June 2, 1936. J. C. PATTERSON, JR 2,042,480

OVERHAULING HOIST

Filed Oct. 16, 1934

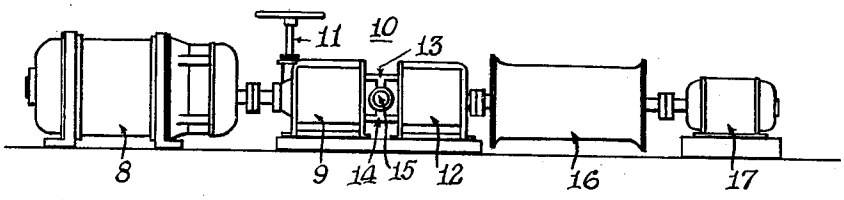


FIG. 1

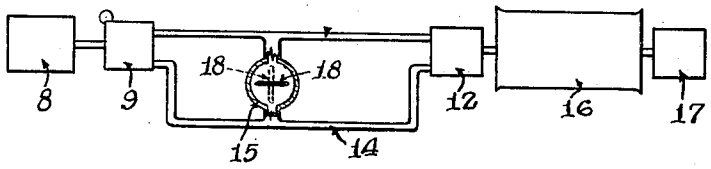


FIG. 2

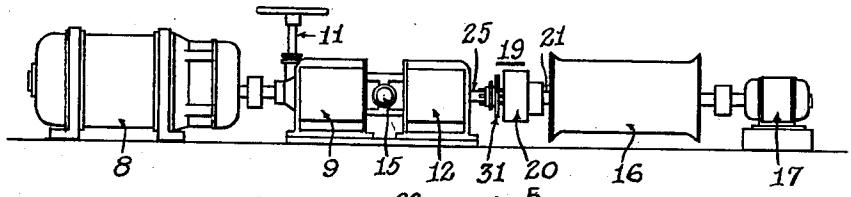


FIG. 3

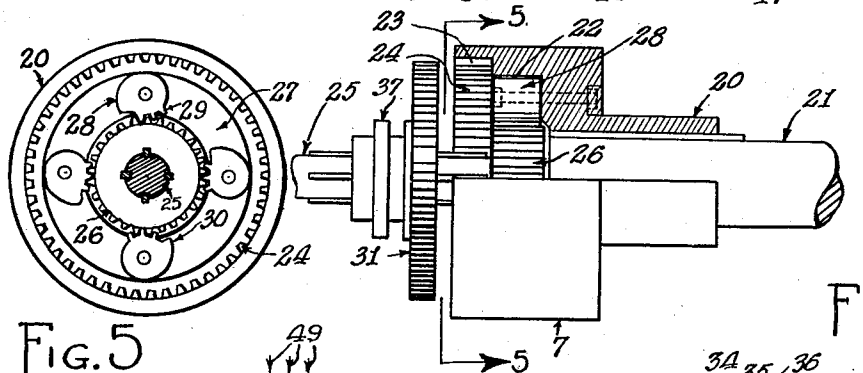


FIG. 4

FIG. 5

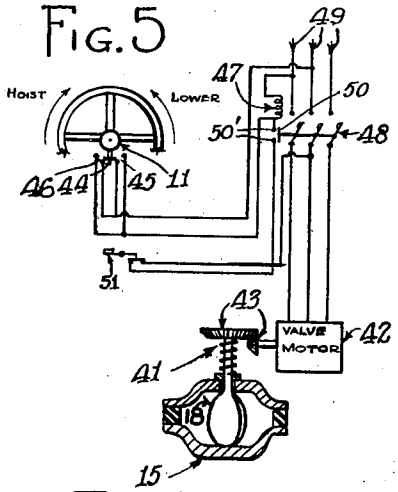


FIG. 7

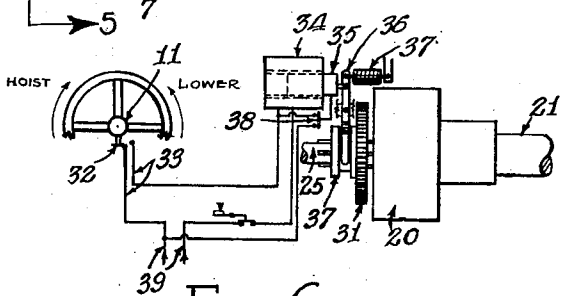


FIG. 6

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OVERHAULING HOIST

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Application October 16, 1934, Serial No. 748,501

