

(19)



(11)

EP 2 855 337 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:

07.10.2015 Bulletin 2015/41

(51) Int Cl.:

B66D 1/38 (2006.01)

B66D 1/36 (2006.01)

(86) International application number:

PCT/SI2013/000030

(21) Application number: **13737695.0**

(22) Date of filing: **13.05.2013**

(87) International publication number:

WO 2013/180665 (05.12.2013 Gazette 2013/49)

(54) **FORESTRY WINCH WITH CONTROLLED COILING OF A TOWING CABLE AND PREVENTING THE OVERLOADING THEREOF.**

FORSTWIRTSCHAFTLICHE SEILWINDE MIT KONTROLLIERTEM AUFWICKELN DES SCHLEPPKABELS UND ÜBERLADUNG-SICHERUNG.

TREUIL FORESTIER AVEC ENROULEMENT CONTRÔLÉ D'UN CABLE DE REMORQUAGE ET EMPÊCHANT LA SURCHARGE DE CELUI-CI.

(84) Designated Contracting States:

**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO
PL PT RO RS SE SI SK SM TR**

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(30) Priority: **31.05.2012 SI 201200174**

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(43) Date of publication of application:

08.04.2015 Bulletin 2015/15

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Description

[0001] In the field of transporting, the invention refers to hoisting, lifting or hauling appliances, in particular to winches, namely to construction details thereof.

[0002] The purpose of the invention is to create a forestry winch suitable for attachment to a tractor, by which coiling of a towing cable should be performed in a controlled manner, which means that each disposable windings of said cable on the surface of a winding drum should be arranged side by side relatively to each other and without any transpositioning or overlapping, and that each overloading of said towing cable and other components of a driving assembly due to towing of too heavy load should be excluded.

[0003] A forestry winch as such is described e.g. in SI 9600339 A2. Such winch comprises a casing, which is on the one hand furnished with beams for establishing a required connection with a three-point mechanism of an usual tractor, as well as with an end portion of a shaft suitable for connection with a joint shaft of a tractor. The opposite side of said housing is furnished with a deflecting surface, a so-called board, which essentially forms a part of casing of a driving and towing unit in such winch, which moreover comprises a winding drum with a brake and a clutch, as well as a reduction gearbox, via which said shaft is connected to said end portion of the shaft for connection with said joint shaft of each tractor. A towing cable is wound around said drum, which is optionally directed over an upper pulley block or over a lower pulley block towards each load, which shall be towed. An upper pulley block is mounted on said winch frame above an lower pulley block and is furnished with a motor-driven pulley. Such upper pulley block is described e.g. in SI 22800 A and is furnished with a pulley, which is driven by means of a hydraulic motor and is moreover adapted for guiding of a towing cable and in particular also for decoiling of said towing cable from each belonging winding drum.

[0004] Such forestry winch is generally suitable for coupling to a tractor and is furnished with a winding drum, on which a towing cable is coiled. Prior to towing of each load, the drum needs to be directed in the opposite direction, by which the cable is decoiled from the drum and extended towards the load in order to attach the load to the cable. As soon as each load, e.g. a timber or several timbers coupled to each other, starts to be towed, rotation of said winding drum in appropriate direction results in coiling of the towing cable onto said drum and consequently to towing of said load towards the winch.

[0005] In particular in some larger winches the towing cable is relatively thick, and the force required for decoiling of the cable is quite high due to friction and inertia of the drum together with the towing cable wound thereon. Of that reason, a motor-driven upper pulley block is extremely useful for each user. The upper pulley block is usually mounted onto the winch frame, so that a direction of extending the towing cable placed over said upper

pulley is normally defined in advance. Redirecting of the towing cable, depending on each position of the load relative to the winch and also relative to each direction of approaching said load towards the winch, is enabled by means of the lower pulley block, which is also mounted onto said winch frame in the area below said upper pulley block and with the possibility of rotating around its vertical axis. Such redirecting leads to displacement of acting direction of tensioning forces closely to the ground and improves the stability of both the winch and the tractor.

