

June 5, 1951

K. F. MORGAN

2,555,501

PULLEY-WINCH

Filed Dec. 12, 1947

2 Sheets-Sheet 1

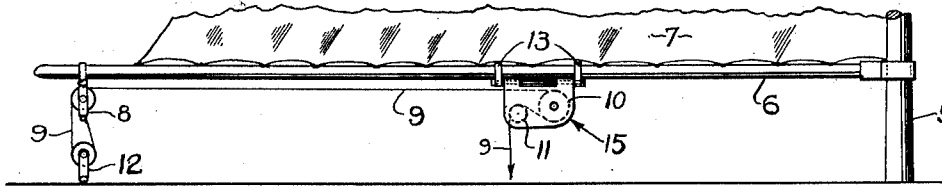


Fig. 1.

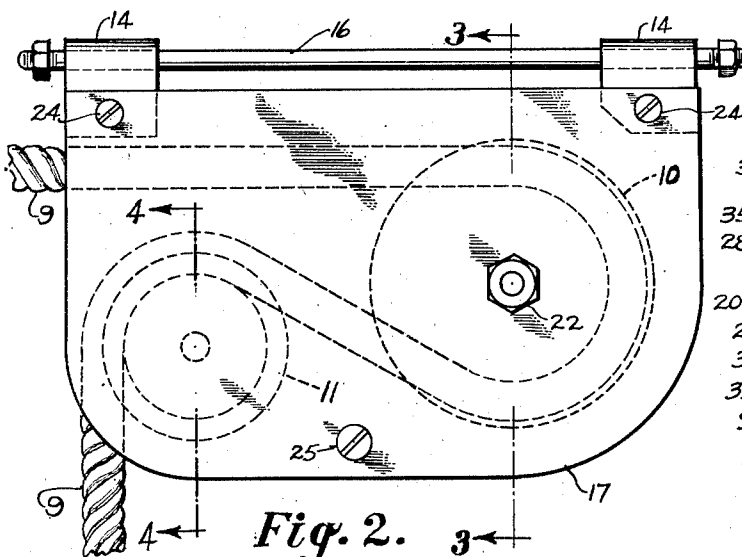


Fig. 2.

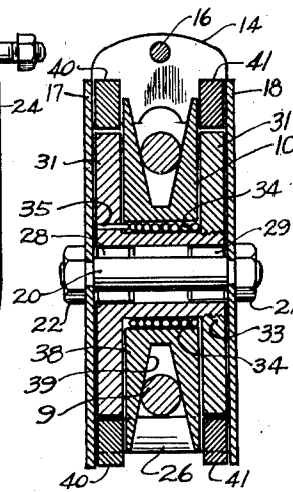


Fig. 3.

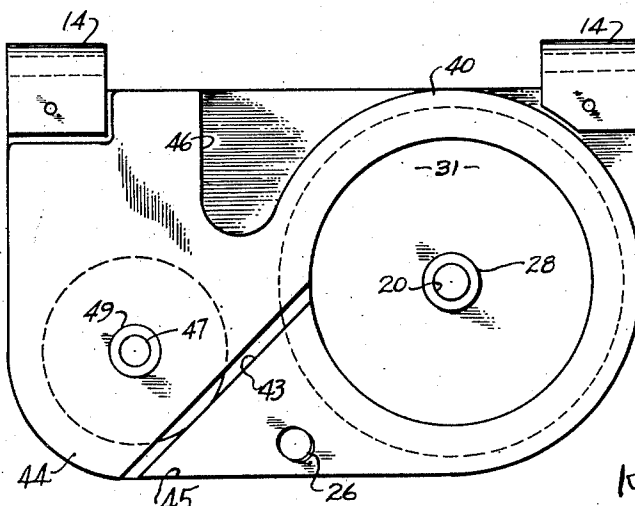


Fig. 5.

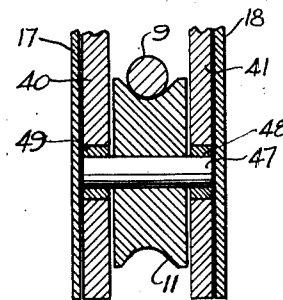


Fig. 4.

INVENTOR.

