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(54) **PULLEY WITH A MECHANISM FOR TERMINATING WINDING OF A ROPE AND A WINCH
COMPRISING SAID PULLEY**

(57) Pulley for a forestry winch, said pulley comprising:

- a circular sheave (1) arranged to receive a rope,
- a housing (2) shaped to correspond to said sheave (1), wherein the housing (2) comprises: two sides (21), an upper curved or multipart protective plate (22), and at least one free, usually frontal part (23), where the rope can access the sheave (1),
- an attachment element (3) for installation on a winch,
- a mechanism for terminating winding of the rope which is arranged to interact with a sensor or a switch (4) installable in a winch housing, said mechanism comprising: an impact element (5), preferably shaped as a pair of impact handles, which at least partly covers the free part (23) of the housing (2), wherein the impact element (5) is movably mounted on the housing (2) of the pulley in a mounting (51), wherein a part of the impact element (5) is connected to a rotatably mounted plate (6), which may be one of the sides (21) of the housing (2) or a separate plate, which is rotatably installed on the side (21) of the housing (2), wherein the rotatably mounted plate (6) is arranged to be in contact with the vertically movable element (7), which is upon movement due to rotation of the plate (6) arranged to be sensed by the sensor or a switch (4), and wherein in its extreme position a top part (72) or a bottom part of the vertically movable element (7) is arranged to enter or leave a sensing field of the sensor or the switch (4) depending on the settings of the sensor or the switch (4) configured to cause termination of rope winding.

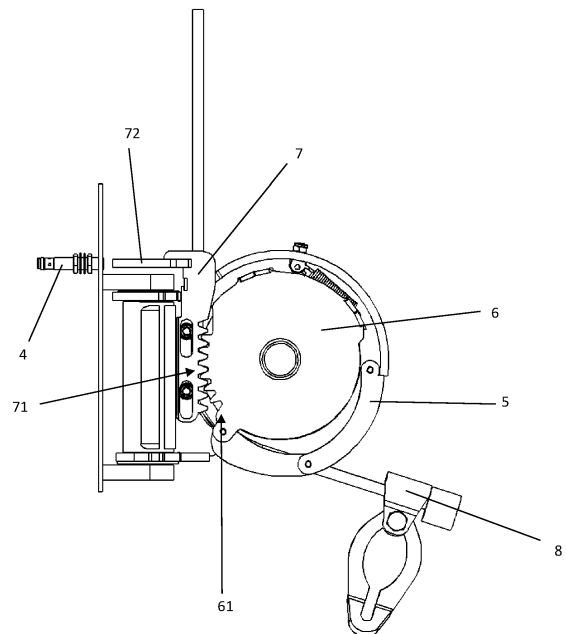


Figure 2

Description

Field of the invention

[0001] The invention belongs to the field of forestry winches, more precisely to the field of constructional details in forestry winches for pulling a load by winding a rope onto a drum. The invention relates to a lower pulley with a mechanism for terminating winding of a rope (i.e., a stop switch) and a forestry winch comprising the said pulley.

Background of the invention and the technical problem

[0002] During use of a winch a situation may occur, in which safe and reliable termination or suspension of pulling of a load via winding a wire rope on a winch drum is required. It is common that the user does not terminate winding timely, resulting in the rope being trapped in-between rope layers on the drum or the end part of the rope is damaged. At the same time, any other construction elements may be damaged, such as a guide of the wire rope or drive parts (chains, sprockets, lamellae, etc.). Consequently, work must be suspended, as the damaged rope and/or any other element has to be replaced due to severe lasting deformation.

[0003] In order to prevent said problems of belated termination of rope winding, several different systems for terminating winding have been developed, such as systems described in patent EP 3 095 748 B1, and also in documents SI 25045 and SI 25043. These solutions are adapted for upper pulleys of winches, which differ from the lower pulleys, as the rope is always installed in the upper pulley, while the rope must be installed and uninstalled from the lower pulley depending on the needs during work.