22 Claims. (Cl. 254—172)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to hoisting means adapted for use when there is relative movement between the platform upon which the hoist is mounted and the object to be hoisted, as in lifting aircraft or boats from the surface of the water to the deck of a ship when both are subjected to wave action and the ship is rolling while the object to be hoisted is rising and falling with the waves. It is the object of this invention to provide mechanism for the purpose specified which will permit relative movement between the platform and the object to be hoisted while maintaining the hoisting line taut, and which may be set to apply a positive force to the line to hoist the object clear of the water when desired.

In the drawing:

Fig. 1 is side elevational view of one contemplated form of my invention;

Fig. 2 illustrates schematically the principle involved in the mechanism of Fig. 1;

Fig. 3 shows another embodiment of my invention that includes a device of the so-called "free wheeling" type;

Fig. 4 is a side elevation, with parts in section, of the "free wheeling" device;

Fig. 5 is a sectional view through the mechanism of Fig. 4 on the line 5, 5;

Fig. 6 is a schematic layout of means for automatically operating parts of the "free wheeling" mechanism.

Fig. 7 shows the means for automatically controlling a by-pass valve in the hydraulic mechanism.

When an object is to be hoisted to a platform with either the platform or the object, or both, subject to wave action, difficulty is frequently experienced through breaking of the hoisting cable or damage to the object being hoisted or to the hoisting mechanism due to the fact that when the platform rolls toward the object or the object is lifted up by a wave, or both of these relative movements occur simultaneously, there is a tendency for the hoisting line to become slack and this slack is violently taken up when the object and the platform move relatively away from each other. The present invention provides means for keeping the hoisting cable free of slack until the actual hoisting operation begins and at the same time to permit the cable to pay out under the pull of the load when desired.

Constant speed motor 8 is connected to drive the A-end 9 of variable speed hydraulic gear 10, the output of fluid from the member 9 being controlled in a well known manner by a tilting box actuated by a spindle 11. The A-end is connected to B-end 12 by means of pipes 13 and 14, one of which serves to convey the fluid under pressure from member 9 to member 12 and the other to return the fluid from driven end 12 to driving end 9. A valve 15 is connected between pipes 13 and 14 to by-pass the fluid around driven end 12 for a purpose that will be hereinafter set forth. A drum 16 adapted to have a hoisting cable wound thereon is rotatably mounted and connected to B-end 12 to be driven thereby. Also connected to drum 16 is an electric motor 17 of the type known as a torque motor, which is constructed to permit of its being stalled or to have the direction of rotation of its armature reversed while the current is on without damage to the motor. The normal direction of rotation of the motor 17 is to drive drum 16 to wind the cable thereon.

When a floating object is to be hoisted the valve 15 is opened to by-pass the fluid around the B-end 12 and the cable attached at one end to drum 16 is connected to the object. When the object is moved upwardly relatively to the platform, motor 17 drives drum 16 to wind the cable thereon and also drives the B-end 12. It is apparent that the motor 17 should have sufficient power to accelerate the drum 16 quickly to take up any slack in the cable even with the added load imposed by rotating the B-end therewith. When the object sinks into a wave trough its weight will unwind the cable from drum 16 and thereby rotate the B-end and it will also rotate the armature of motor 17 against the driving effort of the motor itself. It is for this reason that the special type of motor mentioned must be used since normally the stalling or overhauling of an electric motor of the usual type when the power is on would cause overheating and perhaps even burn out the motor. In Fig. 2 the valve disk 18 is shown in full lines in the closed position and in dotted lines in the open position for by-passing fluid around the B-end. The driving end 9 being on stroke, the valve 15 is closed at the proper moment in the cycle of movement of the floating object and the driven end 12 is thereby actuated to wind the cable on drum 16 and lift the object to the platform, the motor 17 adding somewhat to the power available for hoisting.

