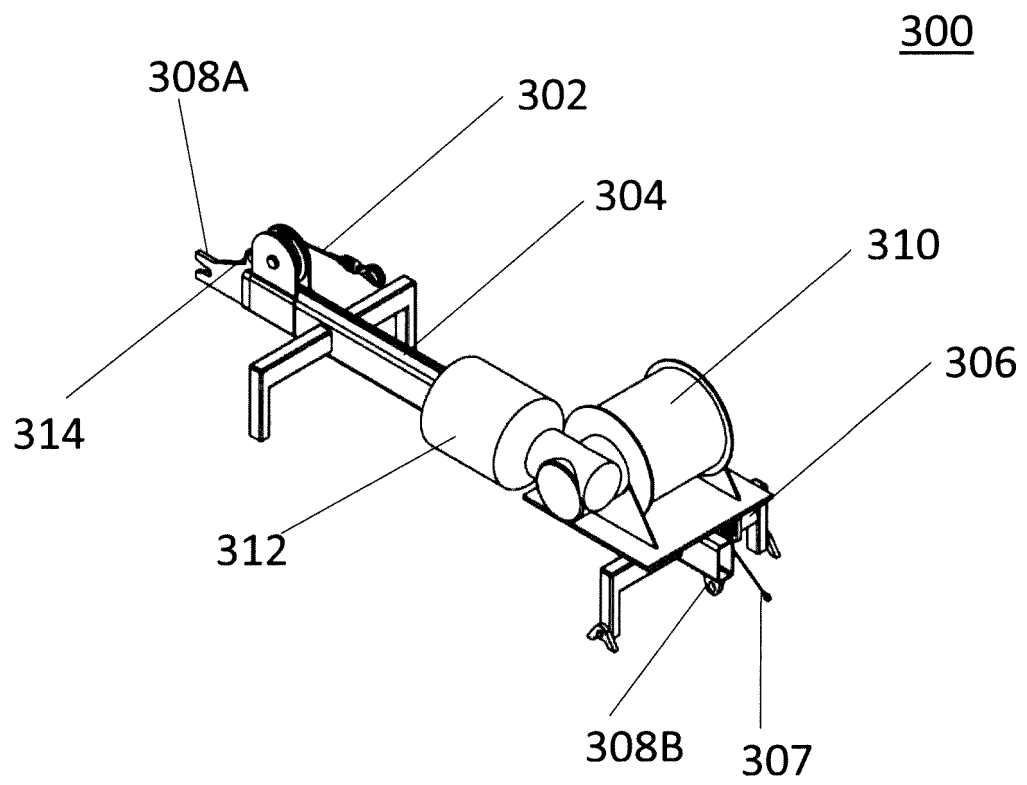


Fig. 1

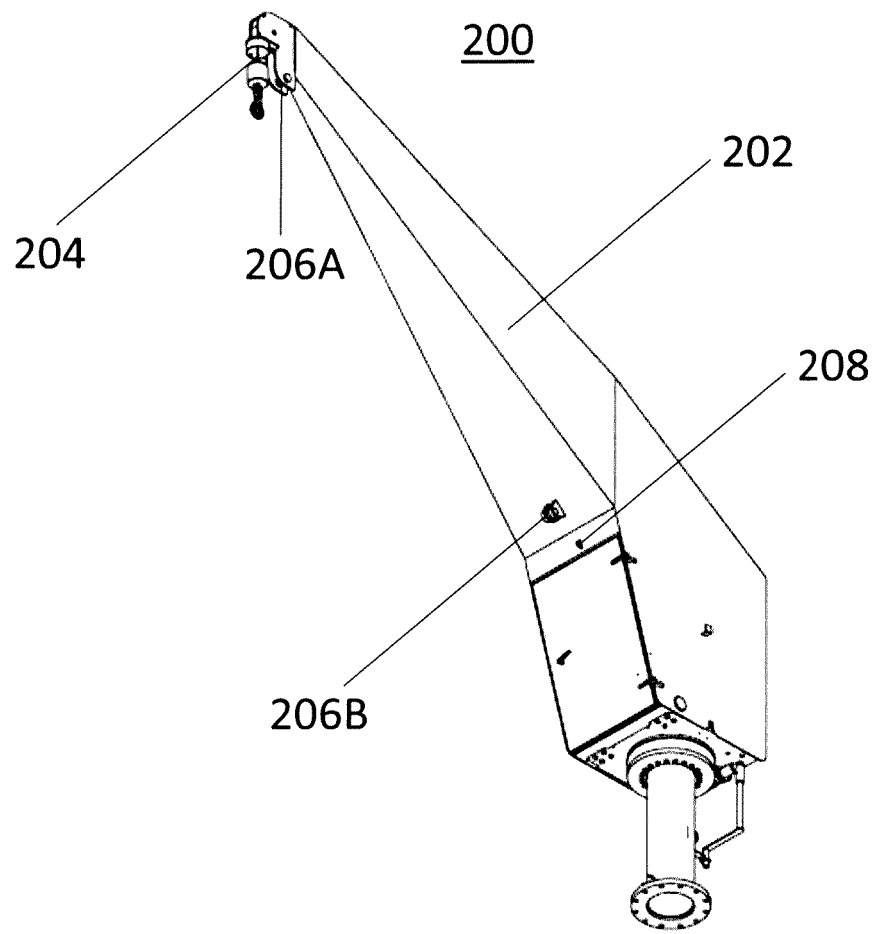


Fig. 2

