

United States Patent

Beaver

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[54] **HYDRAULICALLY OPERATED WINCH**

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188/69

2,903,852	9/1959	Bottoms	60/53
2,060,220	11/1936	Kennedy.....	60/53
R22,718	2/1946	Carnagua.....	188/69 X
2,211,406	8/1940	Cannon	188/69 X

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[57] **ABSTRACT**

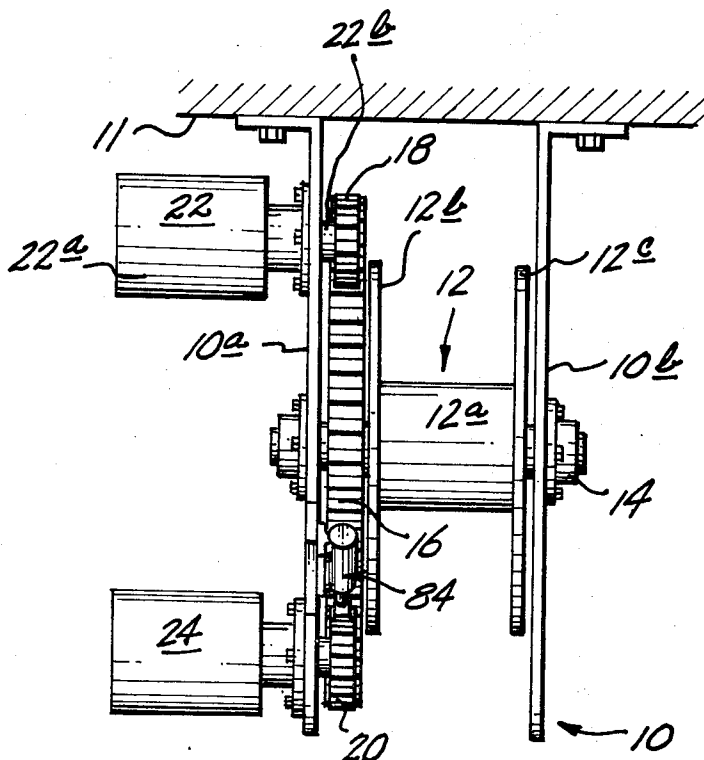
A power-operated winch assembly with multiple power-driven pinion gears meshing with an driving a drive gear coaxial with the winch drum in the assembly. Each of the pinion gears is coupled to a reversible hydraulic motor. The hydraulic motors may be placed in series with each other, to obtain high speed type of operation, and in parallel with each other, to obtain a high torque type of operation.

2 Claims, 3 Drawing Figures

[56] **References Cited**

UNITED STATES PATENTS

2,345,662	4/1944	Fox et al.....	254/186
3,478,514	11/1969	Parker.....	60/53



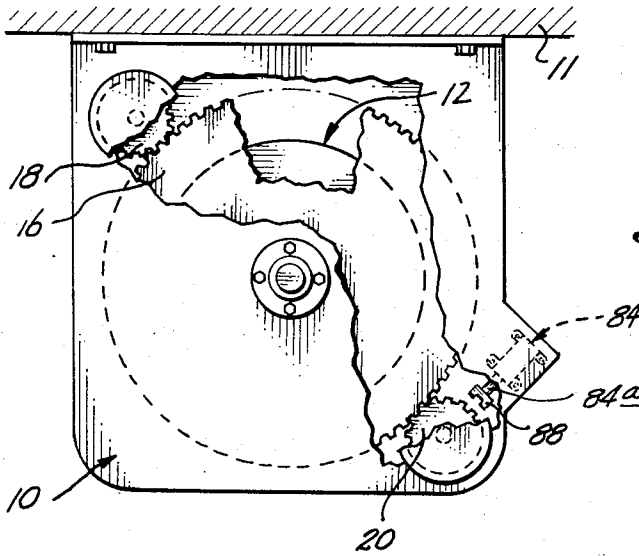


Fig. 1.

