April 15, 1958 W. L. BANKS, JR 2,830,710

CARGO HOISTING APPARATUS

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Fig. 3.

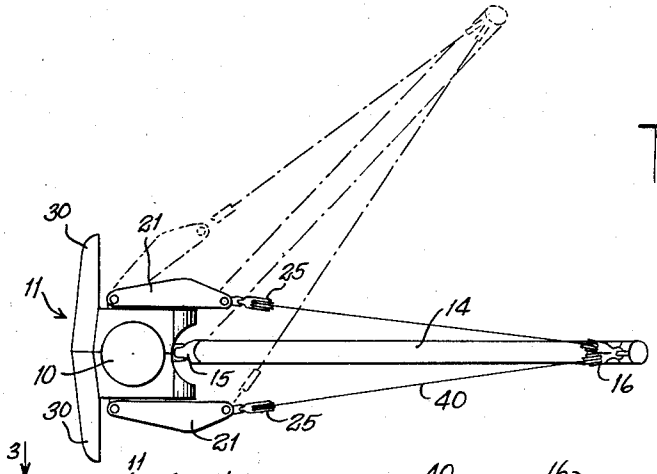


Fig. 2.

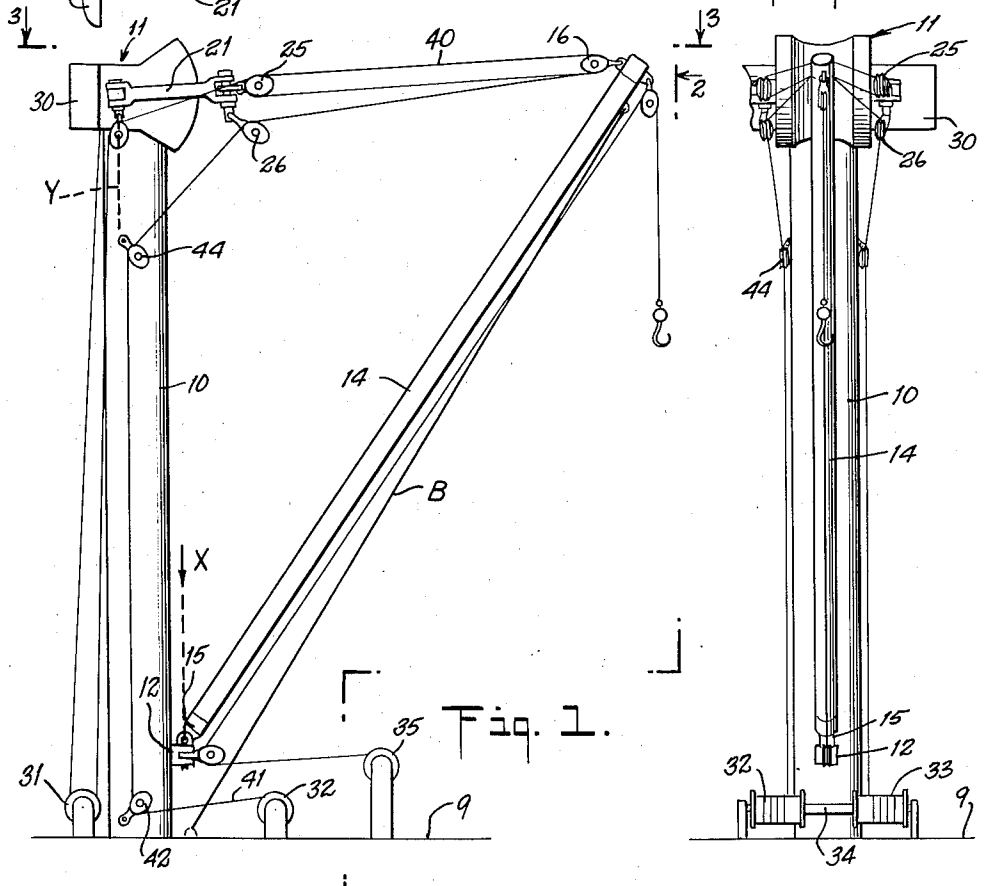


Fig. 1.

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Fig. 4.