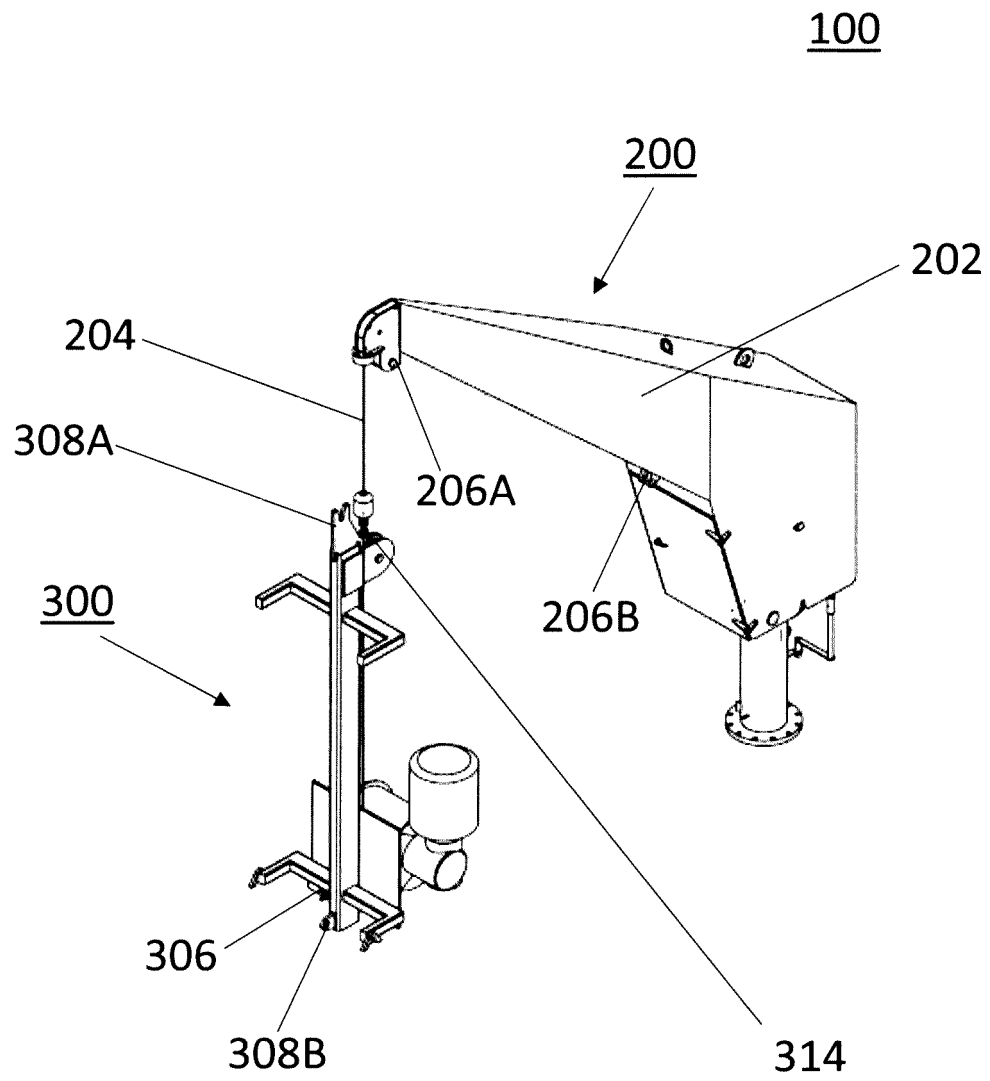


Fig. 3

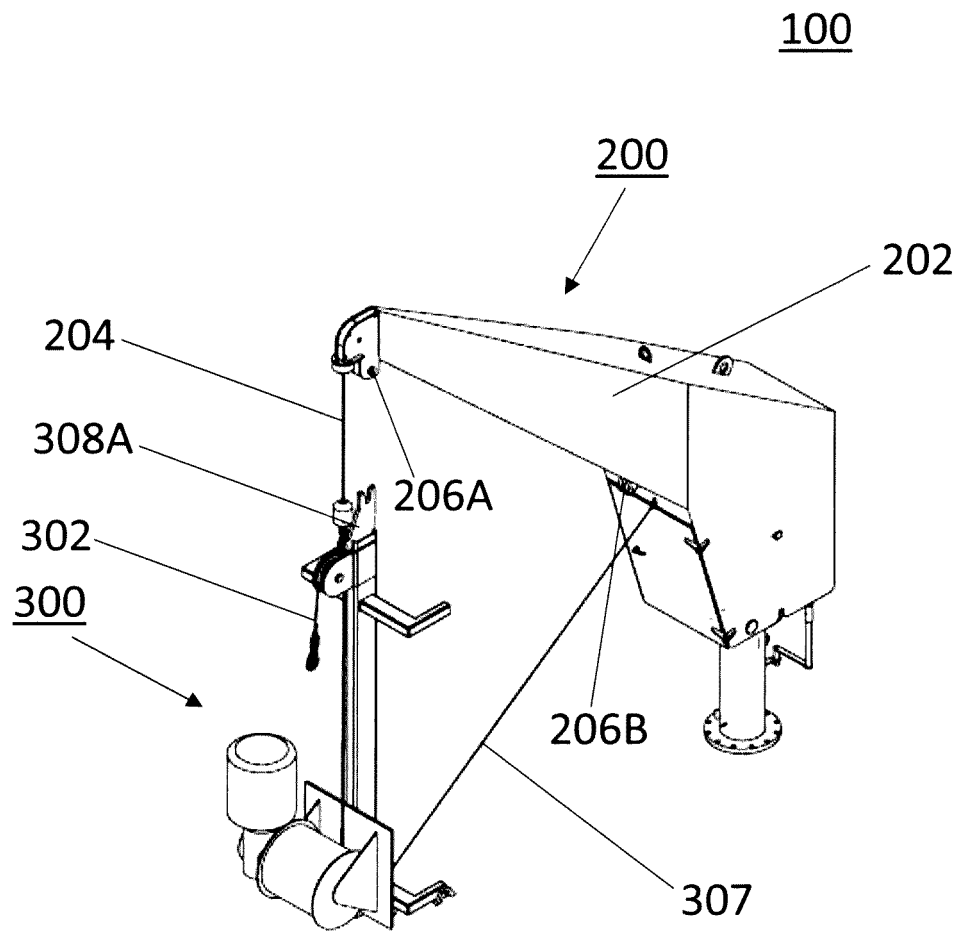