[0004] Lower pulleys of winches serve to lower the centre of gravity of the pulling force during pulling of the load with the forestry winch and thus represent an important part of the winch that ensures reliable pulling of the load. Due to the sporadic use, the lower pulley has to be adapted to fast and simple use, meaning that it has to be quickly opened to insert the rope and afterwards closed. Timely termination of winding of the rope during load pulling is also required for lower pulleys to prevent their deformation, hence the technical problem, solved by the present invention, is a constructional design of a mechanism for terminating winding of the rope, said mechanism being suitable for lower pulleys. In fact, timely termination of winding is even more important in lower pulleys than in upper pulleys. During use of the upper pulley, most commonly load (logs) firstly hit the winch plate, which the user can see and terminate winding. In case of use of the lower pulley, the end part of the rope comes into contact with the pulley before the load hits the winch plate.

State of the art

[0005] Patent application EP3919427 describes a lower pulley for a forestry winch and a winch with said pulley, wherein the essence of this solution is in that it has:

- on a housing (O) of the pulley, preferably in the upper or the lower part, at least one sensor or a switch (4) is installed, said sensor or a switch (4) being arranged to terminate pulling of a load upon touch of the load with an impact element (1);
- the impact element (1) may have one or several parts and is attached to the housing (O) of the pulley in a mounting (2), so that in its extreme position the impact element (1) is pushed into or out from a sensing field of the sensor or switch (4), wherein:
- the impact element (1) has a space (1a), in which the pulling rope can run; and
- the impact element (1) is due to amortization of force of the pulled load additionally mounted in an additional mounting (11);
- and the impact element (1) is equipped with a suitable spring (3), which amortizes the pulling force and ensures a return movement of the impact element into its initial position, in which the pulling force of the load does not affect the impact element (1).

[0006] Alternatively, the additional mounting is not needed and the return movement of the impact element is achieved with a spring installed above the main mounting of the impact element.

[0007] This solution has a disadvantage that the sensor is installed in the pulley itself, which means that the cables connecting the sensor with other elements connected to control of winding and unwinding of the rope on and from the drum, respectively, are subjected to environmental factors and impacts. Particularly, problems are caused by trapping tree branches and similar objects during work, which may affect the operation of the device and may also endanger the user. The purpose of the invention is thus an upgrade of the existing lower pulley with the mechanism for terminating winding of the rope, which will address the disadvantages of known solutions.

Description of the solution to the technical problem

[0008] The present invention is based on the lower pulley, which, as described already above, differs from the upper winch pulley in the design, shape, and operation. The invention represents an upgrade of the solution described in EP3919427, as it enables placement of the sensor or the switch that interacts in the termination of the rope winding in the housing of the winch, which means that all connecting cables are securely installed in the interior and thus protected from external effects. The technical problem is solved as defined in the independent claim, while preferred embodiments of the invention are defined in the depending claims.

[0009] For fast use of the lower pulley, also called an auxiliary pulley, when the pulling rope has to be installed, a specially designed construction is required, said construction usually having a movable part, which allows access to the interior of the housing of the lower pulley, thereby allowing installation or removal of the pulling rope or the wire rope. The mechanism for terminating winding of a rope has to be designed in such a way that it allows simple opening and closing of the movable part, thus allowing access to the rope without removal of the components of the mechanism for terminating winding of the rope. A usual lower pulley comprises:

- a circular sheave arranged to receive a rope,
- a housing of the pulley shaped to correspond to the said sheave, wherein the housing has two sides, an upper curved or a multipart upper protective plate and at least one free, usually frontal part where the rope can access the sheave, and
- an attachment part for installation on a winch.

