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WINCH ASSEMBLY

Filed Aug. 28, 1967

2 Sheets-Sheet 1

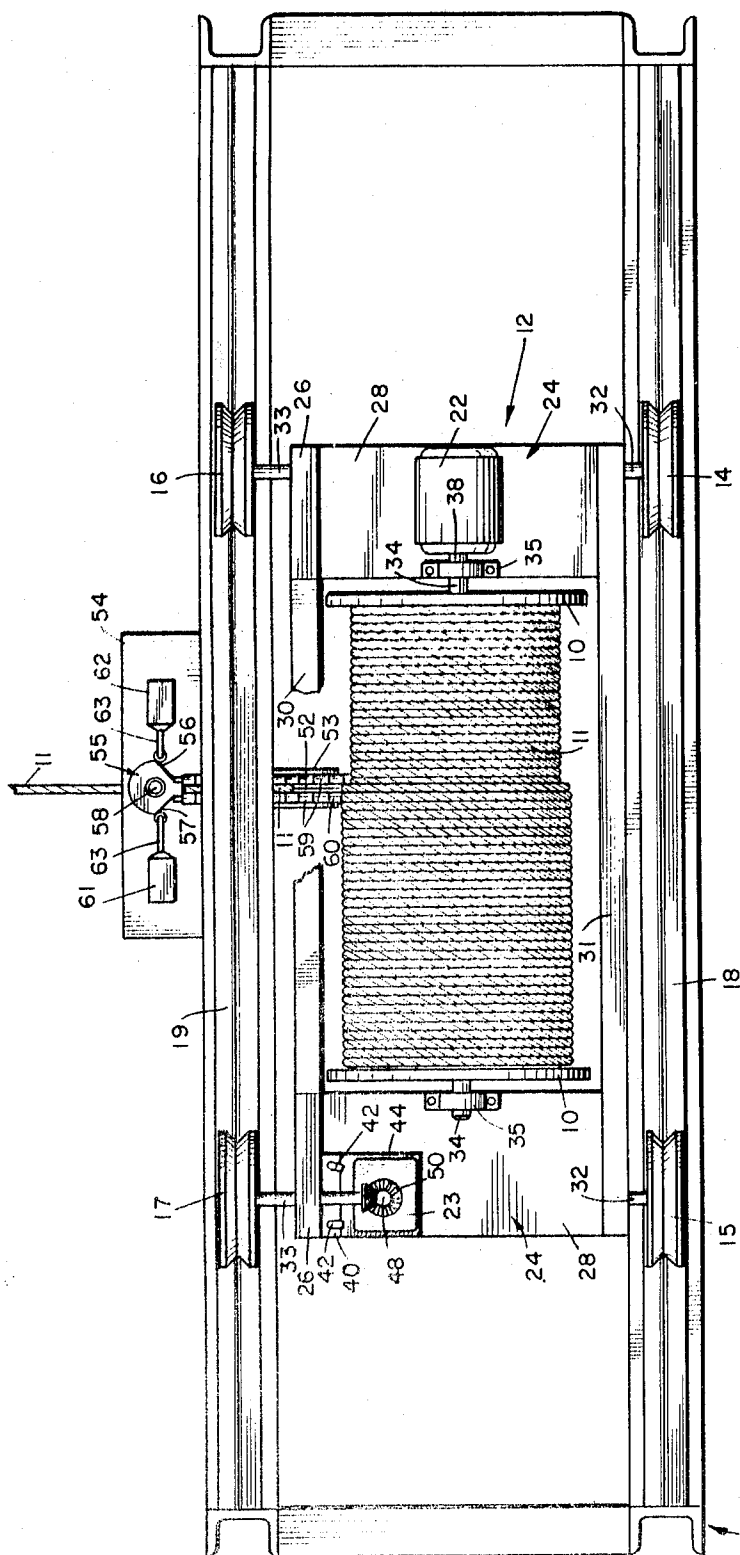


Fig. 1

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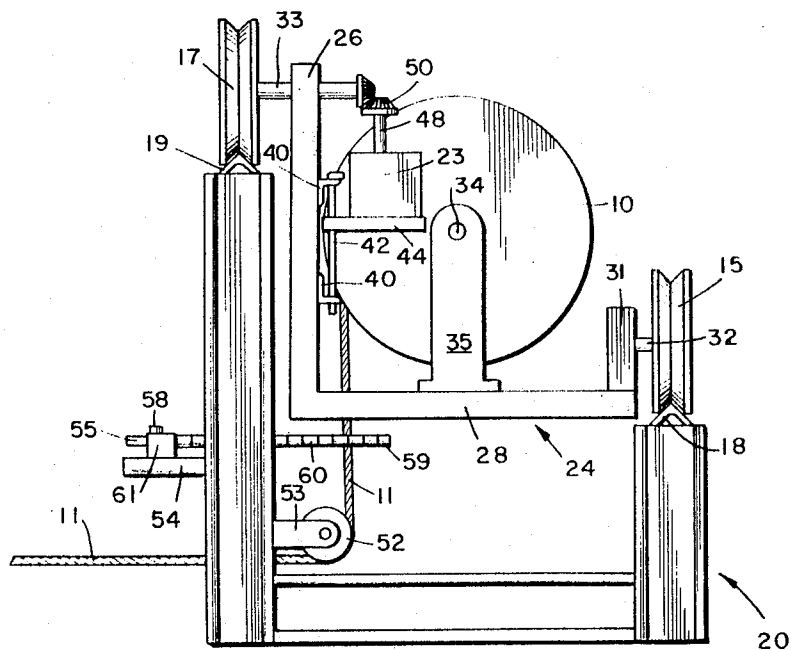


Fig. 2

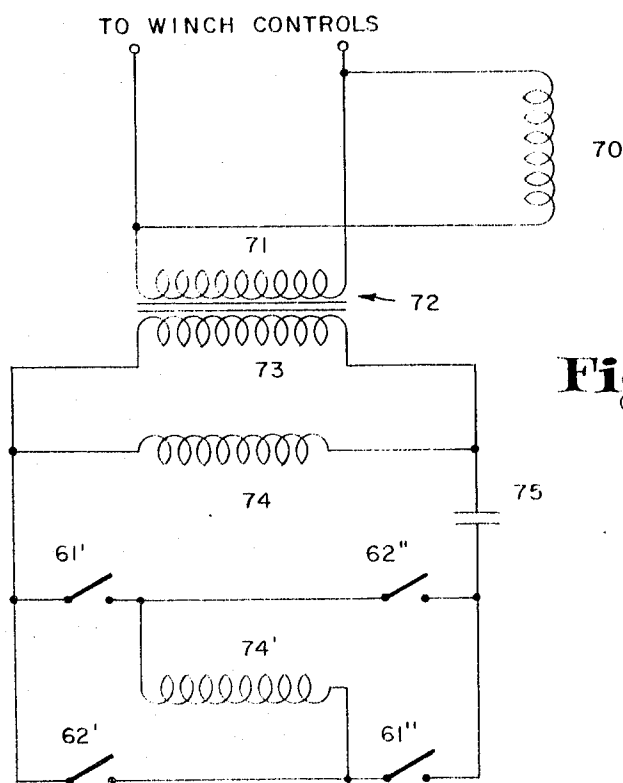


Fig. 3

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WINCH ASSEMBLY

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4 Claims

ABSTRACT OF THE DISCLOSURE

Apparatus for aligning a winch drum with respect to a guide pulley so that a cable is wound uniformly onto and off of the drum. The drum is mounted on a carriage driven along a pair of rails to keep the cable being wound onto or off of the drum aligned with the guide pulley over which said cable passes. A cam having a cable-sensor thereon is swingably mounted on a frame between the drum and pulley so that as the angle between pulley and the point of contact between the drum and the cable leaving or approaching the drum starts to increase, said cam will actuate the carriage drive to keep said point and pulley aligned.

Summary of the invention

In the use of a cable and winch assembly it is sometimes necessary to ensure that the cable is wound evenly about the circumference of the winch drum, and unwound smoothly therefrom. This is particularly true when it is critical that the load to which the cable is connected be moved smoothly and without any sudden jerks. Therefore, it is an object of this invention to provide a winch assembly which evenly distributes its cable along the length of the winch drum, and unwinds the cable perpendicularly with respect to the drum axis.

Summary of the invention

In accordance with the preferred form of the invention, a drum having a length of cable thereon is rotatably mounted on a wheeled carriage movable along a supporting frame. A reversing carriage drive motor mounted on the carriage is operatively connected to at least one of the wheels to drive the carriage parallel to the drum axis. The cable, which is wound onto and off of the drum by a motor on the carriage, extends over a guide pulley mounted in a fixed position on the frame with respect to the center of the drum when said drum is disposed in the center of its limits of axial movement.

A cam is rotatably mounted on the frame and has a pair of sensing arms that embrace the cable at a position spaced from the drum but in alignment with the pulley. Switches for the carriage drive motor are mounted on the frame to operatively engage the cam during the cam's rotational movement whereby movement of the cam in one direction causes a first set of switch contacts to close for driving the carriage in one direction and movement of the cam in an opposite direction causes a second set of contacts to close for driving the carriage in an opposite direction. In this manner, a slight movement of the cam arms from their alignment with the pulley, as caused by the misalignment of the cable between the drum and the pulley, will actuate the appropriate switches to cause the carriage to be moved to realign the cable being paid onto or off of the drum with the pulley.

