April 29, 1941. N. P. LARSEN ET AL 2,239,822

WINCH

Original Filed Feb. 16, 1938 2 Sheets-Sheet 1

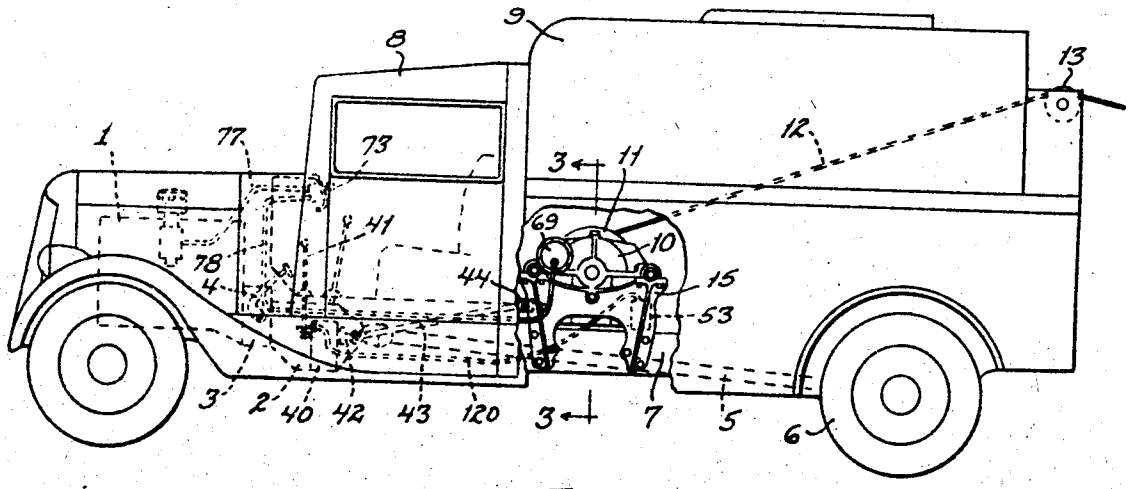


FIG. 1

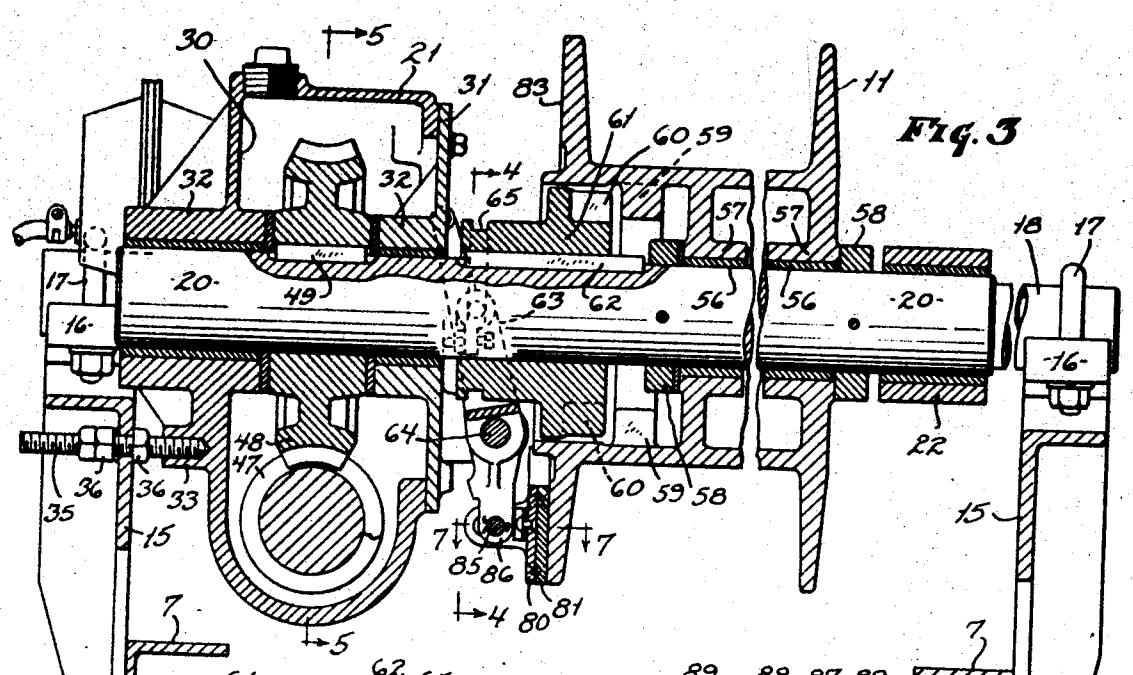


FIG. 3