Fig. 4

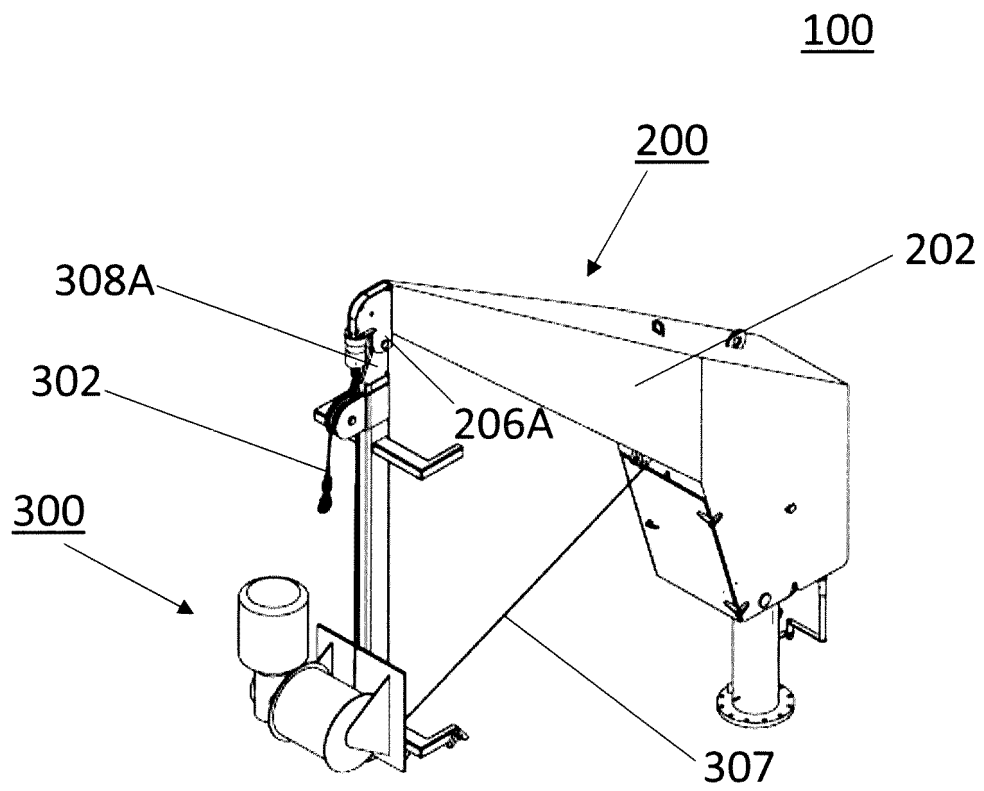


Fig. 5

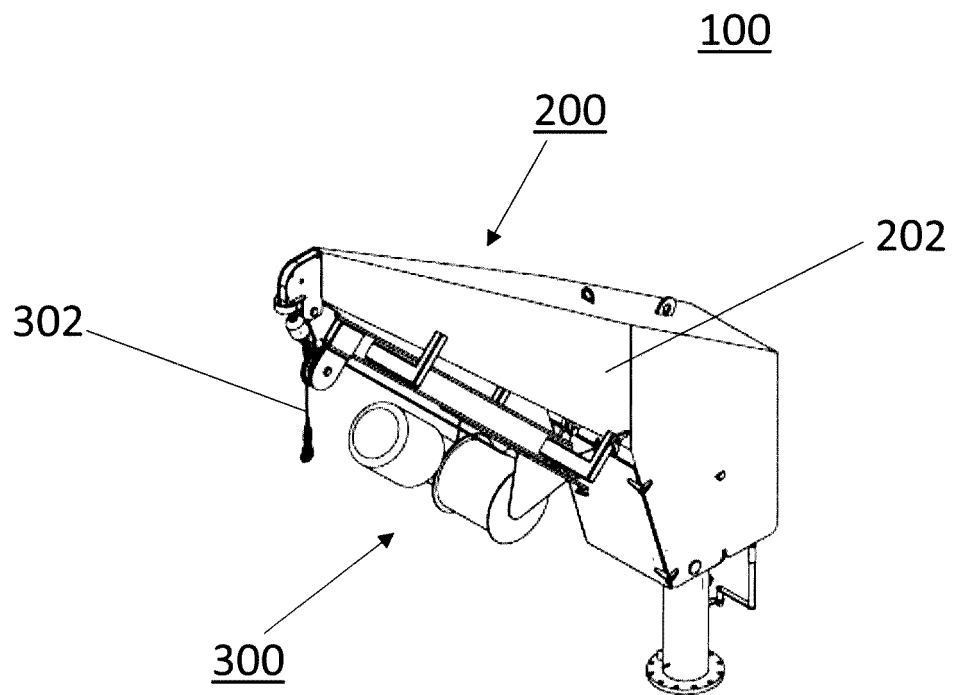


