United States Patent

Priest et al.

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[54] **TRANSMISSION AND COIL BRAKE FOR WINCHES**

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[73] Assignee: **Dutton-Lainson Company**

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[52] **U.S. Cl.**.....**192/4 R,** 74/405, 74/411.5, 254/185 B

[51] **Int. Cl.** **B66d 1/26**

[58] **Field of Search**.....192/4 R, 12 BA; 74/411.5

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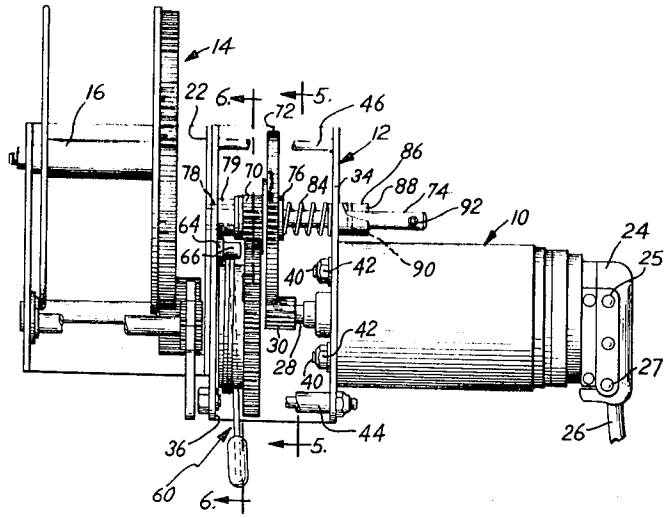
[57] **ABSTRACT**

An electrically powered module for converting a hand winch from which the hand winch handle has been removed into an electrically operated winch. The power module includes an electric motor having a drive gear for driving the gears of a gear train. The gear train is housed between parallel, spaced plates, the motor being attached to one plate and the hand winch to the opposite plate. The drive gear and the winch drive shaft both extend to a position intermediate the plates and are connected by the gear train. A coil spring brake is provided as well as means for disengaging transmission by the gear train of the driving force of the motor drive shaft to the winch drive shaft.