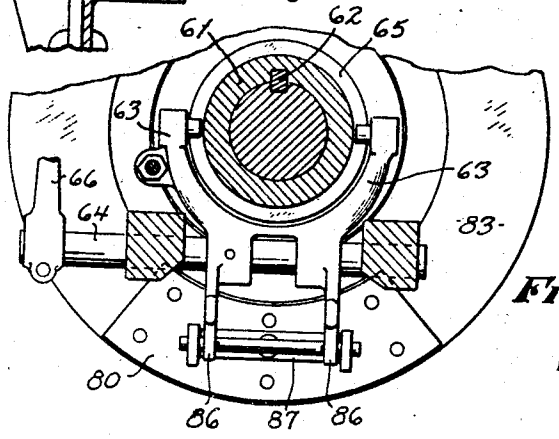


FIG. 4

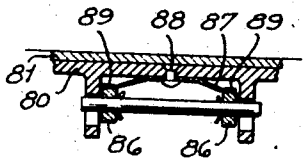


FIG. 7

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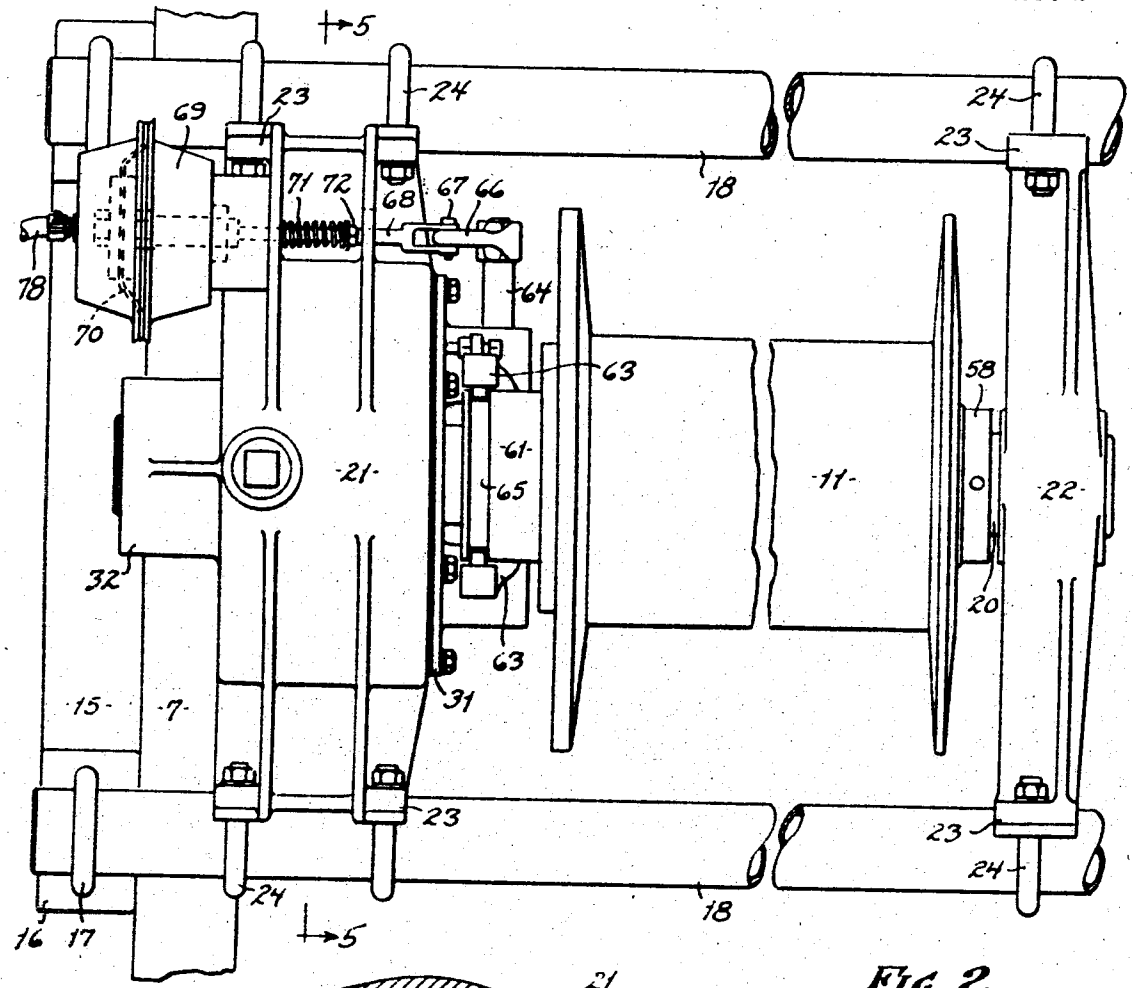