[0006] On the other hand, a direction of the other section of the towing cable, which extend from a fixed upper pulley block, which is unable to rotate around its vertical axis, towards the winding drum. A direction in which the towing cable extends, is namely depending on current location of decoiling area, in which the towing cable is coiled on or decoiled from the winding drum, e.g. on its one or its opposite end portion, or in the middle of said winding drum. Due to central arrangement of the upper pulley block, said direction of running the towing cable via the upper pulley block is approximately aligned with a direction of coiling the cable onto the drum, it decoiling it therefrom, only when said cable is coiled or decoiled in the central region of the winding drum. By increasing distance between said coiling/decoiling area and the central region of the winding drum, a tendency of undesired deflecting the cable away from desired direction and concentrating said cable in the central region of the winding drum, where windings are then coiled over each previous windings instead to the surface of the winding drum, or by multi-layered coiling onto each previous layer of regularly coiled windings. When the towing cable is already damaged, for example flattened, intruded, folded, or otherwise deformed, the probability of irregular coiling becomes still essentially greater. Each cross-like overlapping of windings on the winding drum leads to essentially increasing of tension loadings within particular wires forming said towing cable, while the bottom winding is exposed to essential flattening. By towing heavy loads, said loadings in particular locations may reach enormous values, which can lead to durable damages of the towing cable, or even to completely destroying thereof.

[0007] Various appliances with controlled coiling of a towing cable and preventing thereof from overloading are also described in JP 2004 217 422 A, FR 2 506 277 A1, CH 666 472 A5, JP S49 143688 U and SU 594 031 A1.

[0008] The proposed invention as defined in claim 1 refers to a forestry winch with controlled coiling of a towing cable and preventing thereof from overloading. Such winch comprises a frame, on which a rotatable winding drum is mounted together with said towing cable which is wound thereon, wherein said winding drum is preferably driven by means of a tractor cardan joint shaft and is controlled by means of a clutch and a brake, and wherein moreover an upper pulley block is also mounted on said winch frame, so that said towing cable extends from the winding drum via the upper pulley block and optionally via at least one additional pulley block towards each dis-

posable load.

[0009] A directing assembly is arranged between the winding drum and the upper pulley block, namely above the winding drum, which is rotatably around its horizontal geometric axis mounted on the winch frame, and below the upper pulley block, which is by means of its casing fixedly mounted in the upper area of the winch frame and is furnished with a pulley which is also allowed to rotate around its horizontal geometric axis, wherein said directing assembly is with the possibility of freely rotating or at least pivoting at each required angle around its vertical axis connected to the upper pulley block, or optionally to the winch frame. Said directing assembly comprises a casing, in which two pulleys are embedded, which are each per se freely rotatable around their rotational axes, which are arranged horizontally and parallel to each other, wherein the distance between the rotational axle of the lower pulley and said vertical axis of the directing assembly is greater than the distance between the rotational axle of the upper pulley block and said vertical axis of the directing assembly. Consequently, said pulleys are suitable for guiding the towing cable from the upper pulley block along said vertical axis of the directing assembly towards the upper pulley and then via the lower pulley towards the winding drum, or in the opposite direction.

[0010] Said rotational axle of the upper pulley is arranged in such manner that a tangent to said upper pulley is aligned with said vertical geometric axis of the directing assembly, and both sections of the towing cable in the area of said upper pulley, namely the section of the cable on the side of the upper pulley block and the section of the cable on the side of the lower pulley, when observed in a direction towards the axis of the upper pulley, are arranged at angle between 100° and 170°.

[0011] According to the invention, said upper pulley is embedded within the casing of the directing assembly displaceable in a direction of the resultant force of tension forces in both sections of the towing cable in the area of said upper pulley, and is moreover in said direction supported by means of a dynamometer.

[0012] The invention further provides that said casing of the directing assembly in said winch is rotatably around said vertical axis, which is mounted on a bearing member by means of at least two bearings, which are vertically spaced apart from each other, and said directing assembly is by means of said bearing member mechanically attached either to the upper pulley block or to the winch frame. Said bearing member is preferably available in the form of a tube, through which the towing cable is inserted, when extending from the upper pulley block towards the upper pulley of the directing assembly, or in the opposite direction.

[0013] The previously mentioned dynamometer preferably consists of a hydraulic cylinder, by which the upper pulley is supported in a direction of acting the resultant force of tensioning forces in both sections of the towing cable in the area of said upper pulley of the directing assembly, as well as of a pressure sensor which is adapt-

ed for measuring of pressure within said hydraulic cylinder. Said winding drum is at least by rotating around its rotational axis in a direction of coiling the towing cable thereon driven and controlled under consideration of each tension loading within the towing cable, as measured by means of said dynamometer.

