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(54) **WINCH WITH A SAFETY MECHANISM FOR SWITCHING OFF WINDING OF A ROPE**

(57) Winch with a safety mechanism for switching off winding of a rope, is that switching off of the end switch (10) releases a pushing (5) element, which is pushed into the end switch by a rotatably mounted washer (6) on an accessory (3a) on a rope guide, when the accessory of

an end piece due to winding of the pulling rope reaches the washer and pushes it into its final position. The mechanism may be installed in winches with electric, hydraulic or mechanic steering of winding and unwinding of the pulling rope.

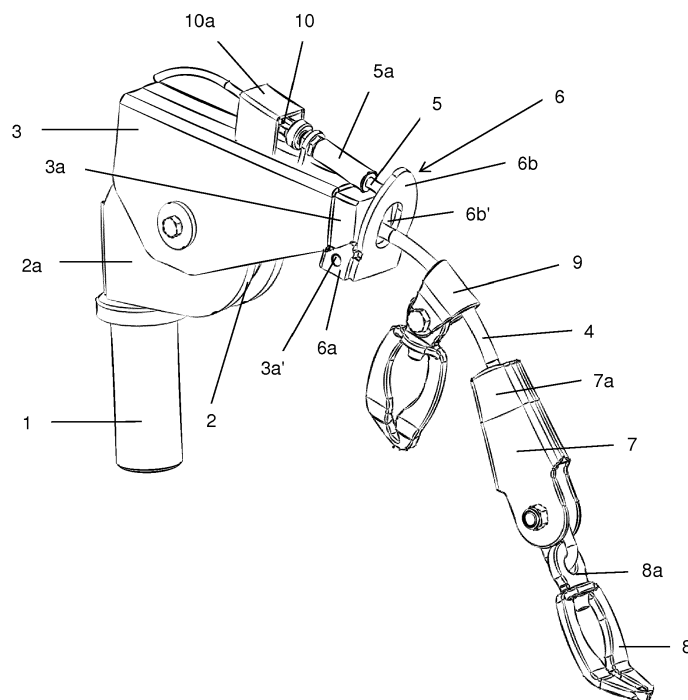


Fig. 1

## Description

### Field of the invention

**[0001]** The invention belongs to the field of mechanical engineering, more precisely to the field of safety devices associated with forest winches.

### Technical problem

**[0002]** The technical problem, which is solved by the present invention, is construction of a mechanism for switching off or suspending winding of a rope onto a winch drum with electric, hydraulic or mechanic control of an unwinding cable, including winches with or without a driven cable. When winding a rope onto a winch drum the user often fails to terminate winding at the right time, therefore the rope is caught between layers of threads on the drum or the end part for attachment is torn. In both cases, work needs to be suspended and the problem must be solved. Permanent destruction of the rope or its part is common, especially if it is caught between layers of threads on the drum causing the rope to be squeezed or permanently deformed. Such permanent deformation can be prevented by using a large pulling force when unwinding, otherwise it is impossible to unwind the rope from the drum. If the pulling rope of the winch is not stopped on time, this may also result in damaged construction elements of the winch. In most cases this element is wire rope guide on the cable.

**[0003]** The purpose and the objective of the invention is such constructional solution for switching off winding of a rope, which will allow safe winch operation and will prevent damage on machines and equipment thereby decreasing costs associated with winch maintenance.

### State of the art

**[0004]** Slovenian patent no. 22855 discloses a device for controlled winding and unwinding of a wire rope - braided cable, which has a sensor for monitoring the position of an end-piece-ending or adjustable restriction piece-washer of the pulling end of the wire rope and enables switching-off the winch when the pulling end of the wire rope reaches a rope guiding mouth to a certain distance. The spatial or three-dimensional adaptation of the rope wire, which travels through the pulley and the cable into the mouth and the end-piece, is controlled by a swinging carrier of guiding/compression wheels, which are pressed by two springs adjustable by two bolts of the swinging carrier. Besides a hydraulic motor, the hydraulic drive features a damper valve and a non-return valve placed on a return flow pipe of the hydraulic motor.

**[0005]** Utility model DE 20 2013 105 782 U1 discloses a winch with a movable handle having a thread on the end of the pulling rope, providing the user with a grip of the handle thereby protecting the user so that his hand is not pulled into the guide of the pulling rope.