Fig. 2

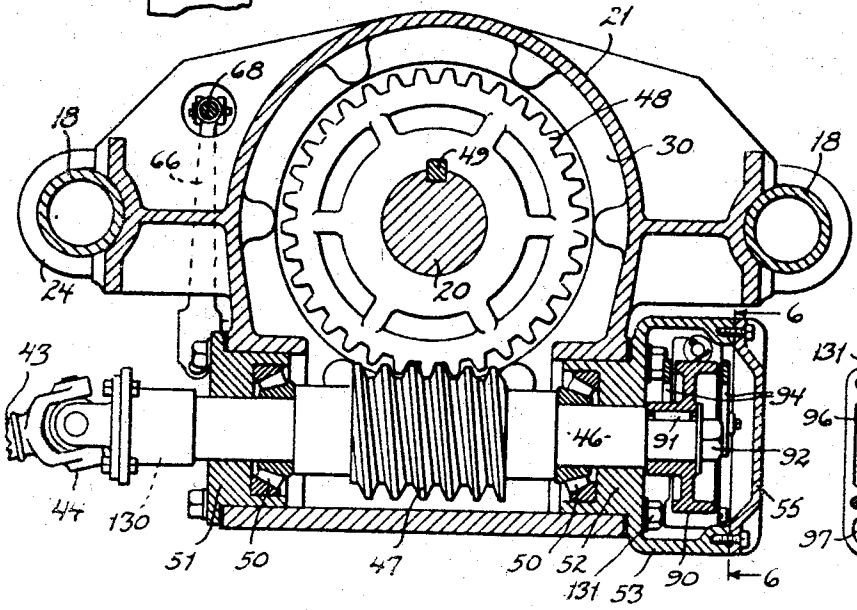


Fig. 5

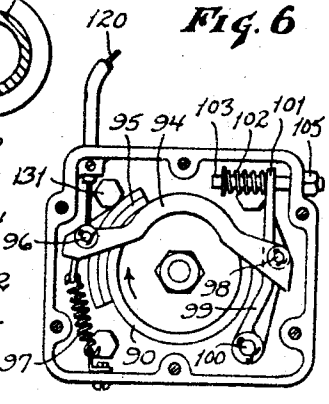


Fig. 6

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WINCH

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Original application February 16, 1938, Serial No. 190,760. Divided and this application February 28, 1940, Serial No. 321,234

5 Claims. (Cl. 180—53)

This invention is a division of our copending application for Letters Patent filed February 16, 1938, and assigned Serial No. 190,760.