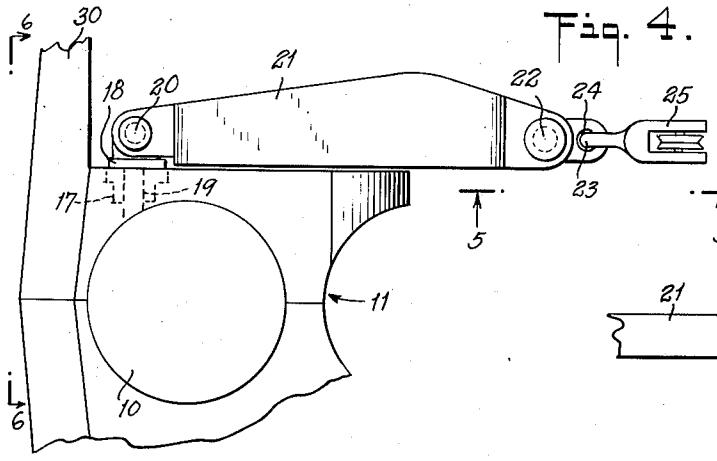


Fig. 5.

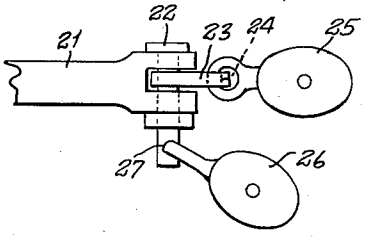


Fig. 6.

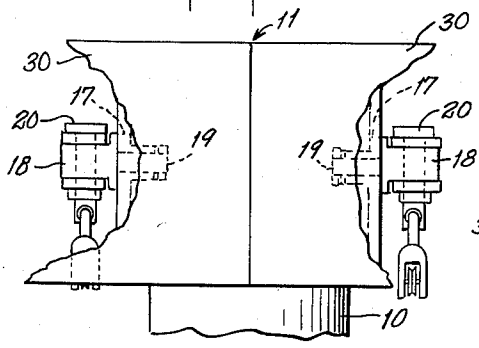
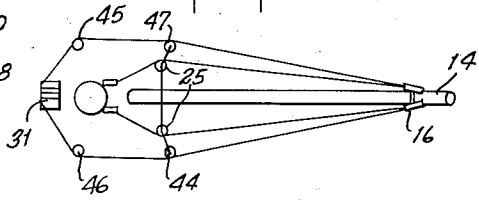


Fig. 9.



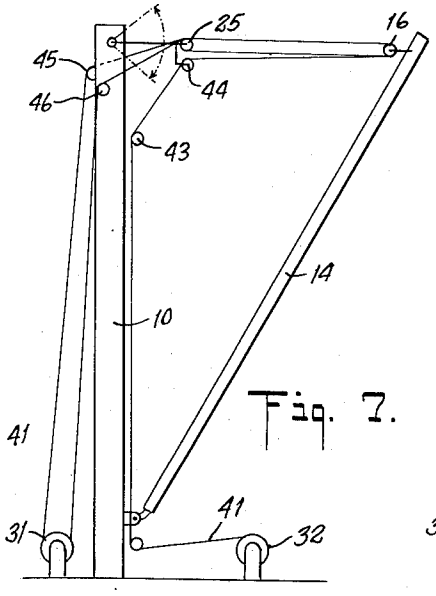


Fig. 7.

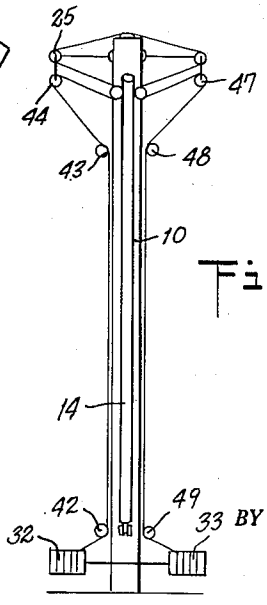


Fig. 8.

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CARGO HOISTING APPARATUS

William L. Banks, Jr., Roslyn Heights, N. Y.

Application July 1, 1955, Serial No. 519,370

11 Claims. (Cl. 212—3)

This invention relates to a cargo hoisting apparatus for ships and more particularly to the manner of rigging the boom of a hoist to produce the necessary movement of the boom in lifting and positioning the cargo where desired without using guy ropes to control the swinging of the boom.