**[0006]** Utility model DE 20 2013 102 281 U1 discloses a solution for switching off the pulling rope drive, when the end of the rope reaches an accessory of a rope guide. The solution is based on a transmitter in the form of a RFID chip installed in the end piece. This utility model also describes an embodiment with two transmitters, the first being present on the end piece and the second before the end of the rope. According to this solution it is possible to set the point of switching off or the distance between the end piece and the pulley, at which the drive is switched off automatically, with a potentiometer. A receiver is placed on the winch. The disadvantage of this solution is that functioning of transmitters on rope or end piece may be unreliable or impaired due to working conditions, which include dirt, mud, dust, moisture, snow and ice.

**[0007]** Winches available on the market do not have options to terminate winch operation when the pulling rope is wound to the end and reaches the entrance of the rope guide. Winches of the company VITLI KRPAN and company Uniforest are equipped with a round plate attached before the end of the rope as a clipping loop, which leans on the rope guide if the rope is wound to its end. This plate is useful for visual positioning of the rope, but in practice, during winch operation, it jams in tree branches or in possible obstacles present in the field.

**[0008]** Above mentioned known solutions do not solve switching off the winch if the pulling rope is wound to the end, as is the case in the present invention, which causes directly or indirectly via an intermediate part on a rope termination of rope winding when the rope is in its final position.

### Description of the invention

**[0009]** The essence of the winch with a safety mechanism for switching off winding of a rope, according to the invention is that an end part of a pulling rope in its final position directly or indirectly via an intermediate part causes a shift of an end switch, which stops a drive of a drum with the rope. Switching off the end switch releases a pushing element, which is pushed into the end switch by a rotatably mounted washer on an accessory on a rope guide, when the accessory of an end piece due to winding of the pulling rope reaches the washer and pushes it into an upright position. The mechanism may be installed in winches with electric, hydraulic or mechanic control of winding and unwinding of the pulling rope with or without an unwinding cable.

**[0010]** The winch with a safety mechanism for switching off winding of a rope will be further described based on Figure 1.

**[0011]** The pulling rope is via a conveying arm rotatably mounted from the inner side into the winch housing or housing of the drum perpendicularly to the drum axis and oscillates along the longitudinal axis of the drum, wherein the wire rope is guided through guiding discs in the direction towards an exit opening on a part of the winch.

On the outer part of the winch housing a console 1 with a housing 2a of an unwinding cable 2 is rotatably mounted around the vertical axis. On the housing 2a with the cable 2 a holder of a guide 3 of the pulling rope 4 is rotatably mounted around the horizontal axis. On the holder of the guide 3 a housing 10a is mounted with an end switch 10 and a guide 5a with a pushing element 5, which is within the reach of a side 6b of a washer 6 with a bottom part 6a rotatably mounted in the axis 3a' of an accessory 3a. The side 6b of the washer 6 has in the middle an opening 6b', through which the pulling rope 4 slides. The opening 6b' may have any shape, preferably it has a round or an oval shape. An end piece 7 with an accessory 7a on the side of the washer 6 and a clamp 8 for the chain are mounted on the rope 4. One or more elements 9 for chain attachment may be present between the end piece 7 and the washer 6.

**[0012]** The end switch is any switching element such as a position sensor, preferably an inductive sensor, mechanically controlled valve or any other element, which causes a switch in the status of a hydraulic or electric circuit of the drum from a turned on status to a turned off status.

**[0013]** When working with the winch the user firstly through the cardan shaft of a tractor enables operation of the drum with the rope as well as operation of the mechanic-hydraulic system of the winch. When the switch is on, the rope 4 is via the cable 2 unwound to a fallen tree, which is attached with a chain with the help of the clamp 8 and if necessary with additional clamping elements 9. After this, with switching on the winding of the rope onto the drum, the rope 4 begins to shorten, causing the attached load to be pulled. This process lasts until the user does not terminate winding of the rope 4 onto the drum. If the user forgets to control the position of the rope 4 with the load for whatever reason and consequently the end piece 7 comes close to the side 6b of the washer 6 so that the latter is pushed into a perpendicular position, the side 6b of the washer 6 pushes the element 5 into the switch 10, which will switch off winding of the rope or drive of the drum, respectively. In different versions of winches the drive of the winding and/or unwinding cable may be controlled with an electric or hydraulic circuit. In more simple versions of winches the drive of the winding and/or unwinding cable is mechanic, using chains and sprockets. The mechanism for switching off winding of a rope may be used in all of the above mentioned versions of winches. The pulling rope 4 is preferably a steel rope, however, it may be made from any material, particularly as a synthetic rope.

**[0014]** A winch with a safety mechanism for switching off winding of a rope according to embodiment I has the washer 6 installed in the lower part of the accessory 3a with the help of at least one or more springs, which hold the washer 6 at a distance from the pushing element 5. When the accessory 7a of the end piece 7 pushes the washer 6, the pushing element 5 is pushed into the end switch 10, which terminates winding of the rope 4 onto

the drum.