6 Claims, 6 Drawing Figures



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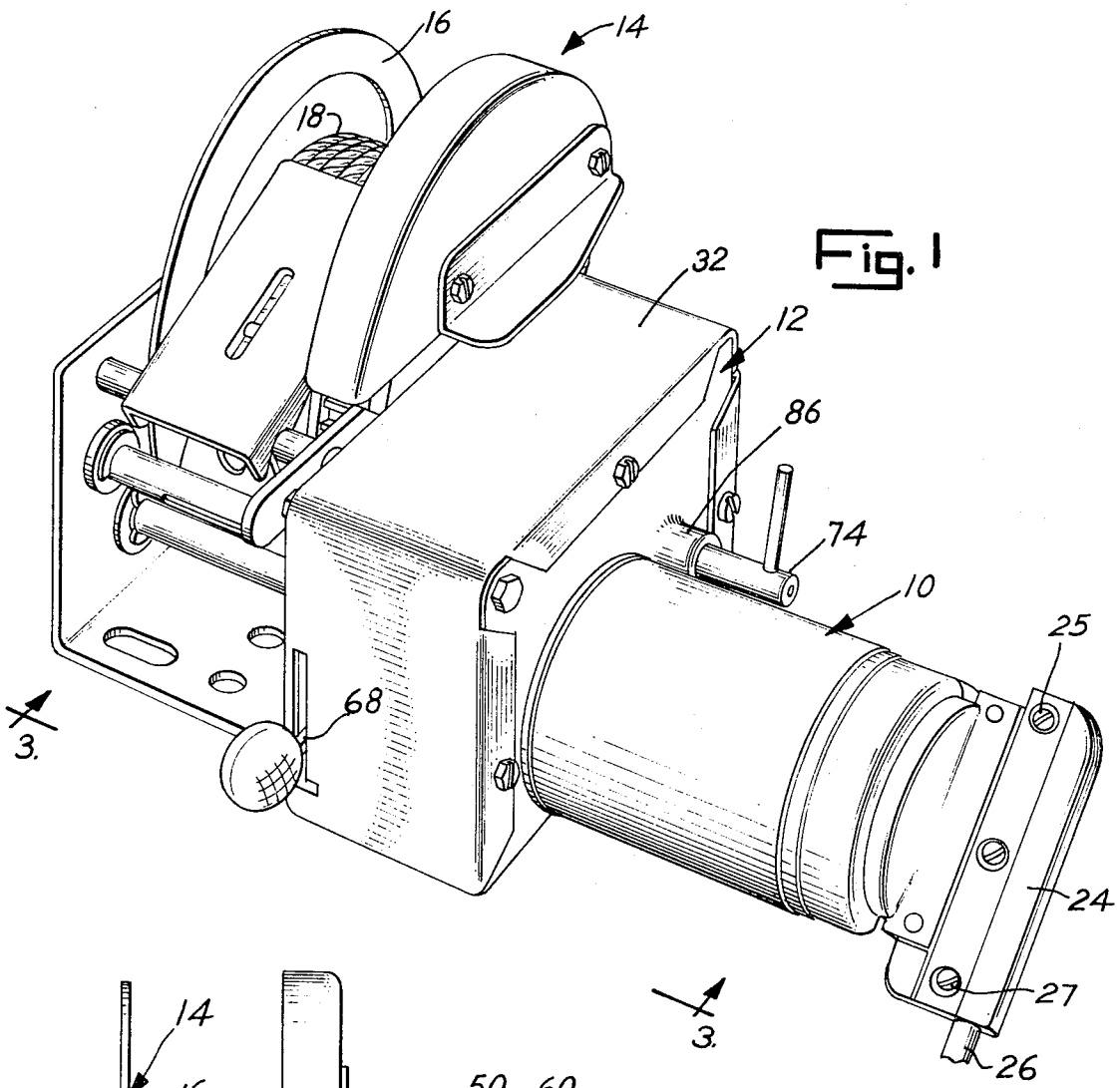