In the operation of a single boom on a ship hoisting apparatus due to the hazardous conditions that exist on shipboard whether the ship is docked or at seat, it has been necessary to provide guy ropes so that a definite control of the swinging movement of the boom is retained at all times. Likewise in burtoning gear where two booms are utilized, guy ropes are provided for each boom so that the cargo handled between booms can be very carefully positioned and an absolute control of the swinging movement of both booms is retained at all times. In the present invention the rigging of the boom has been changed to provide the same degree of control on the swinging movement of the boom without the use of guy ropes.

It is an object of this invention to provide a hoisting apparatus for a ship in which the rigging is comprised of a double topping lift to produce the necessary lifting movement of the boom and a controlled swinging range in an arc of 90° inboard either side of the outboard position.

It is a further object of this invention to provide a hoisting apparatus for ships in which the rigging is comprised of a double topping lift and in which the double topping lift is attached to the boom at one end thereof and is attached to a pair of swinging swivel elements that are spaced apart and attached to the top of the mast.

It is a further object of this invention to provide a hoisting apparatus for a ship in which the boom is mounted at its base on a pivot whose center is forward of the mast center and in which the pivotal supporting attachment for the rigging is centered on the mast and in which the rigging includes a double topping lift to produce the necessary lifting movement of the boom and a controlled swinging range in an arc of 90° either side of the outboard position.

It is a still further object of this invention to provide a hoisting apparatus for a ship in which the boom is mounted at its base on a pivot whose center is forward of the mast center and in which a pair of swinging swivels are mounted at one end thereof to the mast and in which the rigging is comprised of a double topping lift and in which the double topping lift is attached to the boom at one end thereof and is attached to the pair of swinging swivel elements that are spaced apart either side of the mast.

A still further object of this invention is to provide a hoisting apparatus for ships in which the rigging is comprised of a double topping lift and in which the double topping lift is attached to the boom at one end thereof and is attached to a pair of swinging swivel elements that are spaced apart and attached to the top of the mast and in which the double topping lift includes two lines

to a turning drum affixed on deck and in which the two lines are rove on the winch drum in opposite directions so that the drum produces a shortening or lengthening of the lines to provide a bridling effect on the boom head.

It is a further object of this invention to provide a hoisting apparatus for ships in which the rigging is comprised of a double topping lift and in which the double topping lift is attached to the boom at one end thereof and is attached to a pair of swinging swivel elements that are spaced apart and attached to the top of the mast and in which the double topping lift includes two drums affixed on deck for the hauling operation and in which the two drums are operated on a single shaft so that the boom may be topped or lowered while swinging and in which the topping lift includes two lines that are rove on a winch drum in opposite directions so that the drum produces a shortening or lengthening of the lines to provide a swinging of the boom inboard either side of the outboard position.

Other objects of this invention may be apparent by reference to the accompanying detailed description and the drawings in which—

Fig. 1 is a side elevational view of the cargo hoisting device,

Fig. 2 is a front elevational view taken on line 2—2 of Fig. 1,

Fig. 3 is a plan view taken on line 3—3 of Fig. 1,

Fig. 4 is an enlarged detail of the mast head bracket and swivel arm in side elevational view,

Fig. 5 is a partial detail taken on lines 5—5 of Fig. 4,

Fig. 6 is an elevational view taken on line 6—6 of Fig. 4,

Fig. 7 is a schematic illustration of the tackle lines in side elevation,

Fig. 8 is a front elevational view schematically illustrating the tackle lines, and

Fig. 9 is a plan view schematically illustrating the tackle lines.