[0014] The invention will be described in more detail by means of an embodiment, which schematically presented in the attached drawings, wherein

Fig. 1 is a schematic spatial presentation of a concept as well as of relevant components of the forestry winch according to the invention, in particular of a winding drum, an upper pulley block as well as of a lower pulley block; and

Fig. 2 is a front view of detailed and partially sectioned directing assembly of the winch according to the invention.

[0015] The present invention refers to a forestry winch with controlled coiling of a towing cable 2 and preventing thereof from overloading, wherein such winch comprises a frame, which is not shown in the drawings and on which a rotatable winding drum 1 is mounted together with a towing cable wound thereon; said drum 1 is driven by means of a tractor cardan joint shaft and is controlled by means of a clutch and a brake, and wherein moreover an upper pulley block 3 with a preferably motor-driven pulley is also mounted on said winch frame above the lower pulley block, which is not shown in the drawing and is furnished with a freely rotatable pulley, so that said towing cable 2 extends from the winding drum 1 via the upper pulley block 3 and via the lower pulley block towards each disposable load.

[0016] For the purposes of better understanding of the arrangement and orientation of relevant parts of the winch it shall be especially annotated that the winding drum 1 is rotatable around its horizontal rotation axis 10, which is aligned with longitudinal geometric axis of a driving shaft 11 of said drum 1, which is via a corresponding clutch (not shown) and brake (not shown) connectable with a not shown cardan joint shaft of each disposable tractor.

[0017] Besides, just for better understanding, the upper pulley block 3 is by means of its casing 31 fixedly mounted in the upper area of the winch frame and is furnished with a pulley, which is allowed to rotate around its horizontal geometric axis 30 and is preferably a motor-driven one, and is in the shown embodiment preferably driven by means of a hydraulic motor 32.

[0018] In accordance with the present invention, a directing assembly 4 is foreseen in the area between the upper pulley block 3 and the winding drum 1, namely above said drum 1 and below said pulley block 3, and is intended to guide said towing cable 2, namely a section of said towing cable 2, which is located between the winding drum 1 and the upper pulley block 3.

[0019] Said directing assembly 4 comprises a casing

41, which is either rotatable, or may optionally be - depending on the length of the winding drum 1 and each disposable distance between it and the redirecting assembly 4 - just pivoted at corresponding angle around the vertical geometric axis 40, the position and direction of which corresponds to a position and direction of the towing cable 2 in the area below the upper pulley block 3, when extending towards the winding drum 1. To this aim, the casing 41 of the directing assembly 4 is by means of two vertically spaced bearings 42', 42" embedded on a bearing member 43, which is in the shown embodiment conceived as a tube, through which the towing cable 2 can be inserted and by means of which the casing 41 of the directing assembly 4 is mechanically connected with the upper pulley block 3 and attached thereto with the possibility of the previously mentioned rotation or at least pivoting around said axis 40.

[0020] Instead to said upper pulley block 3, said directing assembly 4 could generally or optionally also be mounted directly to a winch frame, and is furthermore furnished with two pulleys 44, 45, which are each per se freely rotatable and embedded on corresponding rotational axles 440, 450, which extend horizontally and parallel to each other, wherein the distance between the rotational axle 440 of the upper pulley 44 and said vertical axis 40 of the directing assembly 4 is smaller than the distance between the rotational axle 450 of the lower pulley 45 and said axis 40, and in addition to that, said upper pulley 44 is arranged in such manner that said vertical geometric axis 40 of the directing assembly 4 corresponds to a tangent to said upper pulley 44.