The mechanism shown in Fig. 3 is similar to that described above except that the "free wheeling" device 19 is connected between the B-end 12 and the drum 16. As illustrated, this device is of the kind known in the art as a Kelpo clutch. The member 20 is keyed upon shaft 21 of the drum 16 and has in it two cylindrical recesses 22

and 23 of different diameter, the latter being provided with internal gear teeth 24. The shaft 25 of B-end 12 extends into the recess 22 and has fixed to its end a gear wheel 26. Pivotally mounted on the radially extending face 27 of recess 22 are a plurality of pawls 28 having teeth 29 that may be meshed with the teeth of gear 26 and a toe 30 that may be turned into locking engagement with gear 26. A gear wheel 31 is feathered on shaft 25 to be slidable into and out of mesh with the teeth 24 in recess 23, any of the well known collar and yoke types of mechanisms being used for that purpose. When gear 31 is meshed with teeth 24 it forms a positive driving connection between shaft 25 and shaft 21, but when gear 31 is not engaged with teeth 24 the device forms a driving connection for one direction of rotation only. Consideration of Fig. 5 shows that when the shaft 21 and member 20 thereon are rotating in a clockwise direction with respect to shaft 25 and gear 26 the pawls 28 will be rotated on their pivots until the teeth 29 are disengaged from the teeth of gear 26, which permits the shaft 21 to rotate free of the B-end 12, this being the mode of operation when valve 15 is open and motor 17 is driving drum 16 merely to keep the hoisting line free of slack. However, when the load on the cable is increased by the floating object sinking into a wave trough, the pawls are rotated to bring the toes 30 into locking engagement with the teeth of gear 26 and so cause the B-end to be driven which, together with the resistance offered by the driving effort of motor 17 while being overhauled, offers sufficient resistance to the pull on the cable to keep it tensioned. It is apparent that when shaft 25 is driven by the B-end for hoisting the load that the relative clockwise rotation of shaft 25 will cause toes 30 to engage gear 26 and form a positive driving connection between shafts 25 and 21. When either of the above described forms of my invention is to be used for lowering an object the A-end 9 is put on stroke to apply a braking force to the drum 16 and cause the object to descend at the desired speed, as is the usual practice.

Fig. 6 discloses mechanism for automatically throwing the gear 31 into or out of mesh with the teeth 24. A contact brush 32 is connected to control spindle 11 to be moved by rotation of the spindle in the "lower" direction to close a circuit through wires 33 which will energize solenoid 34 and thus draw core 35 into the solenoid. Lever 36 is pivoted intermediate its ends, the upper end being connected to core 35 and the lower end being formed into a yoke to engage the groove in collar 37 secured to gear 31 and thus when the solenoid is energized gear 31 is thrown into mesh with the teeth 24, a spring 37 being provided to move the gear 31 out of mesh with teeth 24 when the solenoid is de-energized. As core 35 moves into solenoid 34 the contact member 38 is moved to close the circuit from supply wires 39 through the solenoid and therefore the solenoid remains energized even though the circuit be broken by moving of contact 32 away from its circuit closing position with respect to the wires 33, and gear 31 will be held meshed with teeth 24 until the circuit is broken by opening switch 40. It is to be noted that it is unnecessary to mesh gear 31 with teeth 24 except when lowering under power from the B-end, since when the free wheeling device is operative and it is desired to hoist with the power from B-end 12 the rotation of shaft 25 in the clockwise direction will cause gear 26 to rotate the pawls 28 and bring the toes 30 into locking engagement with gear 26.

In Fig. 7 is shown a device for automatically controlling the by-pass valve 15. A torsion spring 41 is disposed around and connected to the stem of valve 15 to rotate the disc 18 to either the open or the closed position as desired, the latter being preferred, and a torque type motor 42 is connected through bevel gears 43 to turn the disc 18 in opposition to spring 41. When control spindle 11 is rotated from neutral the brush 44 closes the circuit through either contacts 45 or contacts 46 which energizes a solenoid 47 and closes the switch 48 to connect motor 42 to supply wires 49 and simultaneously moves brush 50 against the contacts 50' to keep the circuit through the solenoid closed irrespective of position of brush 44. The motor 42 turns disc 18 to the limit of its possible movement and the motor is then stalled and holds the disc in the position to which it has been turned. Opening the circuit at switch 51 de-energizes solenoid 47 which permits the switch 48 to open and cuts off the current from motor 42, whereupon the spring 41 takes charge and moves the valve disc 18 to the position for which the spring is set. If it is at any time desirable to prevent operation of valve 15 while control 11 is actuated it is necessary merely to keep the switch 51 open.