The drum drive motor for rotating the drum is mounted on the carriage and is operated by conventional control means. Preferably, the carriage motor is electrically connected to be energized only when the drum motor is energized, and its speed of revolution is suitably proportioned to the speed of revolution of the

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drum, such that cable being wound or unwound from the drum is always substantially perpendicular with the parallel drum and pulley axes.

Brief description of the drawing

The accompanying drawings illustrate the invention. In such drawings:

FIG. 1 is a top plan view of a winch assembly embodying the invention;

FIG. 2 is a side elevation of the assembly shown in FIG. 1; and

FIG. 3 is a schematic view of the electrical circuitry as used in one embodiment of the invention.

Description of the preferred embodiments

In the apparatus shown in FIG. 1 a drum 10 carrying a cable 11 is mounted for rotation on a carriage 12. The carriage is supported on wheels 14, 15, 16, and 17 with the wheels 14 and 15 riding on a lower rail 18 and wheels 16 and 17 riding on an upper rail 19. The rails 18 and 19 are mounted on a frame 20 and a drum drive motor 22 and a carriage drive motor 23 are mounted on the carriage to respectively rotate the drum and drive the carriage along said rails.

The carriage comprises a pair of longitudinally spaced L-shaped members 24 having vertical legs 26 and transverse horizontal legs 28. The L-shaped members are interconnected by upper and lower parallel longitudinal braces 30 and 31 with the brace 30 interconnecting the upper ends of the vertical legs 26 and the lower brace 31 interconnecting the outer ends of the transverse legs 28. The wheels 14 and 15 are rotatably mounted on axles 32 connected to the lower brace 31, and wheels 16 and 17 are mounted on axles 33 connected to vertical legs 26 adjacent the upper ends thereof.

The drum 10 has its axle 34 journaled at both ends in a pair of supports 35 mounted on the transverse carriage legs 28. One end of the axle is coupled directly or by a set of gears to the shaft 38 of the drum drive motor 22 mounted on one of the transverse legs 28 for rotating the drum to wind the cable 11 onto or off of said drum. As shown, the drum axis and the rails 18 and 19 are in parallelism with each other.

The carriage drive motor 23 is slidably supported on one of the vertical carriage legs 26 near the upper end thereof and is coupled to the axle 33 of the carriage wheel 17. The slidable mounting is attained by means of a pair of horizontal longitudinally spaced brackets 40 mounted on the vertical leg 26 holding the carriage motor 23, and by means of a pair of vertical longitudinally spaced rods 42 which are mounted between the brackets 40 on said vertical leg. The carriage motor is attached to a mounting plate 44 having a pair of holes therein through which pass the rods 42. The mounting plate 44 is releasably secured at the upper end of the rods by set screws (not shown) which are held by the mounting plate and bear against the rods. The motor shaft 48 is coupled by bevel gears 50 to the axle 33 of the wheel 17. Thus, the coupling between the motor can be disengaged by merely sliding the motor downwardly on the rods 42, thereby permitting the carriage to be moved manually along the rails 18 and 19.

A guide pulley 52 is mounted on a yoke 53 connected to the frame 20 centrally of and below the drum 10 when the carriage is positioned at the center of its excursion along the rails. The cable 11 extends over the pulley 52 for attachment to the load (not shown). A cam and sensor assembly is rotatably mounted on an outwardly projecting bifurcated plate 54 on the frame 20 between the lower periphery of the drum 10 and the pulley 52. The cam 55, which has a pair of lobes 56 and 57 formed on

its opposed sides, is disposed in the same vertical plane as the pulley and is rotatably connected to the plate 54 by a pin 58. A pair of sensing arms 59 extend horizontally inwardly from the cam 55 on the opposed sides of the stretch of the cable 11 between the drum and the pulley. Thus, when said stretch of cable between the drum and pulley lies in the vertical plane of the pulley 52, the arms 58 extend perpendicularly with respect to the vertical plane through the drum axis, and when said stretch of cable forms an angle with respect to the plane of the pulley it bears against the arms 59 to cause the cam 55 to rotate about the axis pin 58. Conveniently, the arms 59 have a plurality of sleeve bearings 60 mounted thereon to provide substantially friction free contact between the cable and the arms.