Fig. 1

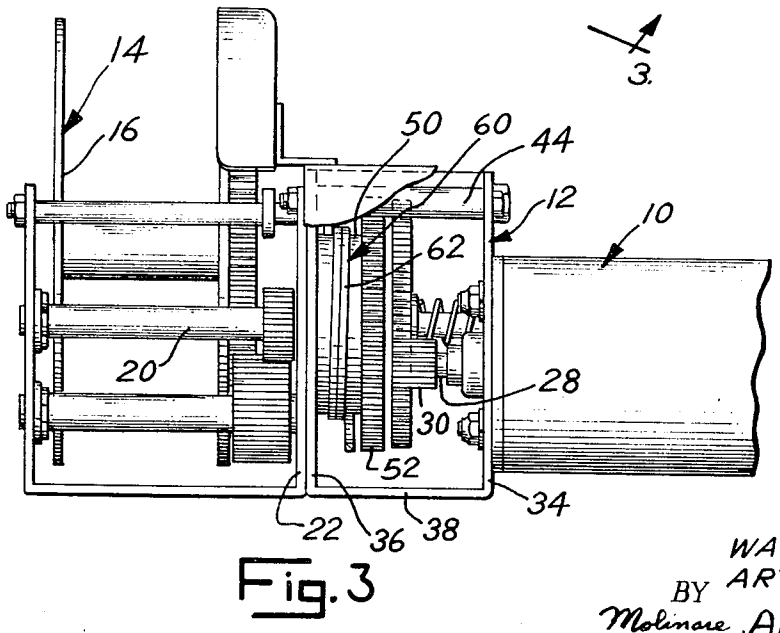

Fig. 3

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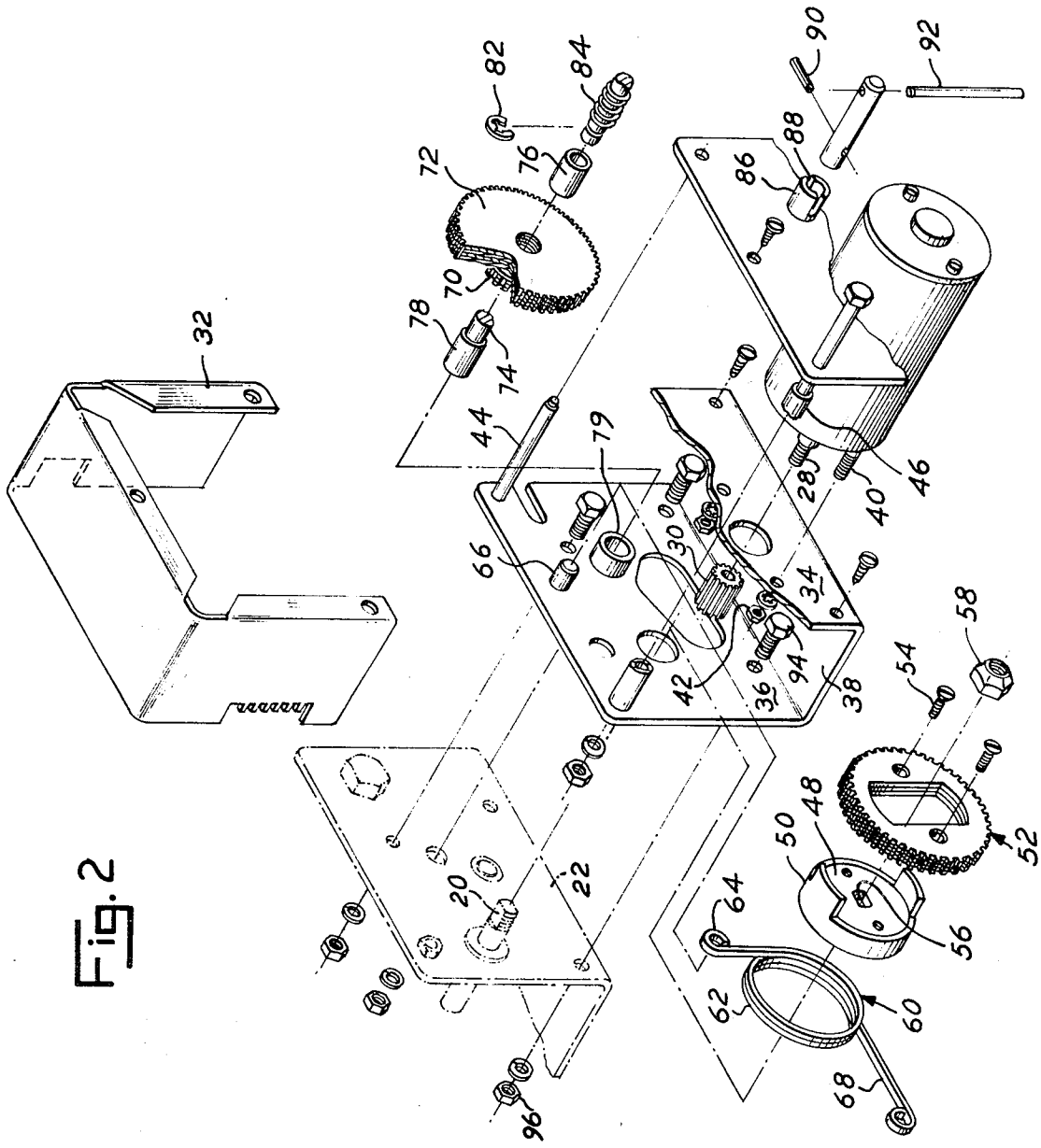