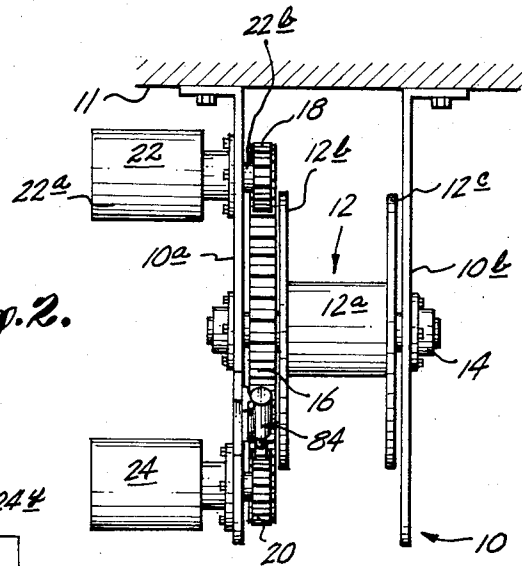


Fig. 2.

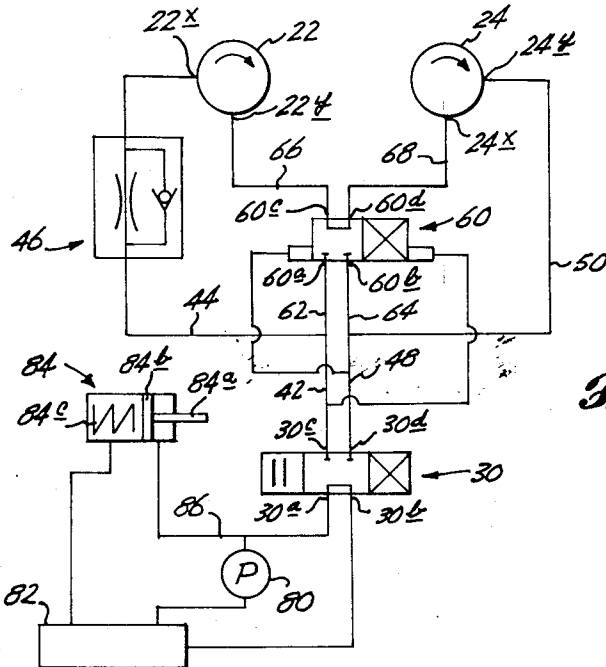


Fig. 3.

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HYDRAULICALLY OPERATED WINCH

This invention concerns a power-operated winch assembly, which comprises a winch drum and hydraulic means for rotating the drum.

The winch assembly of the invention has been used successfully by fishermen in the taking in and paying out of line connected to nets and the like. The compact construction of the winch assembly, coupled with its versatile type of operation, has made the assembly a very practical instrumentality for such a use. It is appreciated, however, that these features of the winch assembly have value in other areas, and it is not intended in any way limit the invention by indicating a specific use of the assembly.

A general object of the invention is to provide an improved winch assembly of a relatively compact but durable construction, which enables it use in places where space is at a premium.

Another object of the invention is to provide a power-operated winch assembly which is versatile in operation. In this connection, a feature of the winch assembly is that it may be operated in one condition of adjustment to obtain a high rotational speed in a winch drum, and in another condition of adjustment to obtain higher torque at a lower speed.

Another and further object of the invention is to provide such versatility where adjustments in the type of operation are made by controlling the supply of fluid under pressure to multiple hydraulic motors in the assembly.

A still further object of the invention is to provide a winch assembly which includes a drive gear coaxial with the winch drum, and multiple power-driven pinion gears meshing with the drive gear at points distributed about the perimeter thereof. Each of such power-driven pinion gears is provided with a reversible hydraulic motor for rotating it under power. The motor casings, as well as the pinion gears and the drive gear, may all be mounted on one of a pair of opposed frame brackets in a frame provided in the winch assembly.

Further objects, features and advantages of the invention will become more fully apparent as the following description is read in conjunction with the accompanying drawings, wherein:

FIG. 1 is a side elevation view, showing a winch drum in the apparatus, and hydraulic motors provided for driving the drum, portions of the apparatus having been broken away;

FIG. 2 is a front elevation view of the apparatus illustrated in FIG. 1; and

FIG. 3 is a schematic drawing showing the means provided for supplying the hydraulic motors with pressure fluid thereby to energize the motors.

Referring now to the drawings, and first of all more particularly to FIGS. 1 and 2, shown at 10 is the frame which supports a winch drum 12 in the assembly. The frame in the particular embodiment of the invention illustrated comprises opposed bracket plates 10a, 10b which are secured to an overhead support 11 and depend from this support.