Referring to Figs. 1, 2 and 3 there is illustrated a ship mast **10** in which a bracket **11** is mounted to the head of the mast. A pivot element **12** is affixed near the base of the mast and a boom **14** is mounted with the heel of the boom **15** affixed to the pivot element **12** to permit a swinging movement of the boom either side of the pivot point **12** as well as a lifting or lowering of the boom in the pivot element **12**. Boom **14** at its top end is provided with a double block **16**. The bracket **11**, referring to Fig. 4, is provided with two mounting means such as the sockets **17** illustrated. The sockets **17** are positioned on either side of the mast and may be spaced approximately 5 ft. apart. A gooseneck swivel **18** is mounted in each socket **17**. The gooseneck swivel comprises a mounting pin **19** that fits into the socket **17** and is rotatable therein while the gooseneck is also provided with a stub shaft **20** protruding at right angles to the mounting pin **19**. Shaft **20** is provided for pivotally mounting a swivel arm **21**. Thus a swivel arm **21** will be mounted on either side of the mast. Arm **21** is approximately 5 ft. in length. Arm **21** is provided with a second aperture at the opposite end thereof to permit mounting a swivel pin **22**. A swivel **23** is supported by pin **22**. Swivel **23** is provided with an aperture **24** to permit mounting a block **25** therein. Thus a tackle block **25** will be mounted at the end of each swivel arm on either side of the mast. Swivel pin **22** is also provided with an aperture **27** at one end thereof and a lead block **26** is mounted to pin **22** by means of aperture **27**. Bracket **11** (Fig. 3) may also be provided with a stop arm **30** projecting to either side of bracket **11** to form an abutting element for either swivel **21** when the swivel **21** is

pivotally moved to a maximum 90° position, that is, in operation swivel 21 may abut with the bracket 11 in one limit of movement and may abut with the stop arm 30 in the other limit of movement. The mast 10 is of course mounted or extending from the deck 9. In the operation of the hoisting device there are provided the necessary winches such as a single drum winch 31 for controlling the swinging movement of the boom and a double drum winch 32 and 33, that is, both drums 32 and 33 are mounted on a single shaft 34 so that the movement of drums 32 and 33 will be together at all times. A further purchase winch 35 is provided for the actual cargo lifting operation. There are a plurality of pulleys and blocks necessary to guide and control the lines, thus taking the socalled topping lift 40, the line for the topping lift may be best followed by referring to Figs. 7 and 8. If we consider a single line 41 and assume that the line 41 has been rove on drum 32, the line may be passed around a guy pulley 42 up the mast through a further guy pulley 44 and through the double block 16 at the top end of the boom. From pulley 16 the line will go back over a double block 25 and continue over a guy pulley 46 and down the mast and pass in a clockwise direction around the drum of winch 31, for two or three or more turns and the line 41 will extend from drum 31 up the mast over a guy pulley 45 over the second pulley of block 25 out over the second pulley of block 16 and back over a guy pulley 47 and through a second guy pulley 48 and down the mast to a third guy pulley 49 and to the drum 33 to be rove on drum 33 in the same direction as the lead 41 is rove upon drum 32. This completes the tackle for operating the movement of boom 14. It is apparent that operation of the winch drums 32 and 33 in a clockwise direction, Fig. 7, will take up cable or line 41 and thus produce a shortening of the topping lift which in turn produces a lifting of the boom 14 while operation of the winch drums 32 and 33 in a counterclockwise direction will release line 41 lengthening the topping lift and allowing boom 14 to drop. With the winch drums 32 and 33 stationary it is apparent that operation of the winch drum 31 clockwise will affect a movement of line 41 producing a pull on the one side of the topping lift to the boom while releasing line 41 on the opposite side of the topping lift to boom 14. This will therefore produce a swinging movement of boom 14 and the direction of movement will be based upon the direction of rotation of winch 31. A clockwise rotation may produce a swinging of the boom to the right of the outboard position while a counter-clockwise rotation may produce a swinging of boom 14 to the left of the outboard position. The degree of swinging movement of boom 14 is of course limited to a 90° swing either side of the outboard position. Referring to Fig. 1 it is apparent that in addition to the topping and lowering of boom 14 by winch drums 32 and 33 and the swinging of boom 14 by winch 31 there is also provided a purchase winch 35 which has a line 50 rove thereon, line 50 extending around a guy pulley 51 at the heel end of the boom and the line 50 will extend along boom 14 to its top end around a pulley 52 and will hang downward to be attached in any standard fashion to the cargo that is to be lifted. Thus it is apparent that winch 35 may be used to lift the cargo with relation to boom 14 to a desired height and drums 32 and 33 may also be used to lift boom 14 with the suspended cargo to a particular height and winch 31 may then be utilized to swing boom 14 to in turn swing the cargo to a loading position. Upon the position being reached, winch 35 may then be payed out to drop the cargo such as into the hold of a ship. The use of this device especially on a ship at sea puts considerable strain on the swinging control. In the event there is considerable list to the ship a further safety measure may be added in the form of a belly guy B. The belly guy comprises nothing more than a cable that is affixed on the under side of the boom head to a pivot point at least 3 ft. below the boom step and pivoting on a center line of the boom heel. This belly guy is in effect a means of stopping or retarding the swing of boom 14 to either side of the outboard position.