While my invention has been described as using a torque type motor to drive drum 16 for winding up slack in the cable, it is to be understood that any equivalent device which will permit the drum 16 to be rotated in opposition to the driving effort of such device may be substituted therefor. For example, I may use a motor of any well known type and connect between such motor and the drum 16 a device such as is known as a fluid clutch, or fluid flywheel, which will rotate the drum 16 when the load on the cable is of less than a predetermined magnitude but will slip and permit reverse rotation of the drum by the load when the load exceeds such magnitude.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

I claim:

1. The combination with a hydraulic variable speed gear having a driving end provided with means to control the output thereof and a driven end, and means to drive said gear, of means connected between said ends operable to by-pass fluid around said driven end, means governed by actuation of said control means to operate said by-pass means, a rotatable drum adapted to have a cable wound thereon, means adjustable to form a positive driving connection between said driven end and said drum or to permit said drum to rotate in a direction to wind the cable thereon while said driven end rests inoperative, means including a solenoid governed by actuation of said control means to set said adjustable means as aforesaid, and a torque type electric motor connected to said drum to drive said drum in the said direction when the load on the cable is of less than a predetermined magnitude and to be driven in the opposite direction by the drum in opposition to the driving effort of the motor when the said load exceeds the said magnitude.

2. The combination with a hydraulic variable speed gear having a driving end provided with means to control the output thereof and a driven end, and means to drive said gear, of means

connected between said ends operable to by-pass fluid around said driven end, means governed by actuation of said control means to operate said by-pass means, a rotatable drum adapted to have a cable wound thereon, means adjustable to form a positive driving connection between said driven end and said drum or to permit said drum to rotate in a direction to wind the cable thereon while said driven end rests inoperative, means including a solenoid governed by actuation of said control means to set said adjustable means as aforesaid, and separate prime mover connected to said drum to drive the drum in the said direction when the load on the cable is of less than a predetermined magnitude and to be driven in the opposite direction by the drum in opposition to the driving effort of the prime mover when the said load exceeds the said magnitude.

3. The combination with a hydraulic variable speed gear having a driving end provided with means to control the output thereof and a driven end, and means to drive said gear of means connected between said ends operable to by-pass fluid around said driven end, means governed by actuation of said control means to operate said by-pass means, a rotatable drum adapted to have a cable wound thereon, means adjustable to form a positive driving connection between said driven end and said drum or to permit said drum to rotate in a direction to wind the cable thereon while said driven end rests inoperative, means governed by actuation of said control means to set said adjustable means as aforesaid, and a torque type electric motor connected to said drum to drive said drum in the said direction when the load on the cable is of less than a predetermined magnitude and to be driven in the opposite direction by the drum in opposition to the driving effort of the motors when the said load exceeds the said magnitude.

4. The combination with a hydraulic variable speed gear having a driving end provided with means to control the output thereof and a driven end, and means to drive said gear, of means connected between said ends operable to by-pass fluid around said driven end, means governed by actuation of said control means to operate said by-pass means, a rotatable drum adapted to have a cable wound thereon, means adjustable to form a positive driving connection between said driven end and said drum or to permit said drum to rotate in a direction to wind the cable thereon while said driven end rests inoperative, means governed by actuation of said control means to set said adjustable means as aforesaid, and a separate prime mover connected to said drum to drive the drum in the said direction when the load on said cable is of less than a predetermined magnitude and to be driven in the opposite direction by the drum in opposition to the driving effort of the prime mover when the said load exceeds the said magnitude.

5. The combination with power mechanism that includes a fluid-pressure driven device having a control operable to govern the output of said device, of means to render said device inoperative during predetermined conditions of operation of said mechanism, a rotatable drum adapted to have a cable wound thereon, means adjustable to form a positive driving connection between said device and said drum or to permit said drum to rotate in a direction to wind the cable thereon while said device rests inoperative, means actuatable by operation of said control to set said adjustable means to form a driving connection as aforesaid, and a torque type electric motor connected to said drum to drive the drum in the said direction when the load on the cable is of less than a predetermined magnitude and to be driven in the opposite direction by the drum in opposition to the driving effort of the motor when the load exceeds the said magnitude.