The drum 12 includes a central hub 12a and joined to the ends of the hub flange plates 12b and 12c. Line is collected on the drum with such coiled around the hub and contained between the flange plates. The drum is journaled in a suitable manner on the frame 10, as by the journal structure shown generally at 14.

Joined to the drum 12 and located between the plates 10a, 10b adjacent plate 10a, is a bull or drive gear 16. The gear, which is concentric with the drum, is joined to the drum to rotate in unison therewith.

The bull gear is rotated under power by means of multiple, power-driven pinion gears which mesh with the bull gear at points distributed about its periphery, such being exemplified by the pinion gears shown at 18 and 20.

The pinion gears are rotated under power by energizing of reversible hydraulic motors 22, 24, one being provided for each of the power-driven pinion gears. As demonstrated by motor 22, the motor is mounted on the frame through mounting its casing 22a on the adjacent frame plate 10a. Power-driven output shaft 22b of the motor extends through plate 10a, and its outer extremity is keyed to pinion gear 18.

As contemplated herein, hydraulic motors 22, 24 may be supplied with fluid under pressure from a source, with the pressure fluid exhausting from one motor and then flowing to the other, with the motors then being in an in-series relationship relative to the source. With the motors connected to the source of pressure fluid in this manner, the drum is rotated at a relatively high speed. Alternatively, the motors may be connected in parallel relative to the source. With this type of connection established, the pressure fluid supplied to each motor is supplied at half the delivery rate of the source, and the drum will be driven at a slower speed. However, the torque applied to the drum is greater, enabling the winch assembly when so operated to handle heavier loads.

The hydraulic circuit contemplated, and associated structure, is illustrated in FIG. 3. Referring to this figure, the two reversible motors again are shown schematically at 22 and 24. With the motors operated to rotate in a clockwise direction, or the direction of the arrows shown in FIG. 3, it will be assumed that the winch drum in the assembly is rotated in a direction causing line to be wound up on the drum. With such a direction of rotation, the inlet for hydraulic motor 22 is illustrated at 22x and the exhaust at 22y. Similarly, the inlet to motor 24 has the reference numeral 24x, and the exhaust 24y.

Shown at 30 is a three-position main control valve. With the valve in the idling position shown, ports 30a, 30b are connected through the valve, as are ports 30c and 30d. With the spool of the valve adjusted to produce the crossflow indicated by the lines within the right-hand portion of the rectangle illustrating the valve, port 30a is connected to port 30d, and port 30b becomes connected with port 30c. With the valve spool adjusted to produce the parallel type of flow indicated by the left-hand portion of the rectangle, port 30a is directly connected to port 30c and similarly, port 30b becomes directly connected to port 30d.

Port 30c of the main control valve is connected by conduit 42, conduit 44, and through flow control and check valve assembly 46 to port 22x of motor 22. Port 30d is connected by conduit 48 and conduit 50, to port 24y of motor 24.

Also part of the conduit system providing for the supply of pressure fluid to the motors is a two-position valve 60 which determines the type of operation of the motors, i.e., whether they are to be connected in series or in parallel with respect to the supply of pressure

fluid. The valve includes ports 60a, b, c, and d, with port 60a being connected by conduit 62 to conduit 42, port 60b being connected to conduit 48 by conduit 64, port 60c being connected to port 22y of motor 22 by conduit 66, and port 60d being connected by conduit 68 to port 24x of motor 24. With the spool of the valve adjusted to have the flow in the direction indicated by the right-hand portion of the valve rectangle, port 60a is connected to port 60d within the valve, and port 60b to port 60c. In the other position of the valve, port 60a, 60b join, and ports 60c, and 60d are joined.

In FIG. 3, a pump which supplies fluid under pressure to the system is indicated at 80. Spent fluid dumps into a reservoir 82.

Completing the description of the apparatus, illustrated at 84 in FIG. 3 is what is referred to herein as a fluid-pressure-operated locking dog. Such includes an element 84a connected to a pressure-sensitive element 84b. Spring 84c normally urges 84a to an extended position. With a high pressure in conduit 86, pressure-sensitive element 84b is urged to the left against the spring to retract element 84a.

As can be seen in FIG. 1, element 84a includes a sector 88 which engages pinion gear 20 with element 84a extended. Such engagement serves to lock the pinion gear from rotation and through locking of the pinion gear to lock the drum 12 from rotation.