[0021] Thanks to such arrangement of said pulleys 44, 45 and their rotational axles 440, 450 within said casing 41 of the directing assembly 4, which is rotatable around the vertical axis 40, the invention provides such arrangement of the towing cable 2, which allows automatically directing of the towing cable 2 during coiling thereof onto the winding drum 1. When coiling of the towing cable 1 takes place, the towing cable 2 is usually intensively tensioned due to towing of a not shown load, wherein the towing cable 2 (Fig. 1) extends from the load either directly or via at least one lower pulley block, and then via the pulley of the upper pulley block 3 vertically downwards and preferably within said tubular bearing member 43 along said axis 40 and then tangentially towards the upper pulley 44 of the directing assembly 4, where the cable 2 is at a pre-determined angle α , which is, when observed in a direction towards the rotational axle 440 of the upper pulley 44, between 100° and 170° , in particular between 120° and 150° , redirected towards the lower pulley 45 of the directing assembly 4 and then only towards the surface of the winding drum 1. Thanks to said freedom of rotation said directing assembly 4 around said vertical axis 40, the casing 41 of the directing assembly 4 can slightly pivot after each winding of the towing cable 2 around the winding drum 1 in order to enable each subsequent winding of the cable 2 to slide down from each previous winding and to rest onto the surface

of the winding drum 1, or by multi-layer coiling, onto each previous layer of windings, which are side by side and closely to each other already coiled on the surface of the winding drum 1.

[0022] As evident in Fig. 2, both components of forces F_1 , F_2 in corresponding sections of the towing cable 2 generate a single resultant force F , which is directed along the axis of symmetry in the middle of said angle α between said sections of the towing cable 2 in the area of the upper pulley 44. Said acting direction of the resultant force F can always be exactly determined in advance, depending on the geometry and location of pulleys 44, 45, namely on position of axles 440, 450 and diameters of pulleys 44, 45, which are preferably equal, but may generally also differ with respect to each other. The invention further provides that the rotational axle 440 of the upper pulley 44 is embedded within said casing 41 along the direction of said resultant force F and is supported by means of dynamometer 46, which in the shown embodiment consists of a hydraulic cylinder 461 as well as of a pressure sensor 462 which is adapted for measuring of pressure within said cylinder 461. Said dynamometer 46 enables permanent measuring and controlling of tension in the towing cable 2, wherein in the case of overloading of the towing cable 2 i.e. tensioning thereof beyond each pre-determined threshold, a signal is generated in the dynamometer 46, on the basis of which the power supply to the winding drum 1 is interrupted.

Claims

1. Forestry winch with controlled coiling of a towing cable (2) and preventing thereof from overloading, comprising a frame, on which a rotatable winding drum (1) is mounted together with said towing cable (2) which is wound thereon, wherein said winding drum (1) is preferably driven by means of a tractor cardan joint shaft and is controlled by means of a clutch and a brake, and wherein moreover an upper pulley block (3) is also mounted on said winch frame, so that said towing cable (2) extends from the winding drum (1) via the upper pulley block (3) and optionally via at least one additional pulley block towards each disposable load, wherein a directing assembly (4) is arranged between the winding drum (1) and the upper pulley block (3), namely above the winding drum (1), which is rotatably around its horizontal geometric axis (10) mounted on the winch frame, and below the upper pulley block (3), which is by means of its casing (31) fixedly mounted in the upper area of the winch frame and is furnished with a pulley which is also allowed to rotate around its horizontal geometric axis (30), and wherein said directing assembly (4) is with the possibility of freely rotating or at least pivoting at each required angle around its vertical axis (40) connected to the upper

pulley block (3), or optionally to the winch frame, and comprises a casing (41), in which two pulleys (44, 45) are embedded, which are each per se freely rotatable around their rotational axles (440, 450), which are arranged horizontally and parallel to each other, wherein the distance between the rotational axle (450) of the lower pulley (45) and said vertical axis (40) of the directing assembly (4) is greater than the distance between the rotational axle (440) of the upper pulley (44) and said vertical axis (40) of the directing assembly (4), so that said pulleys (44, 45) are suitable for guiding the towing cable (2) from the upper pulley block (3) along said vertical axis (40) of the directing assembly (4) towards the upper pulley (44) and then via the lower pulley (45) towards the winding drum (1), or in the opposite direction, and wherein said rotational axle (440) of the upper pulley (44) is arranged in such manner that a tangent to said upper pulley (44) is aligned with said vertical geometric axis (40) of the directing assembly (4), and both sections of the towing cable (2) in the area of said upper pulley (44), namely the section of the cable (2) on the side of the upper pulley block (3) and the section of the cable (2) on the side of the lower pulley (45), when observed in a direction towards the axis (440) of the upper pulley (44) are arranged at angle (α) between 100° and 170° , **characterized in that** said upper pulley (44) is embedded within the casing (41) of the directing assembly (4) displaceable in a direction of the resultant force (F) of tension forces (F_1 , F_2) in both sections of the towing cable (2) in the area of said upper pulley (44), and is moreover in said direction supported by means of a dynamometer (46).

