United States Patent

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[54] **REMOTE RADIO WINCH CONTROL UNIT**

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[58] **Field of Search** 325/37; 318/16; 343/225

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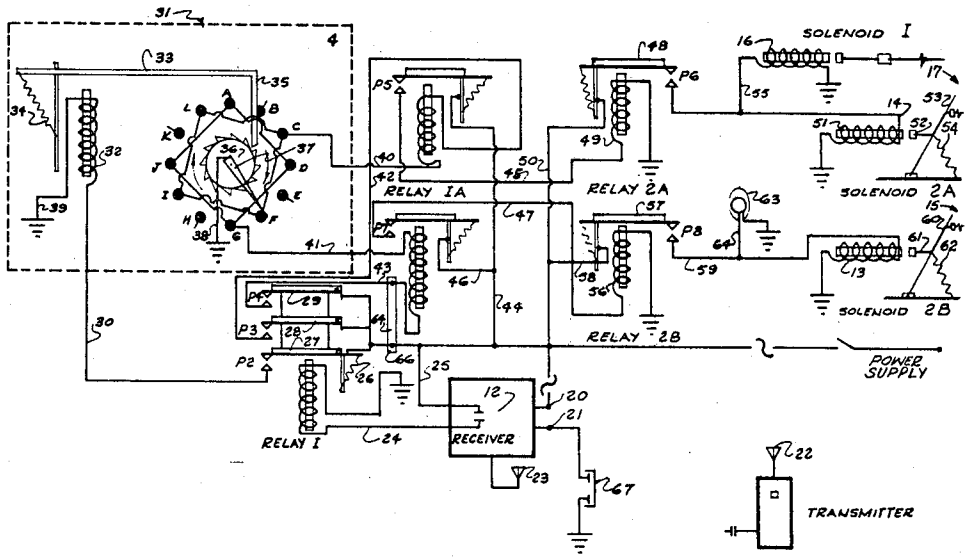
[57] **ABSTRACT**

A hand-held radio frequency transmitter-receiver and drive-engine control device for remotely controlling a winch, crane or other similar winding apparatus comprising a hand-held transmitter generating an r. f. signal, a remote receiver detecting and amplifying the r. f. signal, and relays further amplifying the output from the receiver to energize selectively solenoids controlling the associated winch and winch engine to provide forward-reverse winding control of the winch and speed and power control of the winch engine.