Fig. 2

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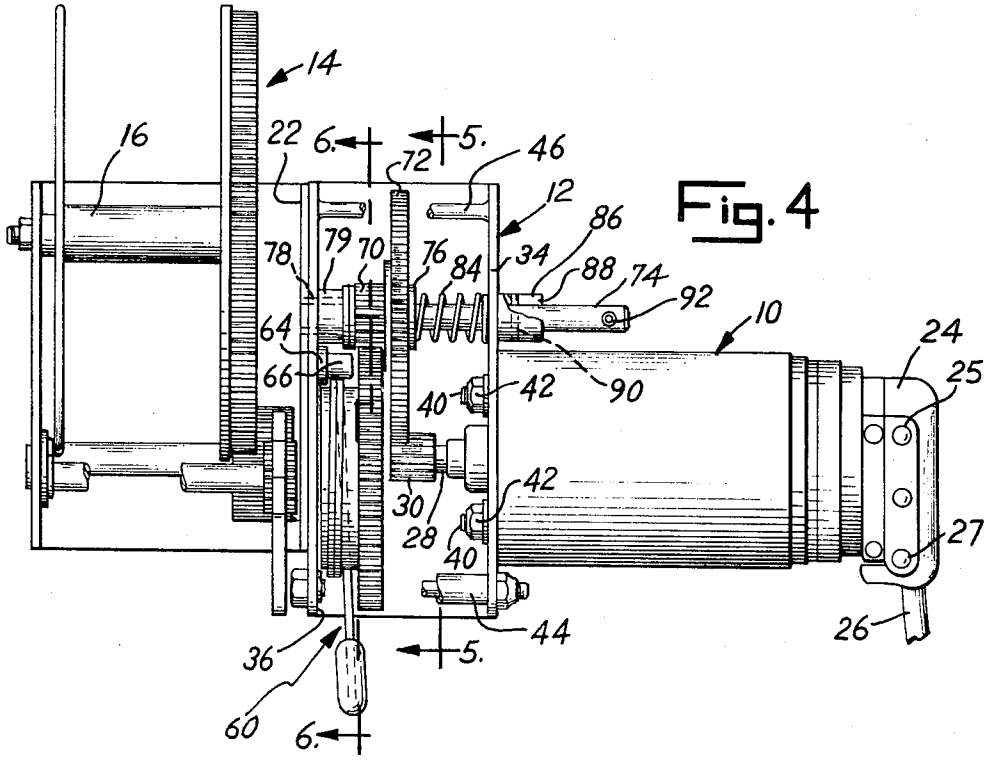


Fig. 4

Fig. 5

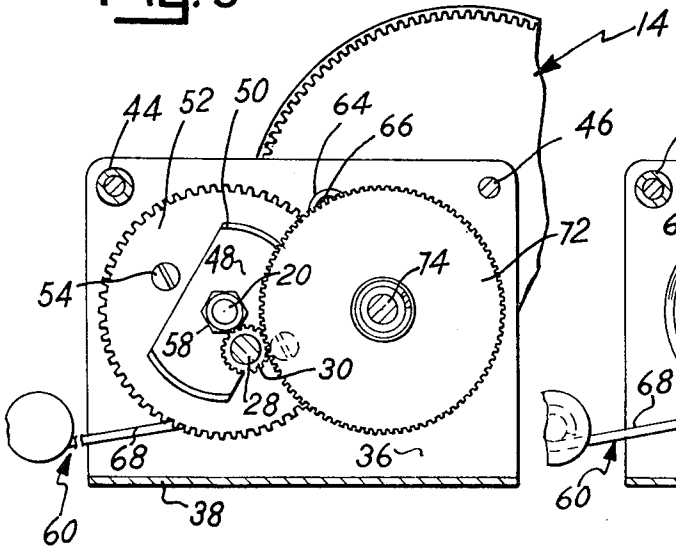
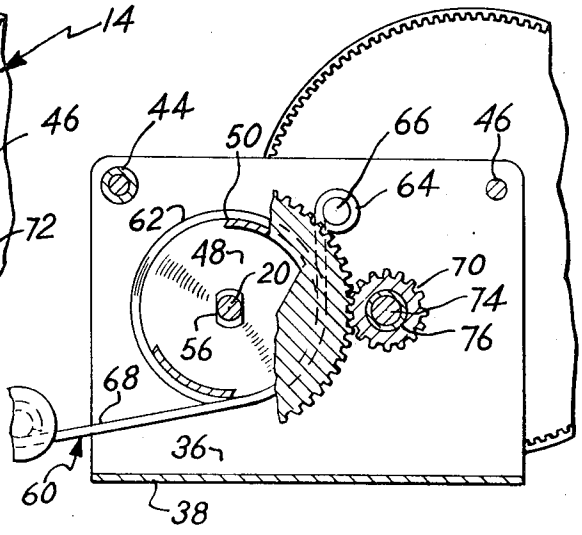