2. Forestry winch according to anyone of Claim 1, **characterized in that** said casing (41) of the directing assembly (4) is rotatably around said vertical axis (40) mounted on a bearing member (43) by means of at least two bearings (42', 42''), which are vertically spaced apart from each other, and said directing assembly (4) is by means of said bearing member (43) mechanically attached either to the upper pulley block (3) or to the winch frame.
3. Forestry winch according to Claim 2, **characterized in that** said bearing member (43) is available in the form of a tube, through which the towing cable (2) is inserted, when extending from the upper pulley block (3) towards the upper pulley (44) of the directing assembly (4), or in the opposite direction.
4. Forestry winch according to anyone of Claims 1 - 3, **characterized in that** said dynamometer (46) consists of a hydraulic cylinder (461), by which the upper pulley (44) is supported in a direction of acting the resultant force (F) of tensioning forces (F_1 , F_2) in both sections of the towing cable (2) in the area of

said upper pulley (44) of the directing assembly (4), as well as of a pressure sensor (462) which is adapted for measuring of pressure within said hydraulic cylinder (461).

5. Forestry winch according to Claim 1 or 4, **characterized in that** said winding drum (1) is at least by rotating around its rotational axis (10) in a direction of coiling the towing cable (2) thereon driven and controlled under consideration of each tension loading within the towing cable (2), as measured by means of said dynamometer (46).

15 Patentansprüche

1. Forstseilwinde mit kontrolliertem Aufwickeln eines Schleppkabels (2) und Überladungssicherung, umfassend einen Rahmen, an welchem eine drehbare Aufwickeltrommel (1) zusammen mit dem auf dieser aufgewickelten Schleppkabel (2) angebracht ist, wobei die Aufwickeltrommel (1) vorzugsweise mittels einer Kardangelenkswelle einer Zugmaschine angetrieben und mittels einer Kupplung und einer Bremse gesteuert wird und wobei außerdem ein oberer Flaschenzug (3) auch an dem Seilwindenrahmen angebracht ist, so dass sich das Schleppkabel (2) von der Aufwickeltrommel (1) über den oberen Flaschenzug (3) und gegebenenfalls über wenigstens einen zusätzlichen Flaschenzug zu jeder verfügbaren Last erstreckt, wobei ein Lenkaufbau (4) zwischen der Aufwickeltrommel (1) und dem oberen Flaschenzug (3) angeordnet ist, und zwar oberhalb der Aufwickeltrommel (1), welche um ihre horizontale geometrische Achse (10), die an dem Seilwindenrahmen angebracht ist, drehbar ist, und unterhalb des oberen Flaschenzugs (3), der mittels seines Gehäuses (31) fest in dem oberen Bereich des Seilwindenrahmens angebracht und mit einer Riemenscheibe versehen ist, die sich auch um ihre horizontale geometrische Achse (30) drehen kann, und wobei der Lenkaufbau (4) mit der Möglichkeit versehen ist, sich um jeden nötigen Winkel um seine vertikale Achse (40), die mit dem oberen Flaschenzug (3) oder gegebenenfalls mit dem Seilwindenrahmen verbunden ist, frei zu drehen oder zumindest zu verschwenken, und ein Gehäuse (41) umfasst, in welchem zwei Riemenscheiben (44, 45) eingebettet sind, welche jeweils für sich frei um ihre Rotationsachsen (440, 450), die horizontal und parallel zueinander angeordnet sind, drehbar sind, wobei der Abstand zwischen der Drehachse (450) der unteren Riemenscheibe (45) und der vertikalen Achse (40) des Lenkaufbaus (4) größer ist als der Abstand zwischen der Rotationsachse (440) der oberen Riemenscheibe (44) und der vertikalen Achse (40) des Lenkaufbaus (4), so dass die Riemenscheiben (44, 45) zum Führen des Schleppkabels (2) von dem oberen Flaschenzug (3) entlang