Generally describing the operation of the apparatus, with valves 30 and 60 in the position of adjustment shown in FIG. 3, the motors 22 and 24 are idling. To produce rotation of the motors in a clockwise direction with the motors placed in series with each other, valve 30 is adjusted to produce parallel flow through the valve as shown by the left-hand portion of the rectangle designating the valve. This introduces pressure fluid to conduit 44 (with release of the locking dog) which passes through the check valve of assembly 46 and thence to inlet 22x of motor 22. Fluid discharged from motor 22 flows through conduit 66 and 68 to the inlet of motor 24. The exhaust from motor 24 passes through conduit 50 and conduit 48 to reservoir 82.

To obtain the same direction of rotation of the motors, with the motors parallel to each other, valve 60 is adjusted to produce the crossed flow through the valve indicated by the right portion of the rectangle designating the valve in FIG. 3. With this adjustment of valve 60, fluid discharged from motor 22 passes through valve 60 into conduit 64, from whence it is discharged to reservoir 82. Pressure fluid is admitted to pump 24 through conduit 42, conduit 62 and conduit 68. The discharge of spent fluid from motor 24 takes place through conduit 50.

To run the assembly in the opposite direction and with the motors hooked up in series, valve 60 is positioned as illustrated, and valve 30 is adjusted to produce crossed flow through the valve. Pressure fluid thence is admitted to conduit 50 to motor 24 and thence passes from motor 24 to port 22y of motor 22. Discharge from motor 22 takes place through throttle valve in assembly 46, and through conduit 44. To place the motors in parallel, valve 60 is adjusted to produce crossed flow through the valves.

While a particular embodiment of the invention has been described herein, it is appreciated that changes and variations are possible without departing from the

invention, such changes being well within the purview of one skilled in the art.

It is claimed and desired to secure by letters patent:

1. A power-operated winch assembly comprising a winch drum,
 - a drive gear joined to the drum to rotate the drum, and multiple power-driven pinion gears meshing with the drive gear at points distributed about the periphery of the drive gear,
 - each of said power-driven pinion gears having a separate hydraulic motor coupled thereto which, on actuation of the motor, rotates the pinion gear, a source of fluid under pressure,
 - conduit means connecting said source and said hydraulic motors supplying fluid to the motor, said conduit means including valve mechanism for placing said motors in series with each other to obtain high speed operation and in parallel with each other to obtain high torque operation, and
 - a fluid pressure-operated locking dog for locking the winch drum,
 - said valve mechanism including one valve for placing said motors in series with each other or parallel to each other, and another valve for actuating the motor and changing the direction of the motor operation, said conduit means further including a connection with said locking dog producing hydraulic release of the dog with said other valve producing actuation of said motors in either direction.
2. A power-operated winch assembly comprising a frame including a pair of opposed, vertically disposed and laterally spaced-apart bracket plates,
 - a winch drum and a bull gear for the drum disposed with the axis of the gear aligned with the axis of the drum, said bull gear being joined to one end of the drum, said bull gear and drum being positioned between said bracket plates with the bull gear and said one end of the drum adjacent and rotatably supported on one bracket plate and the opposite end of the drum rotatably supported on the opposing bracket plate,
 - multiple pinion gears located in the space between said bracket plates and journaled on said one bracket plate, said pinion gears being circumferentially distributed about said bull gear and meshing therewith,
 - a separate reversible hydraulic motor for each of said pinion gears, each including a casing mounted as a cantilever on said one bracket plate on the opposite side of the bracket plate from said one end of the drum and said bull gear, each hydraulic motor having an output shaft axially aligned with its associated pinion gear which extends through said one bracket plate and is keyed to its associated pinion gear,
 - a pump having an outlet supplying fluid under pressure, and
 - conduit means connecting said outlet of the pump and said hydraulic motor for supplying fluid under pressure to the motors, said conduit means including valve mechanism adjustable to connect said motors to said pump outlet with the motors in series with each other whereby the pinion gears which are driven by the motors conjointly rotate

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the bull gear at a relatively high speed, said valve mechanism also being adjustable to connect the motor to said pump outlet with the motors parallel to each other whereby the pinion gears which are driven by the motors conjointly rotate the bull gear 5 at a lower speed and with high torque.

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