Kenneth F. Morgan

June 5, 1951

K. F. MORGAN

2,555,501

PULLEY-WINCH

Filed Dec. 12, 1947

2 Sheets-Sheet 2

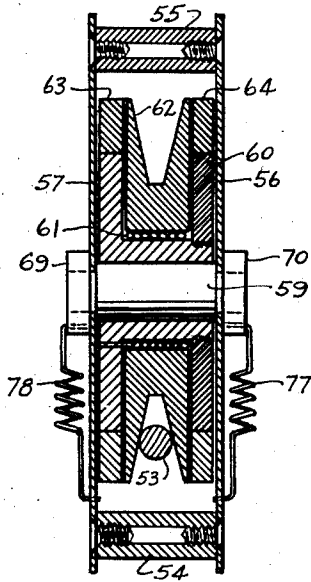


Fig. 7.

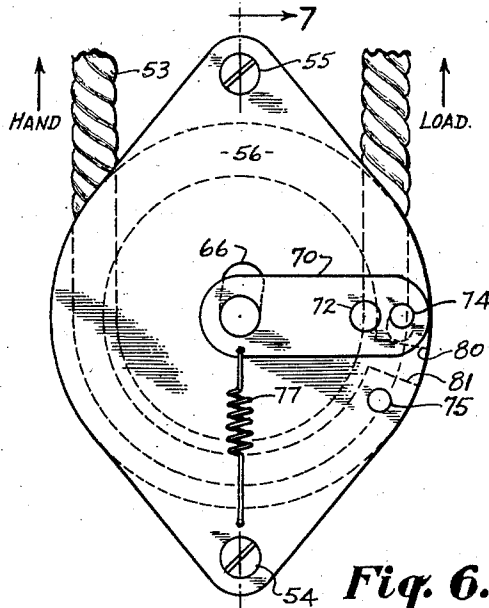


Fig. 6.

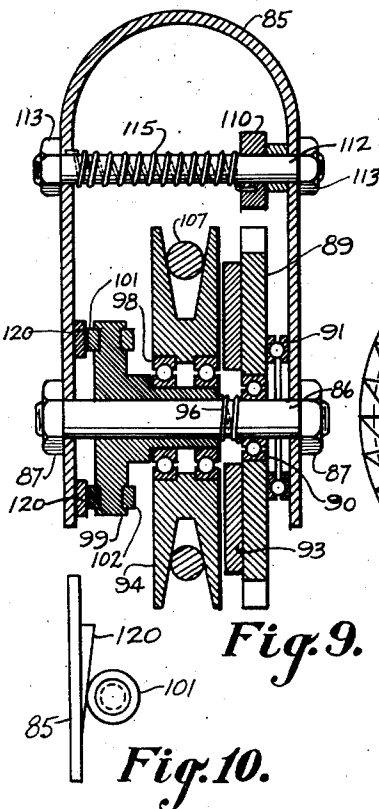


Fig. 9.

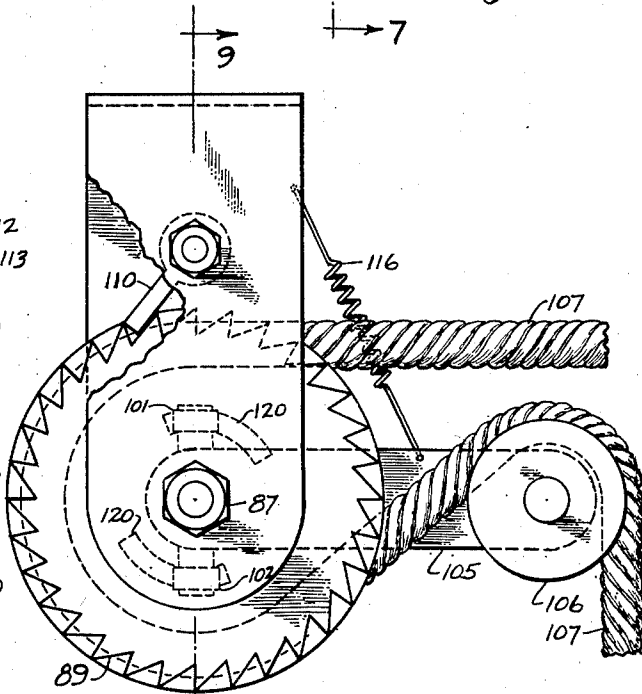


Fig. 8.