The present invention relates to power winch equipped motor vehicles and particularly to a winch control and a driving mechanism so arranged as to be controlled from the driver's cab of the vehicle. This, therefore, is the general object of the present invention.

Power winch equipped motors or road vehicles in which the winch is controlled from the vehicle cab should have a sufficiently simple winch control arrangement so that the operator will not require any great amount of training in the operation of hoists, beyond what would be expected of him as a vehicle operator.

Another problem is presented by the utilization of the vehicle motor as a source of power for the winch. In such instances, the winch must be readily connected and disconnected from the vehicle motor and yet be so arranged as not to be accidentally disconnected from the power source when lifting a load, as in the erection of telephone or light wire poles, for the reason that a disconnection at an inopportune time can cause great personal and property damage. Likewise, the arrangement must be such that if the motor vehicle clutch is accidentally operated while the winch is lifting a load, such load will not be dropped thereby preventing personal and property damage which otherwise might occur.

Another object is to provide a winch equipped motor vehicle with an arrangement adapted to be operated by power supplied from the vehicle engine (as by engine vacuum) in order to disengage the winch winding drum from its source of power, as for instance the vehicle engine.

A further object is to provide a winch with an improved anti-reverse brake, which will operate to prevent unreeling of winch cable whenever the drum is disconnected from its source of power, as, for instance, by inadvertent actuation of the motor clutch.

Other objects and features of the invention will become apparent from the following description relating to the accompanying drawings, showing the preferred form. The essential characteristics are summarized in the claims.

Referring to the drawings; Fig. 1 is a side elevation of a winch equipped motor vehicle, partly broken away to show the winch; Fig. 2 is a fragmentary plan view, in a larger scale, of the winch mechanism and its supporting framework; Fig. 3 is a sectional view, in a vertical plane, taken substantially along the line 3—3 on Fig. 1; Fig. 4 is a detail view thereof, as indicated by the line 4—4 on Fig. 3; Fig. 5 is a sectional view through the worm-driving gearing for the winding drum, as indicated by the line 5—5 on Figs. 2 and 3; Fig. 6 is a detail end view of the working parts of an automatic anti-reverse brake, as indicated by the line 6—6 on Fig. 5; and Fig. 7 is a sectional detail view as indicated by the line 7—7 on Fig. 3.

Referring to Fig. 1, the winch equipped vehicle shown is of the automotive type, having an internal combustion motor 1, which is drivingly connected to a change-speed mechanism 2 by the usual motor clutch 3 arranged to be disengaged by the depression of an operating pedal 4 in the usual manner. The usual driving connections are provided including a propeller shaft 5 leading from the change-speed mechanism to a set of traction wheels 6. The chassis includes the usual longitudinal frame members 7, portions of which are shown in Figs. 1 and 3. A driver's cab is indicated at 8, and a covered load-carrying body at 9 designed, for example, for carrying tools and materials incident to installing and servicing of poles, etc. for electric transmission lines.

The winch mechanism indicated generally at 10, is shown as located within the forward portion of the body 9, behind the driver's cab, and is provided with a winding drum 11 having a cable 12 extending rearwardly as over a guiding sheave 13 supported at the upper rear portion of the body.

The main framework of the winch includes two upright hanger brackets 15 shown in Figs. 1 and 3 as being secured to respective frame members 7. The upper portions of the hanger brackets 15 both forwardly and rearwardly of the winch mechanism, are provided with seats 16. Secured in these seats 16, as by U-bolts 17 are cross-frame bars 18.

The winding drum 11 is borne by a heavy cross-shaft 20, which is supported partly by a worm-gear housing 21 and partly by a vertically and horizontally flanged beam 22, the housing and beam each being anchored to the cross-frame bars 18. The housing 21 and the beam 22 are provided with seats 23 which snugly embrace adjacent surfaces of the cross-frame bars and are secured thereto by U-bolts 24.