[0010] The essence of the lower pulley with the mechanism for terminating winding of the rope according to the invention is in that the sensor or the switch for terminating winding is installed in the winch housing or on the winch housing in a suitable protective housing, wherein said mechanism is designed in the following manner:

- an impact element is arranged to cover at least a part of the free part of the pulley, wherein the impact element is:
 - designed as a one- or multi-piece, preferably said element comprises a left and a right impact handle,
 - movably mounted on the housing of the lower pulley in a mounting, the return movement of which into its initial position, when the force of the load is not pushing on the impact element, is enabled with a spring installed above the mounting or a similarly functioning element, and
 - provided with a suitable opening for the pulling rope or with a suitable space for the pulling rope between both handles,
- the impact element or the impact handles, preferably the lower part of the impact element or the impact handles is connected to the rotatably mounted plate, which is either a side of the pulley housing or a separate plate rotatably installed on the side of the pulley housing, preferably in an axis between the sheave and the fixed side of the pulley housing, wherein the connection may be any suitable, preferably screwed or riveted to allow rotation or rotating movement,
- wherein the rotatably mounted plate is arranged to be in contact with the vertically movable element, which is upon movement due to rotation of the plate arranged to be sensed by the sensor or the switch

installed in the winch, and

- wherein in its extreme position a top part or a bottom part of the vertically movable element is arranged to enter or leave a sensing field of the sensor or the switch depending on the settings of the sensor or the switch configured to cause termination of rope winding.

[0011] The vertically movable element can be provided on its top section with a plate or any other similar element, which can be detected by the sensor or the switch, or the top of the movable element is provided with a protrusion, so that the protrusion extends in the direction of the winch housing or the impact plate where the sensor or the switch is installed. Said vertically movable element is thus arranged to interact with the sensor or the switch in the winch, which is hidden in the construction of the winch and the its cables are therefore not exposed to the external effects.

[0012] The contact between the rotating plate and the vertically movable element is any type of contact that ensures that upon movement of the impact element towards the winch housing and consequently rotation of the rotating plate the movable element is moved upwards or vice-versa, that upon movement of the impact element away from the winch housing (when the end part of the rope moves away from the pulley) and rotation of the rotating plate in the opposite direction, the vertically movable element is moved downwards. The preferred embodiment of the connection or the contact, respectively, is with teeth, so that the vertically movable element is on one side provided with teeth which engage with teeth provided on at least one part of the rotating plate. Instead of teeth any other element for motion transfer can be used, such as levers, handles, parallelogram mechanisms and similar, which are arranged for changing the rotational movement of the rotating plate into a linear movement of the vertically movable element.

[0013] Instead of spring the return movement of the impact element or the impact handles, respectively, any other suitable element may be used that enables return of the element or the handle in the initial position, in which there is no interaction of the pulley or at least one component thereof with the sensor or the switch for terminating winding of the rope.

[0014] In addition, the impact element may be mounted on the pulley housing in an additional mounting, which is optionally spring-supported. The additional mounting of the impact handles is preferably in the middle and can be achieved with ears on both sides of the impact element or on each handle, and ears on both sides of the housing, wherein through holes in said ears a screw with a spring is installed, wherein the position of the screw is secured with a nut. This additional mounting is preferably in the middle, but can be provided anywhere.

[0015] The impact handles are preferably provided with reinforcements, usually shaped as ribs, which decrease the possibilities of the damage to the handles

caused by forces created at the impact of the end part of the rope. The material may be any suitable material for reinforcements, which is known to the skilled person. The reinforcements may also be provided in any other shapes of the impact element, i.e. the single-part embodiment. The latter may be shaped as an element comprising a left and a right element, joined together in a single piece mounted in a single mounting.

[0016] Termination of rope winding using the above-described pulley may be achieved in two manners:

1. the vertically movable element is during winding outside of the sensing field of the sensor or the switch, wherein upon pressure of the load the impact element moves towards the winch housing, which causes rotation of the rotatably mounted plate in the clock-wise direction and consequently movement of the vertically movable element upwards, thus entering the sensing field of the sensor or the switch, which in turn activates the latter and/or terminates the circuit, which leads to termination of rope winding;
2. the vertically movable element is during winding inside of the sensing field of the sensor or the switch thus allowing winding of the rope, wherein upon pressure of the load the impact element moves towards the winch housing, which causes rotation of the rotatably mounted plate in the clock-wise direction and consequently movement of the vertically movable element upwards, thus leaving the sensing field of the sensor or the switch, which in turn activates the latter and/or terminates the circuit, which leads to termination of rope.