der vertikalen Achse (40) des Lenkaufbaus (4) zur oberen Riemenscheibe (44) und dann über die untere Riemenscheibe (45) zur Aufwickeltrommel (1) oder in die entgegengesetzte Richtung geeignet sind, und wobei die Rotationsachse (440) der oberen Riemenscheibe (44) derart angeordnet ist, dass eine Tangente zur oberen Riemenscheibe (44) mit der vertikalen geometrischen Achse (40) des Lenkaufbaus (4) fluchtet und beide Abschnitte des Schleppkabels (2) im Bereich der oberen Riemenscheibe (44), nämlich der Abschnitt des Kabels (2) auf der Seite des oberen Flaschenzugs (3) und der Abschnitt des Kabels (2) auf der Seite der unteren Riemenscheibe (45), gesehen in einer Richtung zur Achse (440) der oberen Riemenscheibe (44) hin, in einem Winkel (α) zwischen 100° und 170° angeordnet sind, **dadurch gekennzeichnet, dass** die obere Riemenscheibe (44) in dem Gehäuse (41) des Lenkaufbaus (4) eingebettet und in eine Richtung der sich ergebenden Kraft (F) von Spannkraften (F_1 , F_2) in beiden Abschnitten des Schleppkabels (2) im Bereich der oberen Riemenscheibe (44) verschiebbar ist und dass sie des Weiteren in dieser Richtung von einem Dynamometer (46) getragen wird.

2. Forstseilwinde nach Anspruch 1, **dadurch gekennzeichnet, dass** das Gehäuse (41) des Lenkaufbaus (4) um die vertikale Achse (40) drehbar ist, die mittels wenigstens zwei Lagern (42', 42'') an einem Lagerelement (43) angebracht ist, die vertikal voneinander beabstandet sind, und der Lenkaufbau (4) mittels des Lagerelements (43) mechanisch entweder an dem oberen Flaschenzug (3) oder an dem Seilwindenrahmen angebracht ist.
3. Forstseilwinde nach Anspruch 2, **dadurch gekennzeichnet, dass** das Lagerelement (43) in Form eines Rohres vorhanden ist, durch welches das Schleppkabel (2) eingeführt ist, wenn es sich vom oberen Flaschenzug (3) zur oberen Riemenscheibe (44) des Lenkaufbaus (4) oder in entgegengesetzter Richtung erstreckt.
4. Forstseilwinde nach einem der Ansprüche 1 - 3, **dadurch gekennzeichnet, dass** das Dynamometer (46) aus einem Hydrozylinder (461), von dem die obere Riemenscheibe (44) in einer Wirkrichtung der sich ergebenden Kraft (F) von Spannkraften (F_1 , F_2) in beiden Abschnitten des Schleppkabels (2) im Bereich der oberen Riemenscheibe (44) des Lenkaufbaus (4) getragen wird, sowie aus einem Drucksensor (462) besteht, der dazu geeignet ist, Druck innerhalb des Hydrozylinders (461) zu messen.
5. Forstseilwinde nach einem der Ansprüche 1 oder 4, **dadurch gekennzeichnet, dass** die Aufwickeltrommel (1) zumindest durch Drehung um ihre Rotationsachse (10) in eine Richtung des Aufwickelns des

Schleppkabels (2) auf dieser unter Berücksichtigung jeder Spannlast innerhalb des Schleppkabels (2), wie sie durch das Dynamometer (46) gemessen wird, angetrieben und kontrolliert wird.