6. The combination with power mechanism that includes a fluid-pressure driven device having a control operable to govern the output of said device, of means to render said device inoperative during predetermined conditions of operation of said mechanism, a rotatable drum adapted to have a cable wound thereon, means adjustable to form a positive driving connection between said device and said drum or to permit said drum to rotate in a direction to wind the cable thereon while said device rests inoperative, means actuatable by operation of said control to set said adjustable means to form a driving connection as aforesaid, and a separate prime mover connected to said drum to drive the drum in the said direction when the load on the cable is of less than a predetermined magnitude and to be driven in the opposite direction by the drum in opposition to the driving effort of the prime mover when the load exceeds the said magnitude.

7. The combination with power mechanism that includes a fluid-pressure driven device, of means to render said device inoperative during predetermined conditions of operation of said mechanism, a rotatable drum adapted to have a cable wound thereon, means adjustable to form a positive driving connection between said device and said drum or to permit said drum to rotate in a direction to wind the cable thereon while said device rests inoperative, means to set said adjustable means for either of the aforesaid modes of operation and a separate prime mover connected to said drum to drive the drum in the said direction when the load on the cable is of less than a predetermined magnitude and to be driven in the opposite direction by the drum in opposition to the driving effort of the prime mover when the load exceeds the said magnitude.

8. The combination with power mechanism that includes a device operable either to do work upon a load or under predetermined conditions of operation to be driven independently of the remainder of said mechanism by said load, of a rotatable drum adapted to have a cable wound thereon, means adjustable to form a positive driving connection between said device and said drum or to permit said drum to rotate in a direction to wind the cable thereon while said device rests inoperative, means to set said adjustable means for either of the aforesaid modes of operation, and a separate prime mover connected to said drum to drive the drum in the said direction when the load on the cable is of less than a predetermined magnitude or to be driven in the opposite direction by said drum in opposition to the driving effort of the prime mover when the load exceeds the said magnitude.

9. The combination with a hydraulic variable speed gear having a driving end provided with means to control the output thereof and a driven end, and means to drive said gear, of means connected between said ends operable to by-pass fluid around said driven end, means governed by actuation of said control means to operate said

by-pass means, a rotatable drum adapted to have a cable wound thereon connected to be driven by said driven end, and a torque type electric motor connected to said drum to drive said drum and said driven end when said driven end is by-passed and the load on said cable is less than a predetermined magnitude and to be driven by said driven end, in opposition to the driving effort of said motor, when said driven end is not by-passed and is rotating counter to the normal direction of rotation of the motor.

10. The combination with a hydraulic variable speed gear having a driving end provided with means to control the output thereof and a driven end, and means to drive said gear, of means connected between said ends operable to by-pass fluid around said driven end, means governed by actuation of said control means to operate said by-pass means, a rotatable drum adapted to have a cable wound thereon connected to be driven by said driven end, and a separate prime mover connected to drive said drum and said driven end when said driven end is by-passed and the load on the cable is less than a predetermined magnitude and to be driven by said driven end, in opposition to the driving effort of said prime mover, when said driven end is not by-passed and is rotating counter to the normal direction of operation of said prime mover.

11. The combination with power mechanism that includes a device operable, under predetermined conditions, by a source of power separate from said mechanism, of a drum adapted to have a cable wound thereon and having an operative connection with said device, and a separate prime mover connected to said drum independently of said device to rotate the drum in a direction to wind the cable on the drum when the load on the cable is of less than a predetermined magnitude and to be driven by the drum in opposition to the driving effort of the prime mover when the load on the cable exceeds the said magnitude, said device being driven by the drum simultaneously with driving of the prime mover by said drum.

12. The combination with power mechanism that includes a device operable, under predetermined conditions, by a source of power separate from said mechanism, of a drum adapted to have a cable wound thereon and having a disconnectible driving connection with said device, and a separate prime mover connected to the drum to rotate the drum in a direction to wind the cable on the drum when the load on the cable is of less than a predetermined magnitude and to be driven by the drum in opposition to the driving effort of the prime mover when the load on the cable exceeds the said magnitude.