[0017] Alternatively, the vertically movable element and the rotatable plate may be designed in such a manner that the vertically movable element is upon pressure of the load due to rotation of the rotatable plate in the counter-clock-wise direction moved downwards. This can cause that the element comes into the sensing field or leaves the latter, which then functions in the same manner as for the embodiments described above. In case termination of winding is achieved due to movement of the vertically movable element downwards, the mounting of the impact element is provided in the bottom part, while the connection of the vertically movable element to the rotatable plate is provided in the upper part of the pulley.

[0018] In the mechanism of the pulley according to the invention any sensor may be used, preferably an inductive, a magnetic, a capacitive or an optical sensor. Sensors may be replaced by switches or similar elements for terminating a function. Preferably, inductive sensor of small dimensions is used, so that it can be entirely hidden in the housing of the pulley, wherein the usual distance of the vertically movable element to the pre-set threshold is determined based on the switch or the sensor, but is usually between 2 and 5 mm, most usually 3 mm. When the vertically movable element reaches this distance from the switch or the sensor, the latter triggers termination of

the rope winding or operation of the winch, respectively, and thus prevents damage of the winch or the wire rope. The sensor or the switch may also be installed on the winch housing, wherein the sensor or the switch is protected with a protective housing, a protective sheet metal or with a similar protective element. This option is not preferred, as the sensor can be easily subjected to environmental factors and/or impurities, which could affect its operation.

[0019] The lower pulley with the mechanism for terminating winding of the rope may be installed in any winch or tractor, wherein the winch may have one or several drums.

[0020] The lower pulley with the mechanism for terminating winding of the rope will be described in further detail based on exemplary embodiments and figures, which show:

Figure 1: The interior of the construction of the lower pulley with the mechanism for terminating winding of the rope according to a possible embodiment

Figure 2: The lower pulley according to a possible embodiment during winding, wherein the end part of the rope is not in contact with the impact element

Figure 3: The lower pulley according to a possible embodiment in the state of paused or terminated winding, wherein the end part of the rope is in contact with the impact element

[0021] The preferred embodiment of the lower pulley with the mechanism for terminating winding is shown in figure 1, but also in figures 2 and 3, wherein some components are better visible. The pulley comprises:

- a circular sheave 1 arranged to receive a rope,
- a housing 2 shaped to correspond to the shape of the sheave 1, wherein the housing 2 comprises:
 - two sides 21,
 - an upper curved or multipart protective plate 22, and
 - at least one free, usually frontal part 23, where the rope can access the sheave 1,
- an attachment element 3 for installation on a winch,
- a mechanism for terminating winding of the rope which is arranged to interact with a sensor or a switch 4 installable in a winch housing, said mechanism comprising:
 - an impact element 5, preferably shaped as a pair of impact handles, which at least partly covers the free part 23 of the housing 2, wherein the impact element 5 is movably mounted on the housing 2 of the pulley in a mounting 51,
 - wherein a part of the impact element 5 is con-

nected to a rotatably mounted plate 6, which may be one of the sides 21 of the housing 2 or a separate plate, which is rotatably installed on the side 21 of the housing 2,

wherein the rotatably mounted plate 6 is arranged to be in contact with the vertically movable element 7, which is upon movement due to rotation of the plate 6 arranged to be sensed by the sensor or a switch 4, and wherein in its extreme position a top part 72 or a bottom part of the vertically movable element 7 is arranged to enter or leave a sensing field of the sensor or the switch 4 depending on the settings of the sensor or the switch 4 configured to cause termination of rope winding.