INVENTOR.

Kenneth F. Morgan

UNITED STATES PATENT OFFICE

2,555,501

PULLEY WINCH

Kenneth F. Morgan, Los Angeles, Calif.

Application December 12, 1947, Serial No. 791,324

7 Claims. (Cl. 254—188)

1

This invention relates to pulleys or pulley-winch, and particularly to a pulley-winch for use on sailboats or for any other purpose where ropes and blocks are used, whereby it is not expedient to fasten the end of a rope, but desirable to hold the rope in the hands and to reduce the pull on the hands while holding the rope.

In sailing close-hauled on a fairly brisk wind, even in a small sailboat, it gets quite tiresome holding the main sheet. It is well-known that it is not desirable to make the main sheet fast, but to take every precaution for instantly releasing the sheet in the case of a sudden and heavy gust of wind in order to avoid the risk of capsizing. Various devices are in use for cleating the main sheet in the cockpit, and, at the same time, for permitting the jerking loose of the rope end. In yacht racing, it is desirable to have the main sheet lead directly from the boom to the hand. This gives the skipper a "feel" of the wind changes which cannot be had if the sheet is cleated fast or leads indirectly to the hand through a pulley in the cockpit. However, if the lead of the main sheet is directly from the boom to the hand, it becomes very tiresome, if not impossible, to hold it on a long beat to windward in a strong wind.

The present invention is directed to a pulley-winch, and is described for purposes of illustration as mounted on the boom of a sailboat and which, in light winds, will run freely, but which, in heavy winds, will set a brake so that a small pull on the hand end of the rope will hold a much heavier pull on the other side of the pulley-winch, and yet, at the same time, will run freely in the direction of hauling in the sheet and also run freely in paying out the sheet when the pull on the hand end of the rope is reduced.

The principal object of the invention, therefore, is to facilitate the handling of a variable load on a line or rope.

Another object of the invention is to provide an improved pulley-winch which permits control of the rotation thereof in accordance with the pull on one side thereof.

A further object of the invention is to provide a braking pulley-winch which permits free running in one direction and a braking action or free running in the other direction according to the pull on the control side thereof.

Although the novel features which are believed to be characteristic of this invention will be pointed out with particularity in the appended claims, the manner of its organization and the

2

mode of its operation will be better understood by referring to the following description read in conjunction with the accompanying drawings, forming a part hereof, in which:

Fig. 1 is a view of a sailboat boom on which the invention is attached, and illustrating one use of the invention.

Fig. 2 is a side view of one species or embodiment of the invention.

Fig. 3 is a cross-sectional view of the embodiment shown in Fig. 2 and taken along the line 3—3 of Fig. 2.

Fig. 4 is a cross-sectional view of the idler pulley of Fig. 2 taken along the line 4—4 of Fig. 2.

Fig. 5 is a plan view of the embodiment shown in Figs. 2, 3, and 4 with one of the side plates removed.

Fig. 6 is a plan view of a second embodiment of the invention.

Fig. 7 is a cross-section of the embodiment shown in Fig. 6 taken along the line 7—7 of Fig. 6.

Fig. 8 is a side view of a third embodiment of the invention.

Fig. 9 is a cross-sectional view taken along the line 9—9 of Fig. 8, and

Fig. 10 is a detailed view of the braking device of the embodiment shown in Figs. 8 and 9.

Referring now to the drawings, in which the same numerals identify like elements, and particularly referring to Figs. 1 to 5, inclusive, mainmast 5 of a sailboat has a boom 6 and a sail 7. At the end of the boom 6 is a fixedly positioned block 8 from which a rope or line 9 extends around the pulley of a block 12 firmly fixed at the deck or on a traveler at the stern of the boat, the line 9 extending around the pulley of block 8, around a braking pulley 10, and an idler pulley 11 of the invention 15, and then to the hand of the boat operator. The pulleys 10 and 11 are mounted in a frame attached to the boom by means of clamps 13.