**[0015]** The winch with a safety mechanism for switching off winding of a rope according to embodiment II has the washer 6 mounted on the pushing element 5, the washer 6 being pushed by the accessory 7a of the end piece 7 when the pulling rope 4 is in its utmost position, which also pushes the element 5 into the end switch 10 and causes termination of rope 4 winding onto the drum.

**[0016]** The winch with a safety mechanism for switching off winding of a rope according to embodiment III has the accessory 7a of the end piece 7 shaped in such a way that in the utmost position of the pulling rope 4 the accessory 7a pushes the element 5 into the end switch 10, which terminates winding of the rope 4. The accessory 7a may be shaped in any shape, preferably the shape is oval, round or rectangular, and the dimensions are such that they allow the element 5 to be pushed.

**[0017]** The proposed solution with automatic switching off of the end switch, when the rope is wound to its end, prevents unforeseen events, which could damage the winch and its equipment. The mechanism for switching off winding of a rope may be installed on the upper or the lower cable and is suitable for winches with electric, hydraulic or mechanic steering of winding and unwinding of the pulling rope with or without the unwinding cable for unwinding the rope from the drum. An advantage of this solution is also that it is practically insensitive for working conditions, where lots of dirt, mud, dust, moisture, snow and ice is present, because no elements are present on the rope, but are instead present on the upper and/or lower cable.

**[0018]** Another advantage of the mechanism according to the invention is that the rope is without any additional movable element, which could be jammed in tree branches or other obstacles in the way of the rope during work process. All elements, which ensure a reliable switch off, are installed in the assembly of upper or lower cable. A winch may be equipped with only the upper cable or the lower cable may be added to the upper, wherein the lower cable is supplied with the safety mechanism as well. The upper cable is in use most of the time, while the lower cable is in use when loads are larger, as pulling force direction is closer to ground, thereby achieving incomparably more stable pulling, because the danger of tractor lifting due to heavy load is eliminated. The possibility of accidents with the tractor or the winch is minimized with the use of the lower cable. The lower cable is activated in such a manner that the pulling rope is attached to the lower cable.

## Claims

1. A winch with a safety mechanism for switching off winding of a rope, **characterized in that** an end part of a pulling rope in its final position directly or indirectly via an intermediate part causes a shift of an end switch, which stops a drive of a drum with the

rope.

2. The winch with a safety mechanism for switching off winding of a rope according to claim 1, **characterized in that** the end switch is any switching element such as a position sensor, preferably an inductive sensor, mechanically controlled valve or any other element, which causes a switch in the status of a hydraulic or electric circuit of the drum from a turned on status to a turned off status. 5
3. The winch with a safety mechanism for switching off winding of a rope according to claim 2, **characterized in that** the mechanism for switching off winding of a rope is installed on winches with electric, hydraulic or mechanic control of pulling rope winding and unwinding function, and with or without an unwinding cable for unwinding the rope from the drum. 10
4. The winch with a safety mechanism for switching off winding of a rope according to claims 2 and 3, **characterized in that** the mechanism for switching off winding of a rope is installed on the upper or the lower cable. 20
5. The winch with a safety mechanism for switching off winding of a rope according to any of the claims from 1 to 4, **characterized in that** on the outer part of the winch housing a console (1) with a housing (2a) of an unwinding cable (2) is rotatably mounted around the vertical axis; that on the housing (2a) with the cable (2) a holder of a guide (3) of the pulling rope (4) is rotatably mounted around the horizontal axis; that on the holder of the guide (3) a housing (10a) is mounted with an end switch (10) and a guide (5a) with a pushing element (5), which is within the reach of a side (6b) of a washer (6) with a bottom part (6a) rotatably mounted in the axis (3a') of accessory (3a); that the side (6b) of the washer (6) has in the middle an opening (6b'), through which the pulling rope (4) slides; that the opening (6b') may have any shape, preferably it has a round or an oval shape; that an end piece (7) with an accessory (7a) on the side of the washer (6) and a clamp (8) for the chain are mounted on the rope (4); that one or more elements (9) for chain attachment may be present between the end piece (7) and the washer (6). 25 30 35 40 45
6. The winch with a safety mechanism for switching off winding of a rope according to any of the claims from 1 to 4, **characterized in that** it has the washer (6) installed in the lower part of the accessory (3a) with the help of at least one or more springs, which hold the washer (6) at a distance from the pushing element (5); that when the accessory (7a) of the end piece (7) pushes the washer (6), the pushing element (5) is pushed into the end switch (10), which interrupts/terminates winding of the rope (4) onto the 50 55

drum.