[0022] As shown in figure 1 the impact element 5 has a suitable machine element enabling return of the element 5 into its initial position, where there is no interaction of the pulley or at least one component thereof with the sensor or the switch 4 for terminating winding of the rope, wherein the return movement of the impact element is preferably achieved with at least one spring 52.

[0023] Said sensor or switch 4 may be any suitable, preferably an inductive switch is used that is installed in the housing of the winch near the place of installation of the pulley, so that the vertically movable element 7 can move into the sensing field of the sensor or the switch 4 or leave said sensing field, respectively. Settings of the sensor or the switch 4 determine whether the movement into or movement out of the sensing field with trigger termination of winding of the rope on the winch drum.

[0024] The contact between the rotatably mounted plate 6 and the vertically movable element 7 is achieved with teeth 61, 71, so that the vertically movable element 7 is on one side provided with teeth 71, which engage and correspond to teeth 61 on at least one part of the rotatable plate 6.

[0025] Figure 2 shows the lower pulley with the mechanism, for terminating winding of the rope shown in figure 1, wherein the end part 8 of the rope is not in contact with the impact element 5. The vertically movable element 7 is during winding with its top part 72 arranged to interact with the sensor or the switch 4 in the sensing field of the sensor or the switch 4. Figure 3 shows the lower pulley in the state of paused or terminated winding, wherein the end part 8 of the rope is in contact with the impact element 5. Upon pressure of the load or the end part 8 of the rope to the impact handles, the impact element 5 is pushed towards the winch housing, which causes rotation of the rotatably mounted plate 6 in the clock-wise direction, which in turn moves the vertically movable element 7 upwards and its top part 72 leaves the sensing field of the sensor or the switch 4, thus activating and/or terminating the circuit, which leads to termination of the rope winding.

[0026] Operation of the mechanism may also be designed in a vice-versa manner, wherein in the state of

winding the upper part of the vertically movable element is outside of the sensing field, and upon pressure of the load the upper part moves in the sensing field. In this case the sensor is installed in a position higher than the position shown in figures 2 and 3.

Claims

1. A pulley for a forestry winch, said pulley comprising:

- a circular sheave (1) arranged to receive a rope,
- a housing (2) shaped to correspond to said sheave (1), wherein the housing (2) comprises:

- two sides (21),
- an upper curved or multipart protective plate (22), and
- at least one free, usually frontal part (23), where the rope can access the sheave (1),

- an attachment element (3) for installation on a winch,

- a mechanism for terminating winding of the rope which is arranged to interact with a sensor or a switch (4) installable in a winch housing, said mechanism comprising:

- an impact element (5), preferably shaped as a pair of impact handles, which at least partly covers the free part (23) of the housing (2), wherein the impact element (5) is movably mounted on the housing (2) of the pulley in a mounting (51),
- wherein a part of the impact element (5) is connected to a rotatably mounted plate (6), which may be one of the sides (21) of the housing (2) or a separate plate, which is rotatably installed on the side (21) of the housing (2), wherein the rotatably mounted plate (6) is arranged to be in contact with the vertically movable element (7), which is upon movement due to rotation of the plate (6) arranged to be sensed by the sensor or a switch (4), and wherein in its extreme position a top part (72) or a bottom part of the vertically movable element (7) is arranged to enter or leave a sensing field of the sensor or the switch (4) depending on the settings of the sensor or the switch (4) configured to cause termination of rope winding.

2. The pulley with the mechanism for terminating winding of a rope according to claim 1, wherein the connection of the rotatably mounted plate (6) and the

vertically movable element (7) is arranged for changing the rotational movement of the plate (6) into a linear movement of the vertically movable element (7), and is achieved with teeth, levers, handles, parallelogram mechanisms or any other motion transfer mechanism.