Fig. 6

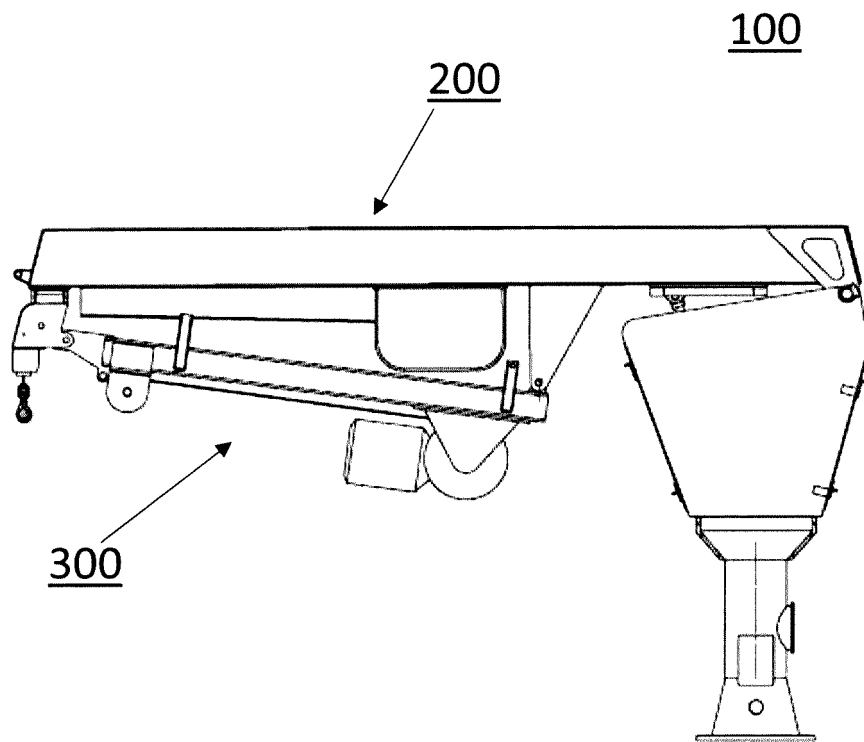


Fig. 7

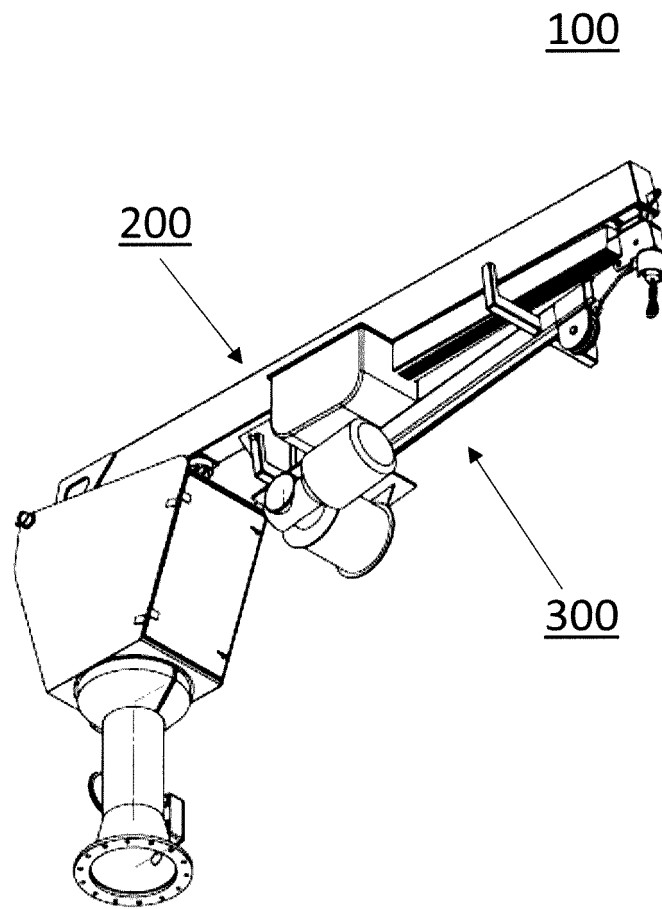


Fig. 8

REFERENCES CITED IN THE DESCRIPTION

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