The housing 21 (see Fig. 3) has a hollow enlarged and circular central portion 30, closed at one side by a detachable wall 31. Opposite walls of the housing members have bosses 32 providing bearings for the shaft 20. The housing 21 may have an adjustable stabilizing connection with one of the hanger brackets 15; such being shown

in Fig. 3 as a stud 35 threaded into a boss 33 on the housing. The stud has a threaded portion extending through the vertical web of a hanger bracket 15 and secured in position by adjusting and securing nuts 36.

For driving the winch drum an auxiliary or power take-off transmission 40 of suitable type (shown in dotted lines, Fig. 1) may be arranged adjacent to and drivingly connected to the main transmission mechanism 2 of the vehicle power unit, in the usual manner. This auxiliary transmission has a control lever 41 and a tail shaft 42. The tail shaft has a universal connection of suitable form with a shaft 43, the rearward end of which as illustrated in Fig. 5, is connected by a universal joint 44 with the forwardly extending end of a worm-shaft 46, having a worm 47 thereon. The worm meshes with a worm wheel 48, which, as shown in Fig. 3, is drivingly keyed to the shaft 20 as at 49.

The auxiliary transmission includes suitable reverse gearing controlled by the lever 41, so that the winding drum can be driven selectively to pull in, or pay out, cable attached to it.

The worm-shaft 46, as shown in Fig. 5, has reduced end portions supported in anti-friction bearings 50 of the end thrust type. The bearings are supported in removable caps 51 and 52, bolted to the lower side walls of the housing 21. The bearing supporting cap member 52, at the right in Fig. 5, has a hollow enlarged extension 53 thereon, adapted to serve as a housing for an automatic reverse-preventing brake mechanism for the wormshaft, the details and functions of which will be fully described below. This can have control connections with the auxiliary transmission so that when it is necessary to drive the winding drum in the direction to pay out cable, the automatic brake will be rendered inoperative. The outer end of the brake casing 53 has a detachable plate 55 closing it.

The driving connections between the winding drum and the worm gear mechanism are arranged as follows: The drum is loose on the shaft 20, being supported as on appropriate bearing sleeves 56 inside hub members 57 of the drum structure. At opposite ends of the hub portions 57 are rings 58, which may be pinned to the shaft and operatively abut respective hub members 57 to secure the drum against endwise movement on the shaft. The end of the drum adjacent the worm gearing is open, and has formed in it a plurality of jaw type, heavy plain-faced clutch teeth 59 adapted to be engaged by a complementary set of jaw type teeth 60 on a sliding clutch 61, keyed to the drum driving shaft 20, as by the key shown at 62. The sets of clutch teeth are normally held in mesh with each other by a lever mechanism, including yoke arms 63 on a cross-shaft 64, secured in suitable brackets extending from the detachable wall member 31 of the worm gear housing. Pins on the yoke arms 63 engage a groove 65 in the sleeve 61 in the usual manner.

At the outer end of the shaft 64, as shown particularly in Fig. 2, is an arm 66, connected as at 67 with an operating rod 68, which extends through an enlarged opening in one of the flanges of the worm gear housing 21 to the driven element of a motor device 69, adapted to be operated by fluid pressure or pneumatically, as by engine vacuum.

The driven element of the motor device 69 is shown in broken lines at 70, as being a diaphragm. A coil spring 71 on the rod may engage an adjustable abutment 72 (a nut, as shown) on the rod at one end, and one of the flanges of the housing 21 at the other. The spring normally maintains the rod 68 in a position to hold the clutch teeth 59 and 60 in mesh. Opposite motion of the rod 68 to disconnect the teeth can be accomplished by vacuum through line 77—78, Fig. 1, in which there is a control valve 73, within reach of the driver or operator, as on the dash or instrument panel in the cab. The portion 77 of the vacuum line may be connected with the intake manifold of the motor, and the portion 78 with the device 69 in a manner to pull the diaphragm 70 against the action of the spring and release the clutch whenever the valve 73 is opened.