3. The pulley with the mechanism for terminating winding of a rope according to claim 2, wherein the connection of the rotatably mounted plate (6) and the vertically movable element (7) is achieved with teeth (61, 71), wherein the vertically movable element (7) is on one side provided with teeth (71) engaging with teeth (61) provided on at least one part of the rotatably mounted plate (6).
4. The pulley with the mechanism for terminating winding of a rope according to any of the preceding claims, **characterized in that** the vertically movable element (7) is at its top provided with a plate or any other element, which can be sensed by the sensor or the switch (4), or the top (72) of the vertically movable element (7) is shaped as a protrusion extending in the direction towards the winch housing, where the sensor or the switch (4) is installed.
5. The pulley with the mechanism for terminating winding of a rope according to any of the preceding claims, **characterized in that** the impact element (5) is provided with a suitable machine element enabling return movement of the element (5) into its initial position, in which there is no interaction of the pulley or at least one component thereof with the sensor or the switch (4) for terminating winding of the rope, wherein the return movement of the impact element is preferably achieved with at least one spring (52).
6. The pulley with the mechanism for terminating winding of a rope according to any of the preceding claims, **characterized in that** the impact element (5) comprises two impact handles, wherein between the handles a space is provided for allowing movement of the rope, and wherein both handles are mounted in the same mounting (51).
7. The pulley with the mechanism for terminating winding of a rope according to any of the preceding claims, **characterized in that** the rotatably mounted plate (6) is mounted in an axis (62) between the sheave (1) and the fixed side (21) of the housing (2) of the pulley.
8. The pulley with the mechanism for terminating winding of a rope according to any of the preceding claims, **characterized in that** the impact element (5) is provided with reinforcements, preferably shaped as reinforcement ribs.

9. The pulley with the mechanism for terminating winding of a rope according to any of the preceding claims, wherein the vertically movable element (7) is during winding inside of the sensing field of the sensor or the switch (4), wherein upon pressure of the load the impact element (5) is arranged to move towards the winch housing, which causes rotation of the rotatably mounted plate (6) in the clock-wise direction and consequently movement of the vertically movable element (7) upwards, thus leaving the sensing field of the sensor or the switch (4), which is activated and/or the circuit is terminated, which leads to termination of rope.
10. The pulley with the mechanism for terminating winding of a rope according to any claim from 1 to 8, wherein the vertically movable element (7) is during winding outside of the sensing field of the sensor or the switch (4), wherein upon pressure of the load the impact element (5) moves towards the winch housing, which causes rotation of the rotatably mounted plate (6) in the clock-wise direction and consequently movement of the vertically movable element (7) upwards, thus entering the sensing field of the sensor or the switch (4), which in turn is arranged to be activate the latter and/or the circuit is terminated, which leads to termination of rope winding.
11. The pulley with the mechanism for terminating winding of a rope according to any claim from 1 to 8, wherein the connection between the vertically movable element (7) and the rotatable plate (6) is provided in the upper part of the pulley, wherein the termination of winding is achieved by the vertically movable element (7) during winding being outside of the sensing field of the sensor or the switch (4), while upon pressure of the load on the impact element (5) the latter is arranged to move towards the winch housing causing rotation of the plate (6) in the counter-clock-wise direction and movement of the vertically movable element (7) downwards, so that the latter is arranged to enter the sensing field of the sensor and the switch (4), which is arranged to be activated and/or the circuit is terminated, which leads to termination of rope winding.
12. The pulley with the mechanism for terminating winding of a rope according to any of the preceding claims, **characterized in that** the switch or the sensor (4) is any suitable element for terminating winding of the rope, preferably an inductive, magnet, capacitive or optical sensor, most preferably an inductive sensor.
13. The pulley with the mechanism for terminating winding of a rope according to claim 12, **characterized in that** the inductive switch is with an electrical conductor connected to an electromagnetic valve, which

in case of activation of the mechanism for terminating winding of the rope interrupts winch operation or winding of the rope, respectively.