Revendications

1. Treuil forestier avec enroulement commandé d'un câble de remorquage (2) et empêchement de la surcharge de ce dernier, comprenant un cadre, sur lequel un tambour d'enroulement rotatif (1) est monté avec ledit câble de remorquage (2) qui est enroulé sur ce dernier, dans lequel ledit tambour d'enroulement (1) est de préférence entraîné à l'aide d'un arbre à joint de cardan de tracteur et est commandé à l'aide d'un embrayage et d'un frein, et dans lequel, en plus, une moufle supérieure (3) est aussi montée sur ledit cadre de treuil, de sorte que ledit câble de remorquage (2) s'étende depuis le tambour d'enroulement (1) par le biais de la moufle supérieure (3) et éventuellement par le biais d'au moins une moufle supplémentaire vers chaque charge utile, dans lequel un ensemble d'orientation (4) est agencé entre le tambour d'enroulement (1) et la moufle supérieure (3), à savoir au-dessus du tambour d'enroulement (1), qui peut tourner autour de son axe géométrique horizontal (10) monté sur le cadre de treuil, et sous la moufle supérieure (3), qui est, à l'aide de son boîtier (31), montée à demeure dans la région supérieure du cadre de treuil et est équipée d'une poulie qui peut également tourner autour de son axe géométrique horizontal (30), et dans lequel ledit ensemble d'orientation (4) est, avec la possibilité de tourner librement ou d'au moins pivoter à chaque angle requis autour de son axe vertical (40), relié à la moufle supérieure (3), ou éventuellement au cadre de treuil, et comprend un boîtier (41), dans lequel deux poulies (44, 45) sont logées, qui peuvent en soi chacune tourner librement autour de leurs axes de rotation (440, 450), qui sont agencés horizontalement et parallèlement l'un à l'autre, dans lequel la distance entre l'axe de rotation (450) de la poulie inférieure (45) et ledit axe vertical (40) de l'ensemble d'orientation (4) est supérieure à la distance entre l'axe de rotation (440) de la poulie supérieure (44) et ledit axe vertical (40) de l'ensemble d'orientation (4), de sorte que lesdites poulies (44, 45) soient appropriées pour guider le câble de remorquage (2) depuis la moufle supérieure (3) le long dudit axe vertical (40) de l'ensemble d'orientation (4) vers la poulie supérieure (44) puis par le biais de la poulie inférieure (45) vers le tambour d'enroulement (1), ou dans la direction opposée, et dans lequel ledit axe de rotation (440) de la poulie supérieure (44) est agencé d'une manière telle qu'une tangente à ladite poulie supérieure (44) est alignée sur ledit axe géométrique vertical (40) de l'ensemble d'orientation (4), et les deux sections du

câble de remorquage (2) dans la région de ladite poulie supérieure (44), à savoir la section du câble (2) sur le côté de la moufle supérieure (3) et la section du câble (2) sur le côté de la poulie inférieure (45), lorsque l'on regarde dans une direction vers l'axe (440) de la poulie supérieure (44), sont agencées selon un angle (α) entre 100° et 170°, **caractérisé en ce que** ladite poulie supérieure (44) est logée dans le boîtier (41) de l'ensemble d'orientation (4) pouvant se déplacer dans une direction de la force (F) obtenue de forces de tension (F_1 , F_2) dans les deux sections du câble de remorquage (2) dans la région de ladite poulie supérieure (44), et est en plus dans ladite direction supportée à l'aide d'un dynamomètre (46).

2. Treuil forestier selon la revendication 1, **caractérisé en ce que** ledit boîtier (41) de l'ensemble d'orientation (4) peut tourner autour dudit axe vertical (40) monté sur un élément de palier (43) à l'aide d'au moins deux paliers (42', 42'') qui sont verticalement espacés l'un de l'autre, et ledit ensemble d'orientation (4) est, à l'aide dudit élément de palier (43), mécaniquement fixé à la moufle supérieure (3) ou au cadre de treuil.
3. Treuil forestier selon la revendication 2, **caractérisé en ce que** ledit élément de palier (43) peut se présenter sous la forme d'un tube, dans lequel est introduit le câble de remorquage (2), lorsqu'il s'étend depuis la moufle supérieure (3) vers la poulie supérieure (44) de l'ensemble d'orientation (4), ou dans la direction opposée.
4. Treuil forestier selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** ledit dynamomètre (46) se compose d'un cylindre hydraulique (461), par lequel la poulie supérieure (44) est supportée dans une direction d'action de la force (F) obtenue des forces de tension (F_1 , F_2) dans les deux sections du câble de remorquage (2) dans la région de ladite poulie supérieure (44) de l'ensemble d'orientation (4), ainsi que d'un capteur de pression (462) qui est conçu pour mesurer la pression dans ledit cylindre hydraulique (461).
5. Treuil forestier selon la revendication 1 ou 4, **caractérisé en ce que** ledit tambour d'enroulement (1) est, au moins par rotation autour de son axe de rotation (10) dans une direction d'enroulement du câble de remorquage (2) sur celui-ci, entraîné et commandé en prenant en considération chaque chargement de tension dans le câble de remorquage (2), telle que mesurée à l'aide dudit dynamomètre (46).