7. The winch with a safety mechanism for switching off winding of a rope according to any of the claims from 1 to 4, **characterized in that** it has the washer (6) mounted on the pushing element (5), the washer (6) being pushed by the accessory (7a) of the end piece (7) when the pulling rope (4) is in its utmost position, which also pushes the element (5) into the end switch (10) and causes termination of winding of the rope (4) onto the drum. 5 10
8. The winch with a safety mechanism for switching off winding of a rope according to any of the claims from 1 to 4, **characterized in that** it has the accessory (7a) of the end piece (7) shaped in such a way that in the utmost position of the pulling rope (4) the accessory (7a) pushes the element (5) into the end switch (10), which terminates winding of the rope (4); that the accessory (7a) may be shaped in any shape, preferably the shape is oval, round or rectangular, and the dimensions are such that they enable the element (5) to be pushed. 15 20 25 30 35 40 45

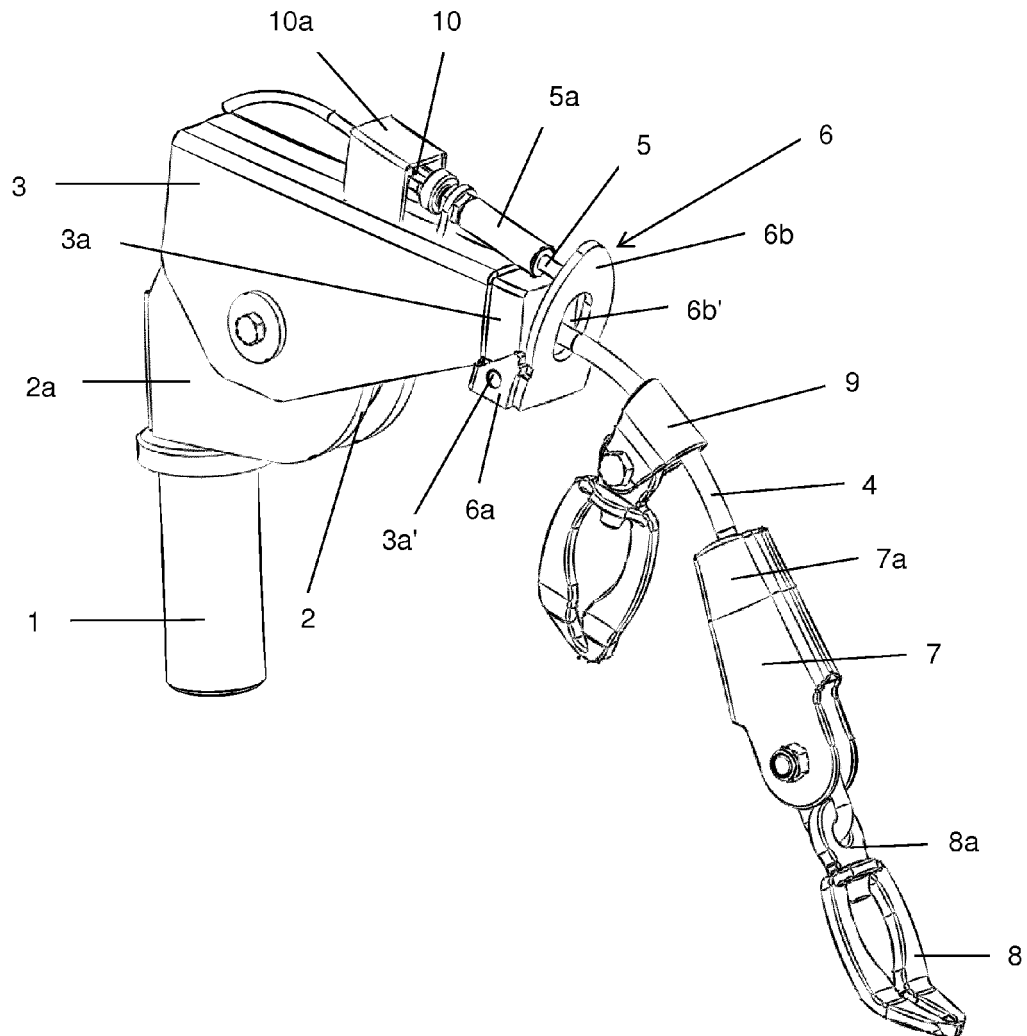


Fig. 1



## EUROPEAN SEARCH REPORT

 Application Number  
 EP 15 17 7249

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			TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 22 September 2015	Examiner Serôdio, Renato
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**ANNEX TO THE EUROPEAN SEARCH REPORT  
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5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
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**REFERENCES CITED IN THE DESCRIPTION**

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