2 Claims, 2 Drawing Figures



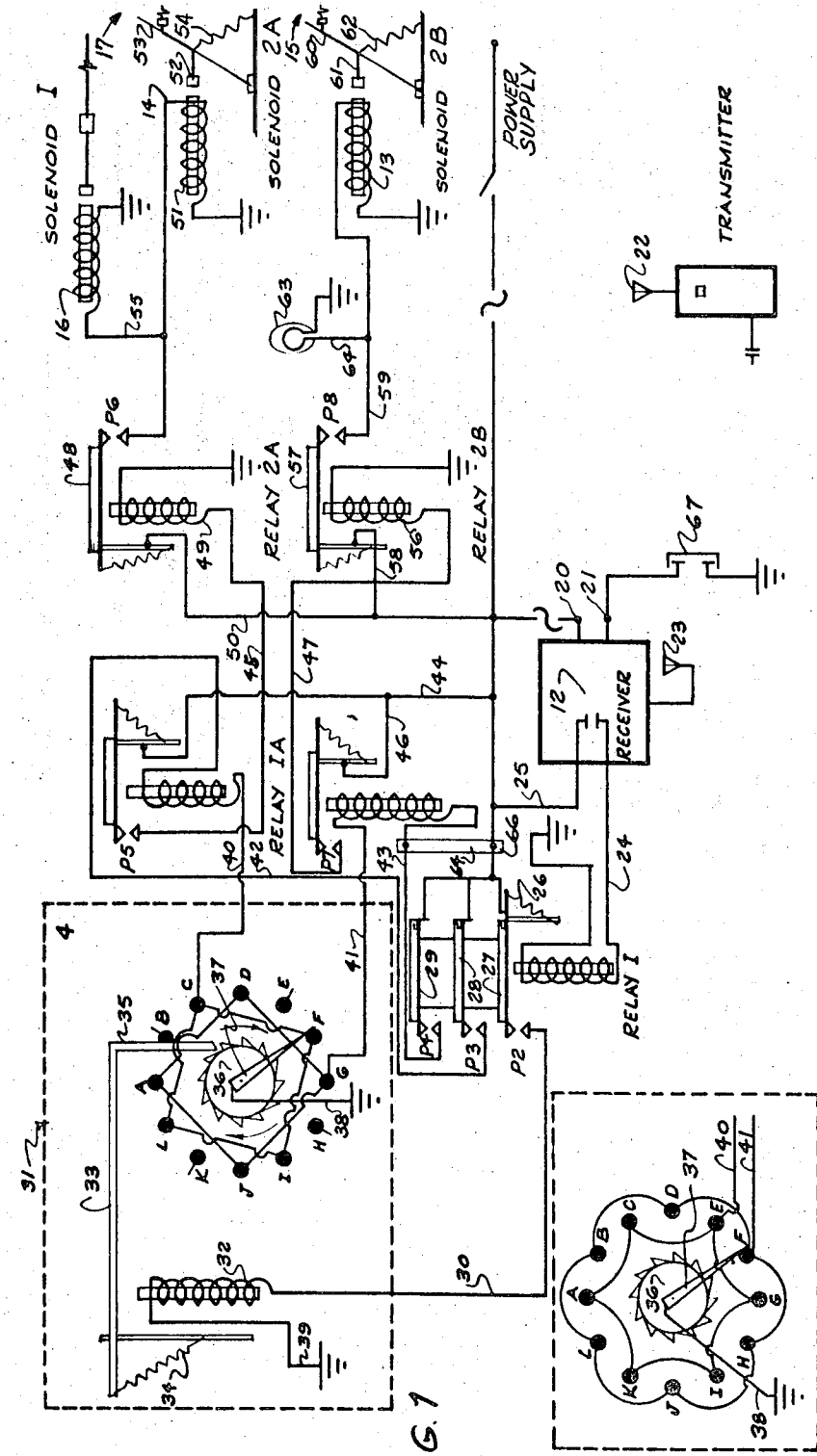


FIG. 1

FIG. 2

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REMOTE RADIO WINCH CONTROL UNIT

This invention relates to winches, hoists, lifting and towing devices adapted to be controlled from a distance, and has particular application to the logging industry, where a single operator may be required to operate a stationary winch from a remote position at the cable end of the winch, for the purpose of yarding logs.

It has hitherto been the practice in the logging industry to require two operators, one operating the winch controls from a position adjacent the winch drum, in response to signals from a second man, handling the free end of the winch cable.

Such practice has been found to be needlessly wasteful of labor, and may be dangerous due to mistaken voice or hand signals between the two persons involved.

The present invention overcomes these disadvantages by providing a means whereby a single operator, handling the free end of the winch cable, may control the winch precisely, without the risk of error induced by misunderstood communications between two operators, and without the necessity of a second operator positioned adjacent the winch.

The principal object and essence of my invention is, therefore, to provide a means whereby a winch, crane, or other similar device may be controlled remotely, by means of a simple hand-held signal transmitting device operating within range of a receiver unit situated adjacent the winch or hoist, said receiving device being adapted to operate forward and reverse solenoid controls on the associated winch or hoist, together with an engine accelerator control on the hoist engine. No physical connection is necessary between the operator and the winch controls and the dangers associated with electrical cable controls are avoided.

In broad aspect, the present invention comprises a hand-held transmitter generating a signal, a remote receiver adapted to detect and amplify the signal generated by the transmitter, means for amplifying the output from such receiver in order selectively to energize solenoids positioned on the associated winch and winch engine, to provide for forward and reverse winding control of the winch and speed and power control of the winch engine.

The invention is herein described by reference to the accompanying drawings forming a part hereof and in which there is set forth by way of illustration and not by way of limitation, one form in which the apparatus of this invention may be constructed, in which:

FIG. 1 illustrates schematically and diagrammatically a winch control circuit embodying the invention; and

FIG. 2 represents an alternative circuit for the index stepper switch of FIG. 1, adapting the apparatus for reverse winch rotation with dead man control.

The drawing FIG. 1 illustrates a logging winch system consisting of a portable transmitter **11**, receiver unit **12**, an amplification and control unit circuit, a pair of solenoids **13** and **14** controlling a winch **15**, and a further solenoid **16** controlling the winch engine **17** (not shown). The winch **15** is capable of being reversed, so that the remote operator may unwind the winch cable **19** from the winch drum, as well as operate the winch in winding condition.

The winch engine **17** will normally be of the gasoline-driven type, because of the weight restrictions associated with a semi-portable logging winch of the nature described.

The construction and operation of the transmitter **11**, generating a relatively low radio frequency, and receiver **12**, capable of detecting the output signal from the transmitter, are well known and since the specific details thereof form no part of this invention, further description thereof is deemed unnecessary. It is normally desirable that the transmitter should have an effective range of from 70 to 150 feet, in order to permit effective use of the invention. The receiver **12** is energized from a direct current 12 volt power supply at terminals **20** and **21** and is turned to detect a modulated radio frequency signal between the antennas **22** and **23** of the transmitter and receiver. The receiver **12** includes a pair of contact points P1, connected by conductors **24** and **25** to energize the Relay **1** with triple armatures **27**, **28**, and **29**, and associated contact points P2, P3, and P4 respectively. A spring **26** urges the armatures against the operation of the relay coil.