Fig. 6



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TRANSMISSION AND COIL BRAKE FOR WINCHES

BACKGROUND OF THE INVENTION

This invention relates to an assembly for automatically driving a winch and, in particular, to an electrically powered module which may be attached to a hand winch to operate such a winch. The invention is thus directed generally to lower powered winches such as hand winches, although the claims and concepts of the invention are equally applicable to high powered industrial winches.

Winches have numerous applications. They are, for example, used with boating equipment to augment removal and placement of a boat on a boat trailer. There are numerous agricultural uses such as for the transportation of feed or the movement of farm equipment. The winch also has numerous industrial applications.

Typically, a winch includes a drum about which a cable is wound. Also included, is a gear train which is operated most often by a hand crank. The gear train provides the operator of the winch with a mechanical advantage so that heavy loads may be moved by means of the winch. Also included in many winches are ratchet means which prevent backlash by the winch and which hold the drum in a fixed position when the drive shaft of the winch is not being operated.

Hand operated winches do not provide satisfactory solutions to various problems, however. For example, a hand operated winch cannot be operated from a remote location. Also, one may not be physically able to operate a hand winch even though the winch provides a mechanical advantage. For these reasons, various attempts have been made to provide winches driven by electric motors. Typically, such electrically powered winches are manufactured and sold as a total unit often in direct competition with hand winches. To modify a hand winch by means of a commercially available power module in order to provide the hand winch with electric power means has not been heretofore known to the inventors. More particularly, an electric motor which can be adapted for use by almost any hand winch has not been heretofore known.

SUMMARY OF THE INVENTION

In a principal aspect, the present invention of an electrically powered module for converting a hand winch to electric motor operation comprises a gear housing having a pair of parallel, spaced plates with an electric motor operable to drive a gear train within the housing and a hub assembly adapted to receive the winch drive shaft of the hand winch, the hub assembly being driven by the gear train. Means provided to brake the module, and means are also provided to disengage the drive train to the hub assembly.

It is thus an object of the present invention to provide improved means for electrically driving a winch.

It is a further object of the present invention to provide means for driving a winch wherein the winch may have originally been a hand winch and the means for driving the hand winch is a modular, electrically driven apparatus which may be used to replace the hand operated handle of most hand winches.

Still another object of the present invention is to provide a reversible, electrically driven winch which may be operated from a remote position.

One further object of the present invention is to provide an electrically driven hand winch which includes means for disengaging the electric drive motor from operation of the winch.

These and other objects, advantages and features of the present invention will be set forth in greater detail in the description which follows.