Referring to Figs. 1 and 3 it is to be noted that the boom 14 is longer than the mast 10 or in some instances due to the heel of the boom being mounted above the lower end of the mast 10 the top of the boom will extend in its raised position to a greater height than the top of the mast. Thus the pivotal connection of the swivel arm 21 is most important. This pivotal connection permits the swivel arm 21 to move in an arc so that the end of the boom may move from any position well above the end of the mast to a position parallel with the deck of the ship and in any position the topping lift will produce a straight pull from the pivotal pin 20 of the gooseneck 18. It is to be noted in Fig. 3 with the swinging of the boom 14, when boom 14 swings to the left as illustrated in dotted lines the right hand swivel arm cannot move to the left and therefore remains in the position illustrated while the left hand swivel arm 21 will move to the dotted position shown. As the boom swings to a maximum 90° position, the line 41 extending from the right hand swivel arm 21 will thus provide the means of pulling the boom back to its normal outboard position illustrated in full lines. This is similar when the boom is swung to the right the left hand swinging arm 21 is limited to the position illustrated in full lines and thus provides the means to produce the necessary pull to return the boom to its normal position.

There is a further advantage to be noted which pertains to the bridling effect. With the boom raised or at a high point, the heel of the boom located at the pivot point 12 is actually positioned ahead of the topping lift swivel point 18, that is, drawing a vertical dotted line X parallel with the mast from the pivot point 12 it will be forward of the pivot point Y at which 18 is located. With the heel of the boom ahead of the topping lift swivel there is a bridling effect on the boom to move it either to the port or starboard side. Actually the topping lift 40 will exert a side pull and the boom will tend to move either to the port or starboard until it reaches its lower point (inboard). It is to be further noted that with the boom lowered that the topping lift swivel is actually about the swivel end 22. Thus the swivel for the topping lift will be ahead of the boom step or heel located at the swivel point 12. This produces the low point in the boom travel in the outboard position. Thus the bridling effect requires a lift or pull on the boom to move it to the port or starboard side. Referring to Fig. 3 the pivot arms 21 can be so designed that if an imaginary line is drawn from the pivot or swivel 18 to the opposed block 25 and a second imaginary line is drawn from the opposite swivel 18 to the opposed block 25, the point at which the two imaginary lines intersect will be slightly forward of a vertical line parallel with the mast that passes through the pivot 12 the point at which the boom pivots. This develops a low spot in the swing of the boom and therefore gives a bridling effect.

Although the drawings and description are drawn primarily to a ship hoist it is apparent that the principal involved may apply to a hoist whether it is mounted on a ship or on land or on other equipment. It is also to be noted that although the hoisting device is provided with a drum to control the swinging of the boom to either side, the drum may be mounted directly under the hoist in a stationary position so that a rotary movement of the mast with relation to the drum would produce an identical control on the movement of the boom 14 without departing from the spirit of this invention.

What is claimed is:

1. A cargo hoisting apparatus which includes a supporting structure such as a ship deck and cargo mast with a cargo boom pivotally mounted at one end of the boom on the lower part of the mast for up and down and swing-

ing lifting movement of the outer end and for transverse swinging movement over the ship deck and to positions with the outer end laterally extending beyond the deck, a hoist cable on said boom with a hoist end depending from the outer end of the boom and a hauling end extending to and available upon the deck, a cable pulley on the outer portion of the boom, a double block on the upper inboard part of the boom, a bracket mounted on the mast head, a pair of swivel arms located in spaced relation either side of the bracket, each swivel arm mounted to swing in an arc of 90° inboard from the outboard position parallel with the outboard position of the boom and to swing in a vertical arc from a maximum top position to a maximum lowered position of the boom, the outer end of each swivel arm provided with a pulley, a pair of winch drums mounted on a single shaft to be rotated in unison, a third winch drum, a rigging cable, one end of said rigging cable rove on one of said pair of winch drums, said cable extending up said mast to the outer end of one of said swivel arms and extending through the double block of said boom end and extending back to the pulley mounted at the outer end of said same swivel arm and extending to said third winch drum to be rove on said winch drum and extending from the opposite side of said winch drum to the second swivel arm extending over the pulley mounted at the outer end of said swivel arm and extending to the second pulley of said double block at the outer end of said boom and extending back to a pulley mounted on the outer end of the second swivel arm and extending down the mast to the second of said pair of winch drums to be rove on said drum in the same direction of rotation as the opposite end of the cable to thus provide a double topping lift for the boom and to control the swinging range of the boom.