Assuming that the vehicle is suitably blocked against movement, that the engine is in operation, that the main transmission 2 is in a neutral or non-driving position, and that the auxiliary transmission 40 is adjusted to deliver power to the worm gear mechanism and the drum 11, then continued operation of the engine will wind the cable onto the drum to lift a load. Reversing the drive by actuation of the auxiliary power take-off transmission lever 41 lowers the load into position. When the load has been released, the operator in the cab releases the control valve 73 of the vacuum system, thus actuating the diaphragm to release the clutch teeth 59 and 60 from engagement and freeing the drum for rotation on its bearings 56. To prevent overrunning of the drum 11 when unreeling cable, as by hand, the clutch release mechanism has an automatic adjustable brake for the drum connected therewith and shown as a flat shoe 80, Figs. 3 and 4, with friction material thereon at 81, adapted to bear against the near smooth face 83 of the drum. The shoe 80 may have a pin and slot connection 85 with the lower ends of two arms 86, which, in turn are connected with the clutch shifter arms 63, so that whenever the shifter arms are moved by the fluid pressure-operated device 69 to disconnect the dental clutch 59—60, the friction shoe 81 is maintained by said device in forcible contact with the drum, thereby checking free movement of it in either direction.

In order to maintain the shoe 80 against the surface 83 of the winding drum when the dental clutch is engaged, and the arms 86 are moved away from said surface 83, we have provided a yieldable member, in the form of a leaf spring 87 (see Fig. 7) which may be connected to the shoe, as at 88, and which has its free ends 89 bearing outwardly on the arms 86. Operating pressure on the shoe 80—81 on the drum may be adjusted to the operator's desire, by movement of the nut 72 (Fig. 2) toward or from the spring 71 on the operating rod 68. The force applied by the friction brake 80—81 may be adjusted so as to permit pulling out of the cable 12 manually for the purpose of securing the cable to a new load.

As heretofore mentioned, one of the features of the present invention is the arrangement whereby an inadvertent actuation of the automotive clutch, or the shifting or inadvertent displacement of the auxiliary transmission, will not result in the lowering or dropping of a load. This provides a hoist equipped motor vehicle which may be safely operated by vehicle operators who are unskilled in the operation of ordinary hoisting mechanisms. Such feature is accomplished in the present in-

vention by locking the cable winding drum to its driving mechanism and incorporating anti-reversing mechanism in the housing unit and controlling this mechanism by interlocking it with the control for the auxiliary transmission, whereby the hoisting drum may rotate in a reverse direction under two and only two conditions; namely, when either there is no load on the hoist cable, or when the auxiliary transmission is in reverse driving position.

The locking of the drum 11 to its driving shaft is effected whenever the drum is being driven. The jaw type clutch arrangement 59—60 described above is inherently difficult, if not impossible, to disengage when hoisting a load, and hence, the force applied by engine vacuum to the member 69 will always be insufficient to disconnect the clutch teeth from each other while the drum is being driven, or while the drum is idle and there is a load on the hoisting cable. If at such times, either the motor clutch 3 is inadvertantly disengaged, or the auxiliary transmission is shifted to a neutral, non-driving position, then the automatic brake shown in Figs. 5 and 6 prevents the worm wheel 48 from driving the worm 47 and thereby prevents the load from falling.

As shown, the automatic worm brake comprises a drum 90 secured, as by a key 91 and nut 92, to one reduced extremity of the worm shaft 46. Disposed on opposite sides of the drum are a pair of bent arms 94, the left hand ends of which, as illustrated in Fig. 6, are connected to a brake shoe 95, as by a pivot pin 96. A coil spring 97 connected to the outer ends of the arms and a wall of the housing exerts sufficient force to keep the shoe in contact with the drum. The right hand ends of the bent arms 94 are pivotally secured as at 98 to a lever 99, which has its lower end pivoted at 100 to the housing. The lever 99 has an upwardly extending arm 101, against which a coil spring 102 on an adjustable rod 103 acts to move the arms 94 in a direction to seat the shoe 95 against the drum. The effective force of the spring 102 may be adjustably controlled by an externally positioned nut 105, which is threaded to the rod 103. It will be noted that the pivotal connections 96 and 98 are in a plane sufficiently above the drum axis so that in the normal rotation of the drum, indicated by an arrow thereon in Fig. 6, the brake has no appreciable retarding influence upon the worm 47. However, the pivots 96 and 98 are sufficiently close to alignment with the drum axis, that upon attempted reversal of the worm and drum 90, the shoe is self-energized to grip the drum tightly and prevent reverse rotation of the worm.