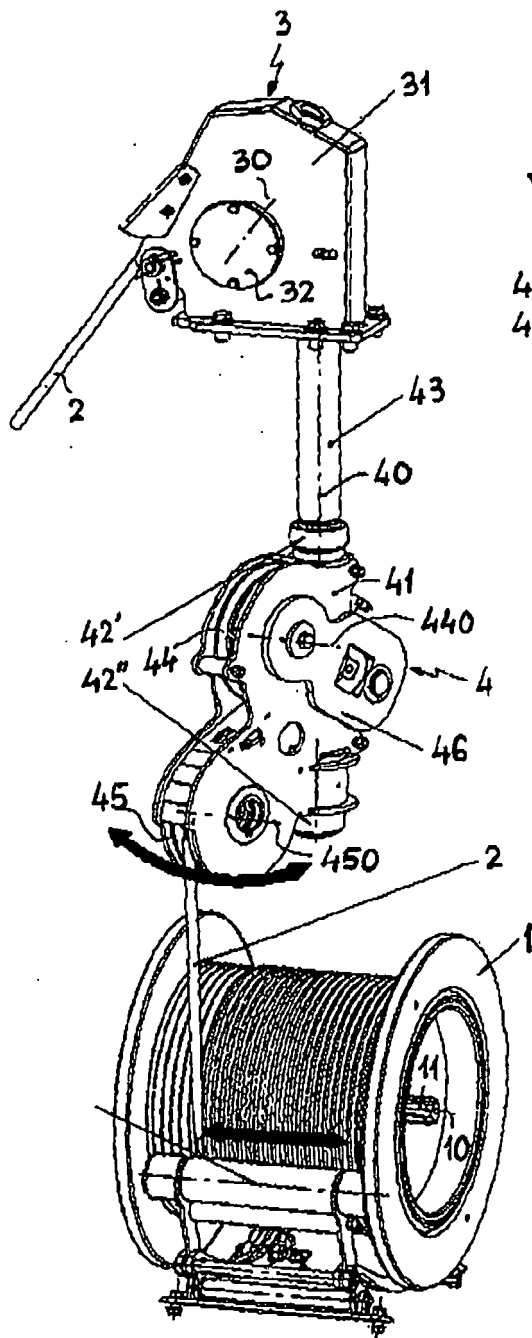


Fig. 1

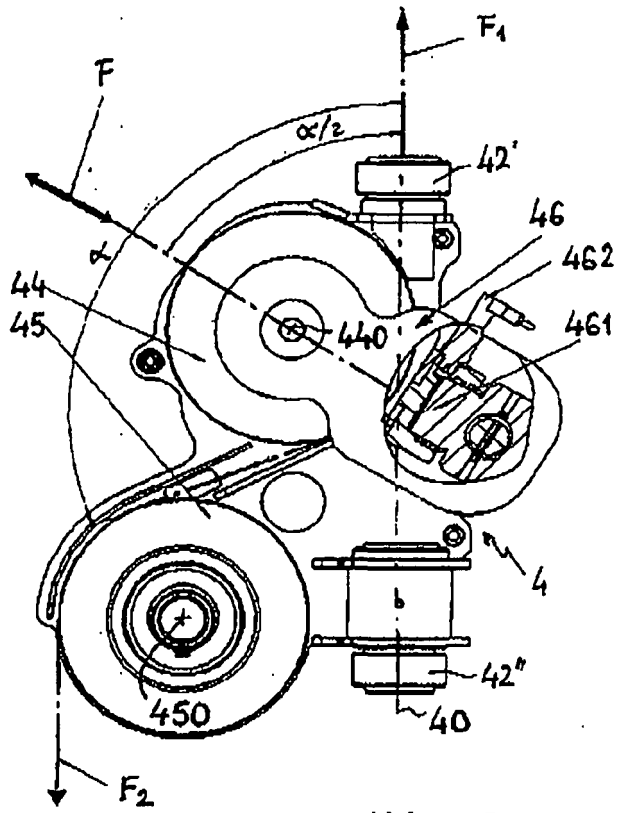


Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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