The construction of the invention 15 consists of two rectangular side members or plates 17 and 18 through which an axle or fixed shaft 20 passes and is fastened by two nuts 21 and 22. The upper corners of the plates 17 and 18 are attached to U-shaped members 14 through which a bolt 16 passes longitudinally for fastening to the clamps 13. Screws such as shown at 24 fasten the members 14 to the side plates 17 and 18, another screw 25 being attached between side members 17 and 18 through a spacer 26.

Mounted on the shaft 20 are a pair of ball bearings 28 and 29 on which is mounted a U-shaped brake drum 31. The brake drum 31 is

3

constructed so that the right-hand side section thereof may be threaded onto the hub as shown at 33. Surrounding the hub of the brake member 31 is an over-riding spring clutch 34 having one end thereof anchored in the left-hand side of the drum 31 as shown at 35. Mounted on the spring 34 is a V-shaped pulley 38 having a deep V groove 39 therein in which the rope 9 passes. The next elements of the unit are two brake bands 40 and 41 which substantially surround the circumference of the side members of the brake drum 31, the ends of which are separated by a cut-out portion 43. That is, any pressure on the ends, such as 44 and 45 of the bands 40 and 41, will cause pressure and friction between the external circumference of the side flanges of the brake member 31 and the internal circumference of the brake bands 40 and 41. To provide greater flexibility of the brake bands 40 and 41, they may be partially cut-out, as shown at 46.

To obtain braking action, the idler pulley 11 is mounted on a shaft 47, which, in turn, is mounted on bearings 48 and 49 on the ends 44 of the brake bands 40 and 41. Since the ends 45 of the brake bands are anchored on the spacer 26, any pressure in a downwardly direction on the pulley 46 will tend to tighten the brake bands on the brake drum 31. The operation of the device 15, therefore, is such that a slight pull downwardly on the rope 9, after passing around the pulley 11, will control a heavy pull from the left-hand direction on the rope 9 and around the pulley 10. For instance, the V pulley 10 will rotate only in one direction with respect to the hub of the brake member 31. That is, it will not rotate in a counter clockwise direction, as shown in Figs. 2 and 5. It will, however, freely rotate in a clockwise direction, so that any movement of the upper end of the rope 9 to the left must rotate the brake member 31 on its bearings 28 and 29. Control of this rotation is obtained by the downwardly pull on the rope 9 which controls the friction between the brake bands 40 and 41 and the brake drum 31. Therefore, in accordance with the leverage ratio in the brake bands and the coefficient of friction between the brake bands and the brake drum, the downwardly pull on the rope 9 will control a heavier pull to the left on rope 9. By releasing this pull, the load can easily rotate the V pulley 10 and the brake drum 31 on its bearings 28 and 29. It is realized that a pull on the hand by the rope 9 will also tighten the brake drums, but since the V pulley 10 may freely rotate in a clockwise direction on the spring 34, the hand may pull the load in a direct one to one ratio as far as the unit 15 is concerned. To insure no slippage between the rope 9 and the V pulley 10, which slippage must be prevented, the sides of the V 39 may be corrugated or roughened, or may even be coated with rubber to provide the necessary friction. The idler pulley 11 is, of course, free to rotate in either direction.

Referring now to Figs. 6 and 7, a similar device to provide control of a heavy load with a smaller force is shown. This device, however, eliminates the use of the idler pulley 11 in Figs. 1 to 5, inclusive, although a fixed idler pulley may be used to change the direction of the hand pull. As illustrated in Figs. 6 and 7, the controlling pull on the rope 53 is in an upward direction on the left-hand side of the device, while the load pulls upwardly on the right-hand side. The pulley may, therefore, be attached in any suitable manner at its lower end on the screw bolt 54, although

4

the pulley will function in any oriented position. This unit consists of side members or plates 56 and 57 attached by units 54 and 55. The same type of brake drum 60 is used in this modification as shown at 31 in the former figures, a similar overrunning spring bearing being shown at 61. A V pulley 62 of the same type as previously shown at 10 is also employed along with similar brake bands 63 and 64. In this modification, however, the axle 59 is mounted for movement in a pair of slots 66 in the side members 56 and 57, the end of the shaft 59 being rotatably mounted on cross members 69 and 70, the other end of these members being pivoted at 72 and attached to one end of each of the brake bands 63 and 64 by a pin 74. The drum 60 may also be rotated on axle 59. The other ends of the brake bands are anchored to the side members 63 and 64 by a pin 75. A pair of springs 77 and 78 bias the bearing cross members 69 and 70 to their lower position which is the release position of the brake bands 63 and 64 on the drum 60.