When a load is to be lowered by power operation of the winding drum in a reverse direction the brake may be released. In order to drive the worm in winding-drum-reversing direction, the arms 94 and the brake shoe 95 are moved bodily upwardly away from the drum 90 by movement of the shifting lever 41. As shown, a flexible cable 120 connects the control lever 41 to the arms 94. The arrangement is such that whenever the lever is moved to reverse drive position the arms 94 will be moved in a clockwise direction (as viewed in Fig. 6) about their pivot 98 thereby moving the brake shoe out of contact with the drum 90.

The end of the worm-shaft opposite the brake mechanism may have a splined connection at 30 with the universal joint 44, and the brake housing may be secured to the worm gear housing 21 by cap screws 131, so that when the cap 55 is removed (permitting access to the screws 131), the reverse-preventing drum mechanism and the worm-shaft can be removed from the housing as a unit for inspection or repair. The worm can also be removed from the opposite side of the housing, upon removal of the cap 51, the plate 55 and the nut 92.

It will be seen that the mechanism described accomplishes the objects heretofore outlined, and has the desirable features referred to in the opening paragraph.

We claim:

1. In combination, a motor vehicle having a motor, a winch mechanism including a winding drum and means for connecting the drum to the motor, said means including a clutch, means operable by the suction of the motor to disconnect said clutch and means actuated upon disengagement of the clutch for resisting rotation of the drum.

2. In combination, a motor vehicle having an engine, a winch mechanism carried by the vehicle and including a winding drum, a driving connection between the drum and the engine, said connection including a clutch, a brake adapted to engage the drum and means operable by the suction of the engine to disengage the clutch and automatically apply the brake.

3. In a winch equipped motor vehicle having an engine, a driver's cab, a cable-winding mechanism mounted on said vehicle, a change-speed transmission disposed between the engine and the cable-winding mechanism, said transmission including a reverse-gear mechanism, a manually releasable normally active driving clutch disposed between the engine and said transmission, a manually operable control for said clutch, a manual control to move the auxiliary transmission to a reverse driving position, means automatically acting to prevent movement of the winding mechanism in a reverse direction, consequent upon inadvertent operation of said clutch control while a load is applied to the drum, and means to render said means automatically inactive when the manual control is moved to a reverse driving position.

4. In a winch equipped motor vehicle having an engine, a driver's cab, propelling wheels, a cable-winding mechanism carried by said vehicle exteriorally of the cab thereof, a change-speed transmission disposed between the engine and the propelling wheels, a manually releasable normally active driving clutch disposed between the engine and said transmission, a control for said clutch operable from the vehicle cab, an auxiliary transmission including a reverse gear mechanism disposed between said first-named transmission and the cable-winding mechanism, a manual control operable from the vehicle cab to position the auxiliary transmission to a reverse driving position, and means normally cooperating with said winding mechanism to prevent movement of the winding mechanism in a reverse direction, and a connection between said means and the auxiliary transmission control to render said means inactive when the control is moved to a reverse driving position.

5. In combination, a motor vehicle having a driver's cab and an internal combustion motor, a winch mechanism including a winding drum, a speed reduction device and a suction operated device all mounted together as a unitary structure, a driving connection between said speed

reduction device and said motor, said suction operated device being operable by the suction of the motor to disconnect said winding drum from said speed reduction device, a brake automatically actuated upon disconnection of said winding drum from said speed reduction device for resisting the rotation of the drum, and a member within the driver's cab for controlling application of the suction to said suction operated device.

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