A switch assembly is mounted on the plate 54 for controlling the actuation of the motor 23. Conveniently, said assembly comprises a pair of switches 61 and 62 mounted on opposite sides of the cam adjacent the cam lobes 56 and 57. Each switch has a plunger 63 extending from its housing to engage the adjacent cam lobe and function as a cam follower. In the embodiment shown, the plungers 63 are positioned with respect to the cam 55 such that a 3° rotation of the cam, as is caused by movement of the arms 59 due to a misalignment between the cable leaving or approaching the drum 10 and the pulley 52, will cause one of the switches to actuate. Conversely, a 3° movement of the arms 59 in the other direction will cause the other switch to actuate. Actuation of either of the switches 61 or 62 will cause the carriage drive motor 23 to be energized to drive the wheel 17 and move the carriage along the rails 18 and 19 to bring the cable 11 leaving or approaching the drum into alignment with the pulley 52.

As shown schematically in FIG. 3, the switches 61 and 62 are connected in a circuit with the carriage drive motor. The winch controls (not shown) apply a voltage to the field winding 70 of the drum motor 22 and to the primary 71 of a transformer 72. The secondary 73 of the transformer applies voltage to the field winding 74 of the carriage drive motor 23 and to the reversing winding 74' thereof through the switches 61 and 62. The carriage motor field winding 74 is connected directly across the transformer secondary 73, and one side of the secondary 73 is also connected to one terminal of each of the normally open contacts 61' and 62' of switches 61 and 62, while the other side of the secondary is connected to one side of a capacitor 75. The other side of the capacitor 75 is connected to one terminal of each of the normally open switch contacts 61'' and 62'' of switches 61 and 62. The other terminals of contacts 61' and 62' are connected together and to one side of the reversing winding 74' of the carriage motor. The other terminals of contacts 61'' and 62'' are connected together and to the other side of the carriage motor reversing winding 74'.

Thus, when power is applied to the drum motor 22, it is also applied through the transformer 72 to the field winding 74 of the carriage motor 23. The reversing winding 74' of the carriage motor is energized whenever the arms cause the cam to swing more than 3° from its center position and therefore the carriage motor drives the carriage to maintain the cable in proper alignment with the pulley 52 and ensure that the cable is wound and unwound evenly from the drum. When switch 61 is actuated, its contacts 61' and 61'' close and the reversing winding causes the motor shaft to start rotation in one direction, while the field winding causes continued rotation in that one direction until switch 62 is closed or until the supply power is cut off. Similarly, when switch 62 is actuated, contacts 62' and 62'' close causing the motor to start ro-

tation in the other direction, which rotation continues until switch 61 is closed or until the supply power is cut off.

As will be understood, it is desirable that the speed of travel of the carriage along the rails 18 and 19 be correlated with the speed of the drum rotation. This can be accomplished such as by proper selection of the gears 50, the use of gears on the drum shaft 34, motor design, etc.

We claim:

1. A winch assembly, comprising a supporting frame, a carriage movably supported on said frame, a drum carrying a cable rotatably supported on said carriage, first drive means for rotatably driving said drum, guide means mounted on said frame in fixed position with respect to said carriage and adapted to have said cable extend thereover, sensing means supported from said frame between said drum and guide means for sensing the positioning of said cable between said drum and guide means, and second drive means operatively connected to said sensing means and to said carriage for moving said carriage to dispose the cable being wound onto or off of said drum in alignment with said guide means said second drive means being releasably operatively connected to said carriage whereby said carriage is movable manually or by said second drive means.

2. A winch assembly, comprising a supporting frame, a wheeled carriage supported on said frame, a drum carrying a cable rotatably supported on said carriage, a first motor for rotatably driving said drum, guide means mounted on said frame and adapted to have said cable extend thereover, sensing means mounted on said frame for sensing the positioning of said cable between said drum and guide means and comprising a cam swingably mounted on said frame in vertical alignment with said guide means and having a pair of opposed lobes and a pair of outwardly projecting arms straddling said cable, a second motor slidably supported on said frame for releasably interconnecting it to one of the wheels on the carriage for moving said carriage along said frame, said second motor being a reversible electric motor having a field winding and a reversing winding, and switch means having a pair of plungers operatively engageable with the lobes on said sensing means and having two sets of electrical contacts coupled to said field winding and reversing winding for actuating said second motor to move said carriage along said frame and dispose the cable being wound onto and off of said drum in alignment with said guide means.

3. A winch assembly as set forth in claim 1 in which said guide means and sensing means are mounted on the frame in alignment with each other, and said sensing means comprises a pair of arms fixedly interconnected to each other and swingable about a unitary axis.

4. A winch assembly as set forth in claim 1 in which said second drive means comprises a motor mounted on said carriage and releasably operatively disconnectable to a wheel on said carriage whereby said carriage can be moved either manually or by said second motor along said frame.

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