The operation of the above modification is similar to that of the modification shown in Figs. 1 to 5, inclusive, except that the hand pull on the rope 53 bodily moves all the rotating elements upwardly, which moves the left-hand ends of the cross bearing members 69 and 70 upwardly to bring the ends 80 and 81 of the brake bands closer together, thus increasing the friction between the brake bands and the brake drums. Since the V pulley 62 will rotate freely in a clockwise direction, the hand may pull the load in a one to one ratio. However, the V pulley locks to the brake drum 60 when the load attempts to rotate the pulley 62 on the brake drum 60, and the load must, therefore, overcome the friction between the brake bands and the brake drum in order to move the rope in its direction. The load may easily move the rope in its direction, however, when the tension on the hand side of the rope 53 is released, thus permitting the springs 77 and 78 to release the brake and permitting the brake drum 60 to rotate on its shaft 59.

Referring now to the third modification shown in Figs. 8, 9, and 10, this modification is similar to the modification shown in Figs. 1 to 5, inclusive, except that it employs a pawl and ratchet clutch instead of the spring type of overrunning clutch and a side disc brake instead of the band brakes. A U-shaped yoke 85 has a fixed shaft 86 between the legs of the yoke and is held in position by nuts 87. A ratchet wheel 89 is mounted for rotation on a bearing 90, while a thrust bearing 91 is provided between the side of ratchet wheel 89 and the side of the yoke 85. Mounted on the other side of the ratchet 89 is a friction ring 93 adapted to contact the right-hand side of a V pulley 94 when moved in contact therewith. The friction disc 93 and pulley 94 are normally kept out of contact by a compression spring 96. The V pulley 94 is mounted on bearings 98, which, in turn, are mounted on a longitudinally slidable T member 99, member 99 having a pair of rollers 101 and 102 thereon and having an extension 105 on the end of which is mounted an idler pulley 106. The control rope 107, therefore, passes over the idler pulley 106 and around the V pulley 94, similarly to the arrangement in Figs. 1 to 5, inclusive. A pawl 110 is pivoted on a shaft 112 attached by nuts 113 to the yoke 85, a spring 115 being provided to bias the pawl in locking position on the ratchet 89. A bias spring 116, attached to the extension

5

105 and to the upper end of the yoke 85, urges the brake to release position on this type of unit. Positioned along the left-hand leg of the yoke 85 are a pair of wedge blocks 120, movement of the rollers 101 and 102 along the blocks moving the member 99 to the right and bringing the right-hand side of the pulley 94 in contact with the friction disc 93.

The operation of the embodiment of the invention shown in Figs. 8, 9, and 10 is the same as that of the other modifications. That is, the hand may pull the rope 107 downwardly by rotating the pulley 94 and the ratchet 89 in a counter-clockwise direction. If the load, however, tends to pull the rope 107 to the right, it must overcome the friction between the pulley 94 and the friction disc 93, which friction is determined by the tension in the rope 107 placed there by the hand pull. Hand tension moves the pulley 106 downwardly, which rotates the element 99 against the wedges 120 to move the pulley 94 in frictional contact with the disc 93. Since the ratchet 89, attached to the disc 93, cannot move in a clockwise direction, the pulley 94 must rotate against the friction between it and the disc 93 controlled by the hand pull. Since the idler pulley 106 is free on one side, that is, no second side member extension 105, the line 107 may be quickly released from the pulley 94, and it may then be used as a conventional pulley or block. This may be desirable where the load is so light that no drag can be tolerated. Also, in this modification, any desired amount of braking leverage is easily obtainable by varying the length of the arm 105 with respect to the length of the ends carrying the rollers 101 and 102 and the pitch of the wedges 120.