Relay point P2 is connected by conductor **30** to an index stepper switch generally designated **31**, which includes a coil **32** and hammer **33**. A spring **34** urges the hammer **33** away from the coil **32**, the hammer **33** being urged downwardly when the coil **32** is energized, so that the detent portion **35** of the hammer **33** indexes an index cam **36** by one unit upon each energization of the relay coil **32**. In the embodiment depicted, this unit of indexing is one-twelfth of a revolution. A series of 12 contacts, A to L, are positioned on the index stepper switch, and a rotating armature **37** secured to the cam **36**, makes selective contact with each of said contact points. In the embodiment depicted, contacts A, D, and J are electrically connected, as are contacts L, C, F and I. Contacts H, K, B and E are electrically neutral. Armature **37** is grounded at **38**, and coil **32** is grounded at **39**.

Common points F, I, L and C are connected by conductor **40** to Relay 1A, and common contact points A, D, G and J are connected by conductor **41** to Relay 1B, Relays 1A and 1B being connected to points P3 and P4 respectively of Relay 1 by conductors **42** and **43** respectively.

Relay 1A includes contact points P5, which are connected with the 12 volt D C source by conductor **44**, and to the coil of Relay 2A by conductor **45**. Similarly, the coil of Relay 1B includes contact points P7, which are connected by conductor **46** to the 12 volt D C power supply and by conductor **47** to Relay 2B. Relay 2A includes the armature **48**, coil **49**, and contact point P6, connected by conductor **50** to the 12 volt D C power supply, so that energization of the coil **49** creates a current path to a solenoid designated 2A, comprising a power coil **51**, and an armature **52**, connected with the forward winch control **53**. A spring **54** urges the winch control against the energized movement of the solenoid armature **52**.

Solenoid 1, operatively connected to the accelerator of the winch engine **17**, is energized from conductor **55**, connected to contact points P6, so that when contact points P6 close, the engine accelerator solenoid **16** and forward winch control solenoids **14** are simultaneously energized.

Relay 2B includes a coil **56**, armature **57**, and a pair of contact points P8, the armature **57** being connected

to the 12 volt direct current power supply by conductor 58, so that when contact points P8 are closed, a current path is created in conductor 59, to energize solenoid 13, connected to the reverse winch control 60, by means of the armature 61. Spring 62 urges the reverse winch control 61 against the energized movement of the armature 61. A warning light 63 is connected by conductor 64 to conductor 59, so that the light will indicate the energized condition of the solenoid 13.

A removable shorting bar 64 is inserted between contact points 65 and 66. In order to effect the dead man control feature for reverse winch rotation, the shorting bar 64 is removed, and the alternative connection of the contacts A to L of the stepper switch 31 depicted in FIG. 2 are employed.

OPERATION

The remote control circuit has been designed to enable the operator to manipulate the cable with both hands after depressing the transmitter button or, alternatively, to require the transmitter button to be continually depressed in order to actuate the winch for either forward or reverse rotation, a condition known as "dead man control". Where operating conditions are considered sufficiently hazardous, the dead man control circuit will be desirable, so that if for any reason the receiver 12 ceases to be energized by a signal from the transmitter 11, the winch 15 will immediately cease operation. Thus, should the operator carry the transmitter 11 beyond the frequency range of the transmitter, or should the transmitter or receiver cease functioning for any reason, or should the operator become incapacitated, the winch 15 will immediately shut down.

a. Condition of Control Circuit for Forward Winch Rotation

(Winding Inwards) with Dead Man Control

When the operator depresses the button on the transmitter 11, a signal is transmitted and picked up by antenna 23. When this signal is amplified in the receiver 12, contact points P1 within the receiver 12 will close, thereby creating a current path from the receiver 12 to the amplification and control unit. Relay 1 is energized, causing contact points P2, P3 and P4 to close. A current path is created from Relay 1 to the index stepper switch 31 by conductor 30, which is energized from the 12 volt power supply. Energizing of coil 32 in the index stepper switch 31 causes the hammer 33 to move against the rotating cam 36, thereby indexing the cam by one unit and creating a current path from the ground through the conductor 38 and armature 37 to the contact points F, I, L and C to energize Relay 1A through closed contact points P3, to the 12 volt source. The energizing of Relay 1A in turn energizes Relay 2A through the closing of contact points P5 and the creation of a current path to the 12 volt power supply. The activation of Relay 2A and the closing of contact points P6 will energize solenoid 2A by creating a current path to the 12 volt source. The movement of armature 52 in solenoid 2A operates the forward winch control 53; simultaneously, the engine accelerates, solenoid 1 is energized on the closing of contact points P6, and the winch engine 17 will be caused to accelerate.