BRIEF DESCRIPTION OF THE DRAWINGS

In the detailed description which follows, reference will be made to the drawing comprised of the following figures:

FIG. **1** is a perspective view of the improved electrically powered module of the present invention in combination with a typical hand winch;

FIG. **2** is an exploded, perspective view of the improved module of the present invention;

FIG. **3** is a cut-away front view of the module taken substantially along the line **3—3** in FIG. **1**;

FIG. **4** is a top view of the module with the protective cover removed from the gear housing;

FIG. **5** is a cross-sectional view of the gear housing taken substantially along the line **5—5** in FIG. **4**; and

FIG. **6** is a cross-sectional view of the gear housing taken substantially along the line **6—6** in FIG. **4**.

DESCRIPTION OF THE PREFERRED EMBODIMENT

In the detailed description which follows, like numbers indicate the same component in each of the FIGURES. Referring to the FIGURES, the module includes an electric motor **10** fastened to a gear housing **12**. A winch **14** is attached to the opposite side of the gear housing **12**. The inch **14** is of typical construction and includes a drum **16** upon which a cable **18** may be wound as well as as any ratchet mechanism (not shown) which may be utilized to prevent backlash or unwinding of cable **18** from drum **16**. Importantly, as shown in FIG. **2**, the winch **14** includes a winch drive shaft **20** and a side plate **22** to which the module comprised of the motor **10** and gear housing **12** may be attached. The winch drive shaft **20** extends beyond the side plate **22** for cooperation with the gear housing **12** as will be described below. The winch drive shaft **20** is keyed for cooperation with the gear housing **12** as illustrated in FIG. **2**, and as will be described in greater detail below.

The motor **10** includes a switch handle **24** and electric power leads **26**. In the embodiment shown, rotation of the switch handle **24** in a clockwise or counterclockwise sense will cause operation of an output shaft **28** of the motor **10** in the clock wise or counterclockwise direction respectively, thus imparting a similar driving movement to an output shaft spur gear **30**. The handle **24** may be moved by direct manual actuation, or cables may be attached to the opposite ends of the handle **24**, for example, at bolts **25** and **27** respectively, for remote operation.

The gear housing **12** normally includes a cover **32** to prevent debris from damaging the gears and mechanism of the invention and also for safety reasons. The gearing housing **12** also includes first and second parallel plates **34** and **36** respectively interconnected by a base member **38**. The plates **34** and **36** are maintained in rigid spaced relation not only by means of the base member **38** but also by means of spaces **44** and **46**.

The motor **10** is attached to the plate **34** by means of bolt ends **40** projecting from the motor **10** through appropriate openings in the plate **34** and fastened thereto by means of nuts **42**. The shaft **28** and attached spur gear **30** therefore extend to a position intermediate the plates **34** and **36**.

Winch drive shaft **20** extends through an appropriate opening in the second plate **36** for cooperation with a hub assembly comprised of a hub **48** attached to a brake drum **50** and cooperably interlocked and fastened to a spur gear **52**. The gear **52** and hub **48** are attached to the drum **50** by means of threaded bolts **54**. The winch drive shaft **20** is keyed through the shaped opening **56** in hub **48** and held in a fixed position thereby means of a nut **58**.

A coiled spring brake **60** includes a coil **62** adapted to fit over the drum **50** and a pivot end **64** adapted to fit over a stub **66** extending from the second plate **36**. An active end or hand operated end **68** of the brake **60** may then be hand biased to engage the coil **62** with the outer surface of the drum **50** to prevent movement of the drum **50** and consequently movement of the shaft **20**.

The gear **52** of the hub assembly is interconnected with the gear **30** by means of a drive train. The drive train includes a pair of spur gears **70** and **72** mounted indirectly on a shaft **74**. The gears **70** and **72** are actually mounted on a bushing **76** which is fixed to the shaft **74**. Another bushing **78** on shaft **74** slides within a cylindrical bushing or ferrule **79** which is attached to the plate **36**. A lockring **82** abuts the bushing **76** and holds the gear **72** thereon. A biasing spring **84** is positioned on the shaft **74** intermediate the gear **72** and plate **34** and acts to bias the shaft **74** and thus the gears **70** and **72** into engagement with the gears **52** and **30** respectively. Thus, gear **70** may be made to intermesh with gear **52** and gear **72** will mesh with gear **30** to provide a continuous transmission of mechanical connection from the electric motor **10** to the drive shaft **20**.