From the three embodiments of the invention described above, it is realized that the operator may control a load, such as the main sail of a sailing boat, without undue exertion, while, at the same time, have a delicate control over the main sail to take advantage of variations in the wind. By lessening the hand pull, the main sheet may be permitted to move with the wind, while the sail may be hauled in, in the normal manner. By maintaining a slight pull on the rope, heavy gusts of wind cannot take the sail out of control of the operator.

I claim:

1. A pulley-winch comprising a pair of side plates, an axle between said plates, a rotatable brake element concentrically mounted on said axle, a pulley having its axis of rotation coincident with the axes of said rotatable brake element and said axle, means for permitting rotation of said pulley in only one direction with respect to said brake element, a line around said pulley, a load connected to one end of said line, brake pressure means, and means for controlling the pressure between said brake pressure means and said brake element in accordance with the tension in the other end of said line, said means for permitting rotation of said pulley in only one direction with respect to said rotatable brake element including an overrunning clutch consisting of a coiled spring between said pulley and said rotatable brake element.

2. A pulley-winch comprising side plates, an axle between said plates, a brake drum mounted concentrically with respect to said axle for rotation in either direction on said axle, a pulley, means for mounting said pulley for rotation in only one direction on said brake drum, a line over said pulley, one end of said line being connected

6

to a load to be controlled, and means for applying braking friction to said drum in accordance with the tension in the other end of said line, said mounting means for said pulley being an anchored coil spring bearing between said brake drum and said pulley and on which said pulley rotates in one direction only with respect to said brake drum.

3. A pulley-winch comprising side plates, an axle between said plates, a brake drum mounted concentrically with respect to said axle for rotation in either direction on said axle, a pulley, means for mounting said pulley for rotation in only one direction on said brake drum, a line over said pulley, one end of said line being connected to a load to be controlled, and means for applying braking friction to said drum in accordance with the tension in the other end of said line, said last mentioned means including a second pulley and a brake band surrounding said brake drum, one end of said band being anchored to said plates, and the other end of said band supporting said second pulley, said line passing around said first pulley and over said second pulley.

4. A pulley-winch comprising side plates, an axle between said plates, a brake drum mounted concentrically with respect to said axle for rotation in either direction on said axle, a pulley, means for mounting said pulley for rotation in only one direction on said brake drum, a line over said pulley, one end of said line being connected to a load to be controlled, and means for applying braking friction to said drum in accordance with the tension in the other end of said line, said last mentioned means including a brake band having one end anchored to said plates and a cross member having one end attached to the other end of said brake band, another end of said member supporting said axle, and an intermediate point on said cross member being attached to one of said plates.

5. A pulley-winch comprising supporting side plates, an axle between said plates, a brake member between said plates and concentrically mounted on said axle, a pulley between said plates and having its axis of rotation in alignment with the axes of said brake member and said axle, a line around said pulley, one end of said line being connected to a load, and means for creating friction on said brake member by a pull on the other end of said line in the opposite direction to the pull of said load, a spring clutch attached to said brake member being provided between said brake member and said pulley for locking said pulley to said member when said pulley is rotated in one direction and to permit rotation of said pulley on said spring when said pulley is rotated in the other direction.

6. A pulley-winch comprising a pair of side plates, an axle between said plates, a braking drum mounted for rotation in either direction on said axle, a pulley mounted on said drum, means between said pulley and drum to permit rotation of said pulley in only one direction with respect to said drum, a brake band surrounding said drum, one end of said band being anchored, a second pulley on the other end of said band, and a line around said pulleys, a pull on the second pulley side of said winch tightening said brake band on said drum.

7. A pulley-winch comprising a pair of side plates, an axle between said plates, a braking drum mounted for rotation in either direction on said axle, a pulley mounted on said drum,

means between said pulley and drum to permit rotation of said pulley in only one direction with respect to said drum, a brake band surrounding said drum, one end of said band being anchored, a link member supporting said axle at one end and having its other end attached to the other end of said band, an intermediate point on said member being attached to said plates, and a line around said pulley, a pull on said line tightening said band on said drum.

KENNETH F. MORGAN.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,014,728	Tabulo	Jan. 16, 1912
1,221,390	Tabulo	Apr. 3, 1917
1,714,452	Schat	May 21, 1929