2. In a device according to claim 1 in which the bracket mounted at the mast head provides the pivotal support on either side for said pair of swinging swivels and in which the bracket is shaped to limit the movement of said swinging swivels in their movement toward each other to a parallel position parallel with the central outboard position of said boom.

3. In a device according to claim 1 in which the bracket mounted at the mast head provides the pivotal support on either side for said pair of swinging swivels and in which the bracket is provided with extended portions to limit the horizontal swing of said swivels within an arc of 90° from their parallel outboard position.

4. In a device according to claim 1 in which the swinging swivels at the mast head are spaced apart a predetermined distance to insure a bridling effect on either side of said boom.

5. In a device according to claim 1 in which the heel of the boom is pivotally mounted on a vertical axis that is forward of the mast center and in which the pivotal supporting attachments for the rigging cable are centered on the mast to exert a side pull on the boom either side of said boom when said boom is in a high point to move the boom towards either low point of said boom inboard.

6. In a device accrding to claim 1 in which the heel of the boom is pivotally mounted on a vertical axis that is forward of the mast center and in which the outer ends of said swivels provide the pivotal supporting attachments for said rigging in a position ahead of said vertical axis of the boom mounting to produce a bridling effect in the travel of the boom to port or starboard side of the outboard position of said boom.

7. In a device according to claim 1 in which the third winch drum may be rotated in a clockwise direction to produce a shortening of the rigging cable on one side of the boom and a lengthening of said cable on the opposite side of said boom to in turn produce a clockwise movement of the boom and in which said winch drum may be rotated counterclockwise to produce a shortening of the rigging cable on one side of the boom and a lengthening of said cable on the opposite side of said boom to in turn produce a counterclockwise movement of the boom.

8. In a device according to claim 1 in which the pair of winch drums may be rotated in a clockwise direction to top said boom and in which the third winch drum may be operated in a clockwise direction to, at the same time, swing said boom in a clockwise direction.

9. In a device according to claim 1 in which a belly guy is attached at one end adjacent to the base of the mast and is attached at its opposite end to the outer end of the boom to limit the swinging movement of said boom.

10. A cargo hoisting apparatus which includes a supporting structure such as a mast with a cargo boom pivotally mounted at one end of the boom on the lower part of the mast for up and down and swinging and lifting movement, a hoist cable on said boom with a hoist end depending from the outer end of the boom and a hauling end extending to and available adjacent to the base of the mast, a cable pulley on the outer portion of the boom, a double block on the upper inboard part of the boom, a bracket mounted on the mast head, a pair of swivel arms located in spaced relation either side of the bracket, each swivel arm mounted to swing in an arc of 90° either side of a central position of said boom, and to swing in a vertical arc from a maximum top position to a maximum lowered position of the boom, the outer end of each swivel arm provided with a pulley, a pair of winch drums mounted on a single shaft to be rotated in unison, a third winch drum, a rigging cable, one end of said rigging cable rove on one of said pair of winch drums, said cable extending up said mast to the outer end of one of said swivel arms and extending through the double block of said boom end and extending back to the pulley mounted at the outer end of said same swivel arm and extending to said third winch drum to be rove on said winch drum and extending from the opposite side of said winch drum to the second swivel arm extending over the pulley mounted at the outer end of said swivel arm and extending to the second pulley of said double block at the outer end of said boom and extending back to a pulley mounted on the outer end of the second swivel arm and extending down the mast to the second of said pair of winch drums to be rove on said drum in the same direction of rotation as the opposite end of the cable to thus provide a double topping lift for the boom and to control the swinging range of the boom.

11. In a device according to claim 10 in which the third winch drum is mounted in a horizontal position.

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