When the finger is removed from the button on the transmitter 11, all of the contact points P1, P2, P3, P4, P5, and P6 will open and solenoids 1 and 2A will return to their neutral position under the action of the associated spring biasing.

b. Condition of Control Circuit for Reverse Winch Rotation

(Unwinding) with Free-Hand Operation

It is desirable that the operator should be able to handle the winch cable 19 with both hands during the unwinding operation, and for this purpose the dead man control condition is eliminated. When the button on the transmitter 11 is depressed momentarily, a signal is picked up by the receiver 12, and Relay 1 is energized and points P2, P3, and P4 will close. Coil 32 of index stepper switch 31 will be momentarily energized, pulling down hammer 33, and indexing the index cam 36 into another clockwise step. Armature 37 will then make contact with contact point G and current will flow from ground through conductor 38, armature 37, contact point G, conductor 41 to energize Relay 1B through the shorting bar 64 connected to the 12 volt source. Contact points P7 will thereby be closed and Relay 2B will be energized, resulting in contact points P8 being closed. Solenoid 2B is thus energized, thereby actuating reverse winch control 60; the warning light 63 will be "on". This condition will continue, notwithstanding release of the transmitter button, because of the presence of the shorting bar 64 in the circuit shorts out the open contacts P4. In order to stop the winch, the transmitter button is momentarily depressed and released, which sends a further pulse through the circuit, turning the armature 36 of the index stepper switch 31 a further step clockwise, to the neutral H, thereby interrupting current flow to Relay 1B, opening Relay 2B and deenergizing solenoid 2B, whereupon the reverse winch control 60 returns to its closed position under biasing of the spring 62. It will be understood that contact points G, J, A and D of the index stepper switch are all electrically common, and contact by the rotating armature 37 with any of these points will create the circuit condition just described.

c. Condition of Circuit Control for Reverse Winch Rotation

(Unwinding) with Dead Man Control

In order to convert the circuit for dead man control for reverse winch rotation, the shorting bar 64 is removed, so that the operation of the circuit depends on contact points P2, P3, and P4 being closed, which condition prevails only when the receiver 12 is being energized by the modulated radio frequency signal from the transmitter. The contacts A to L of the index stepper switch 31 are connected as depicted in FIG. 2, so that contacts A, C, E, G, I and K are electrically common, and contacts B, D, F, H, J and L are electrically common. Thus, successive pulse signals from the transmitter 11 will cause either forward or reverse rotation of the winch 15, responsive to the signal of the transmitter 11 causing closure of the points P2, P3 and P4 of the Relay 1 only during persistence of each pulse signal.

Although this invention has been described in its preferred form with a certain degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of the circuit and the combination and arrangement of circuit ele-

ments may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What I claim as my invention is:

1. A remote control for engine-driven winches having forward and reverse operating conditions comprising in combination:

a. a transmitter adapted to transmit a signal;

b. a receiver responsive to the signal transmitted by said transmitter;

c. a forward winch control solenoid and linkage connecting said forward winch control solenoid with said forward winch control;

d. a reverse winch control solenoid and linkage connecting said winch control solenoid with said reverse winch control;

e. a winch engine accelerator control solenoid electrically connected in parallel with said forward winch control solenoid, and linkage connecting said accelerator control solenoid with said accelerator of said winch engine;

f. a source of electrical power;

g. primary switch means comprising a first receiver-operated relay having three switch sets, each of which is closed only when said receiver is receiving and responding to a signal;

h. an index stepper switch in circuit with said source of electrical power through a first of said switch sets of said primary switch means, and having a first set of index contacts operatively connecting with a forward winch control relay in circuit with said forward winch control solenoid, and having a second set of index contacts operatively connecting with a reverse winch control relay in circuit with said reverse winch control solenoid;

i. circuit connections adapted to complete a circuit connecting a second of said switch sets of said primary switch means with said source of electrical power and said forward winch control solenoid and said winch engine accelerator control solenoid when said forward winch control relay is in closed position; and

j. circuit connections adapted to complete a circuit connecting a third of said switch sets of said primary switch means with said source of electrical power and said reverse winch control solenoid when said reverse winch control relay is in closed position;

so that operation of each of said index stepper switch, said forward winch control solenoid, said accelerator control solenoid and said reverse winch control solenoid will occur only during persistence of said signal.

2. The apparatus according to claim 1 additionally including electrical shorting means whereby said second and third of said switch sets of said primary switch means may selectively be shorted out of said circuit, thereby optionally adapting the forward or reverse winch rotation condition of said apparatus for continuous operation notwithstanding the discontinuation of said signal.

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