Shaft **74** extends beyond plate **34** through an opening in plate **34** and concentric with a cylindrically shaped and slotted bushing or ferrule **86** which is rigidly attached to the plate **34**. The bushing **86** includes a slot **88** cooperable with a pin **90** in shaft **74**. The pin **90**, when made to slide to the bottom of slot **88**, permits the gears **70** and **72** to be engaged. However, the shaft **74** may be withdrawn manually against the force of the spring **84** by pulling on a handle pin **92** in shaft **74** and twisting the shaft **74** so that the pin **90** will not fall within the slot **88**. Thus, the gears **70** and **72** are maintained out of engagement with the gears **52** and **30** respectively. This prevents transmission of mechanical energy to the shaft **20**.

It is to be noted that bolts as at **94** and nuts as at **96** are provided to fit through appropriate openings in the plate **36** and the plate **22** of an adjacent winch **14** to hold the winch **14** in secure communication with the electric power module of the present invention. Also, the electric motor **10** which operates the drive shaft **28** may be operated from a car battery, for example, or from an alternating current voltage source depending upon the requirements of the application and the motor which is being used. The module of the present invention may be utilized in combination with hand winches which are currently being used. One merely need remove the handle of the hand winch and attach the module to the hand winch in place of the handle. This arrangement provides a great convenience to a dealer in winches who may now stock modules as a separate commercial item and merely attach the module to a winch if such is desired by a customer. A single module will thus be cooperable with many winches.

Very importantly, a ratchet which is an integral part of most hand winches will remain as an operable component of the entire system, even though the module has been added to the system. The ratchet when engaged will thus automatically lock the winch in position when the power is turned off. This is a very desirable safety feature. In addition, of course, the brake as described above is provided with the module of the present invention and, further, the mechanical interconnection between the electric motor and the hub assembly may be disengaged to permit free wheeling. This allows the winch wheel to be rotated by hand or by pulling on the winch cable. Thus, quick unreeling is possible without operation of the motor.

What is claimed is:

1. An electric power module for operating a winch, said winch having a winch drive shaft, said module comprising, in combination:

a gear housing having first and second substantially parallel, spaced plates; motor means attached to the outside of said first plate and having drive gear means extending therethrough to a position intermediate said plates; a hub assembly between said plates, said hub assembly including means for interlocking with said winch drive shaft when said winch drive shaft extends from outside said second plate through said second plate to a position intermediate said plates, said hub assembly also including a brake drum; a spring brake comprising a spring having a first end fastened in a fixed position relative to at least one of said plates, a coil about said brake drum and also having an opposite end free for manual actuation to thereby engage said coil with said drum to prevent rotation of said drum and movement of said hub assembly; and drive train means connecting said drive gear means to said hub assembly to provide a mechanical driving connection and to drive said assembly and thus said winch whenever said motor means is on and said brake is off.

2. The module of claim 1 wherein said drive train means includes means for disengaging the mechanical driving connection between said drive gear means and said hub assembly.

3. The module of claim 2 wherein said means for disengaging comprise a biased gear in said drive train means, said biased gear being normally biased to provide the mechanical driving connection between said drive gear means and said hub assembly and being moveable against the biasing force to a second position whereby said biased gear disengages the mechanical driving connection.

4. The module of claim 2 including means for maintaining disengagement of said drive gear means with said hub assembly.

5. The module of claim 4 wherein said means for maintaining disengagement comprise a biased gear on a shaft, said gear being normally biased to provide the

mechanical driving connection between said drive gear means and said hub assembly, and means for locking said shaft and attached gear in a position of disengagement of the mechanical driving connection between said drive gear means and said hub assembly.

6. The module of claim 1 wherein said motor means is reversible.

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