13. The combination with power mechanism, of a drum adapted to have a cable wound thereon having a disconnectible driving connection with said mechanism, and a separate prime mover connected to said drum to rotate said drum in a direction to wind the cable on said drum when the load on the cable is of less than a predetermined magnitude and to be driven by said drum in opposition to the driving effort of said prime mover when the load on the cable exceeds the said predetermined magnitude.

14. The combination with power mechanism, of a drum adapted to have a cable wound thereon operatively connected to said mechanism, and a separate prime mover connected to said drum, independently of the connection of said mechanism to said drum, to drive the drum in a direction to wind the cable thereon when the load on the cable is of less than a predetermined magnitude and to be driven by the drum in opposition to the driving effort of the prime mover when the load on the cable exceeds the said magnitude.

15. The combination with power mechanism, of a drum adapted to have a cable wound thereon operatively connected to said mechanism, and a separate prime mover operatively connected to said drum, independently of the connection of said mechanism to said drum, to drive the drum in a direction to wind the cable thereon when the load on the cable is of less than a predetermined magnitude, the said drum being rotatable in the opposite direction by the load on the cable in opposition to the driving effort of the prime mover when said load exceeds the said magnitude.

16. The combination with power mechanism, of a drum adapted to have a cable wound thereon operatively connected to said mechanism, and a separate prime mover operatively connected to said drum, independently of the connection of said mechanism to said drum, to drive the drum in a direction to wind the cable thereon when the load on the cable is of less than a predetermined magnitude, the said drum being rotatable in the opposite direction by the load on the cable when said load exceeds the said magnitude, the energy that actuates the said prime mover acting continuously in the same direction irrespective of the direction of rotation of the drum.

17. The combination with a hydraulic variable speed gear having a driving end provided with means to control the output thereof and a driven end, and means to drive said gear, of a valve connected between said ends to by-pass fluid around said driven end when in the open position and to prevent such by-passing when in the closed position, continuously acting means tending to move said valve to one of said positions, a torque type motor connected to move said valve to the other of said positions when the motor is energized, and means operable by actuation of said control means to govern the energizing of said motor.

18. The combination with a hydraulic variable speed gear having a driving end provided with means to control the output thereof and a driven end, and means to drive said gear, of a valve connected between said ends to by-pass fluid around said driven end when in the open position and to prevent such by-passing when in the closed position, continuously acting means tending to move said valve to one of said positions, a motor connected to move said valve to the other of said positions when energy is supplied to said motor, and means operable by actuation of said control means to govern the supply of energy to said motor.

19. The combination with a hydraulic variable speed gear having a driving end provided with means to control the output thereof and a driven end, and means to drive said gear, of a valve connected between said ends to by-pass fluid around said driven end when in the open position and to prevent such by-passing when in the closed position, continuously acting means independent of the pressure of the fluid tending to move said valve to one of said positions, means to move the valve to the other of said positions, and means operable by actuation of said control

means to govern the operation of the last mentioned means.

20. The combination with power mechanism, of a drum adapted to have a cable wound thereon, a shaft upon which said drum is fixed to rotate therewith and to which said mechanism is operatively connected at one end, and a separate prime mover connected to the other end of said shaft to drive the drum in a direction to wind the cable thereon when the load on the cable is of less than a predetermined magnitude and to be driven by the drum in opposition to the driving effort of the prime mover when the load on the cable exceeds the said magnitude.

21. The combination with power mechanism, of a drum adapted to have a cable wound thereon, a shaft upon which said drum is fixed to rotate therewith and to which said mechanism is operatively connected at one end, and a separate prime mover connected to the other end of said shaft to drive the drum in a direction to wind the cable thereon when the load on the cable is of less than a predetermined magnitude, the said drum being rotatable in an opposite direction by the load on the cable in opposition to the driving effort of the prime mover when the said load exceeds said magnitude.

22. The combination with power mechanism, of a drum adapted to have a cable wound thereon, a shaft upon which said drum is fixed to rotate therewith and to which said mechanism is operatively connected at one end, a seprate prime mover connected to the other end of said shaft to drive the drum in a direction to wind the cable thereon when the load on the cable is of less than a predetermined magnitude, the said drum being rotatable in the opposite direction by the load on the cable when said load exceeds said magnitude, the energy that actuates said prime mover acting continuously in the same direction irrespective of the direction of the rotation of the drum.

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