14. A forestry winch with the pulley with the mechanism for terminating winding of a rope according to any of the preceding claims. 5
15. The forestry winch with the pulley with the mechanism for terminating winding of a rope according to the preceding claim, **characterized in that** the sensor or the switch (4) for interacting in the termination of winding of the rope is installed in the interior of the winch, namely behind a protective plate near the installation place of the pulley, or on the winch housing, wherein the sensor or the switch is protected with a protective housing, a protective sheet metal or with a similar protective element. 10 15

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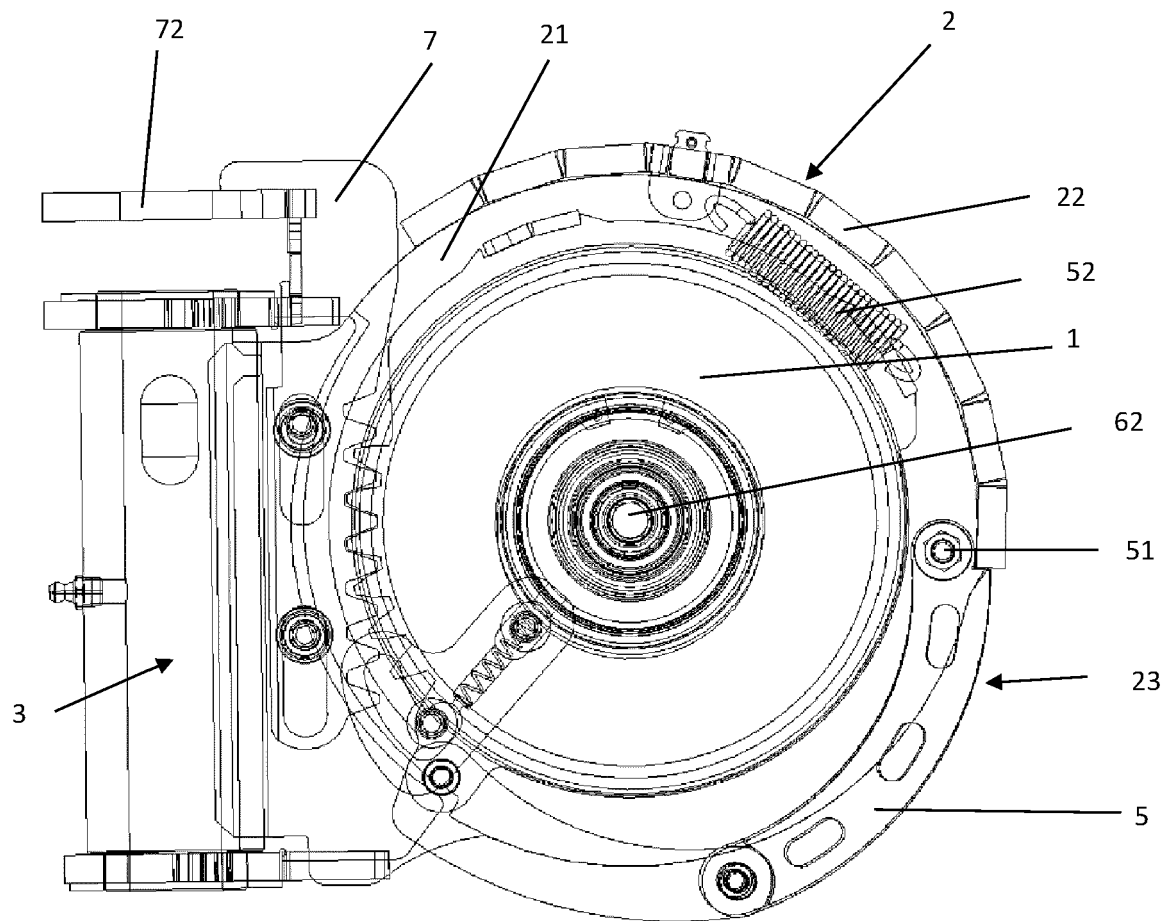


Figure 1

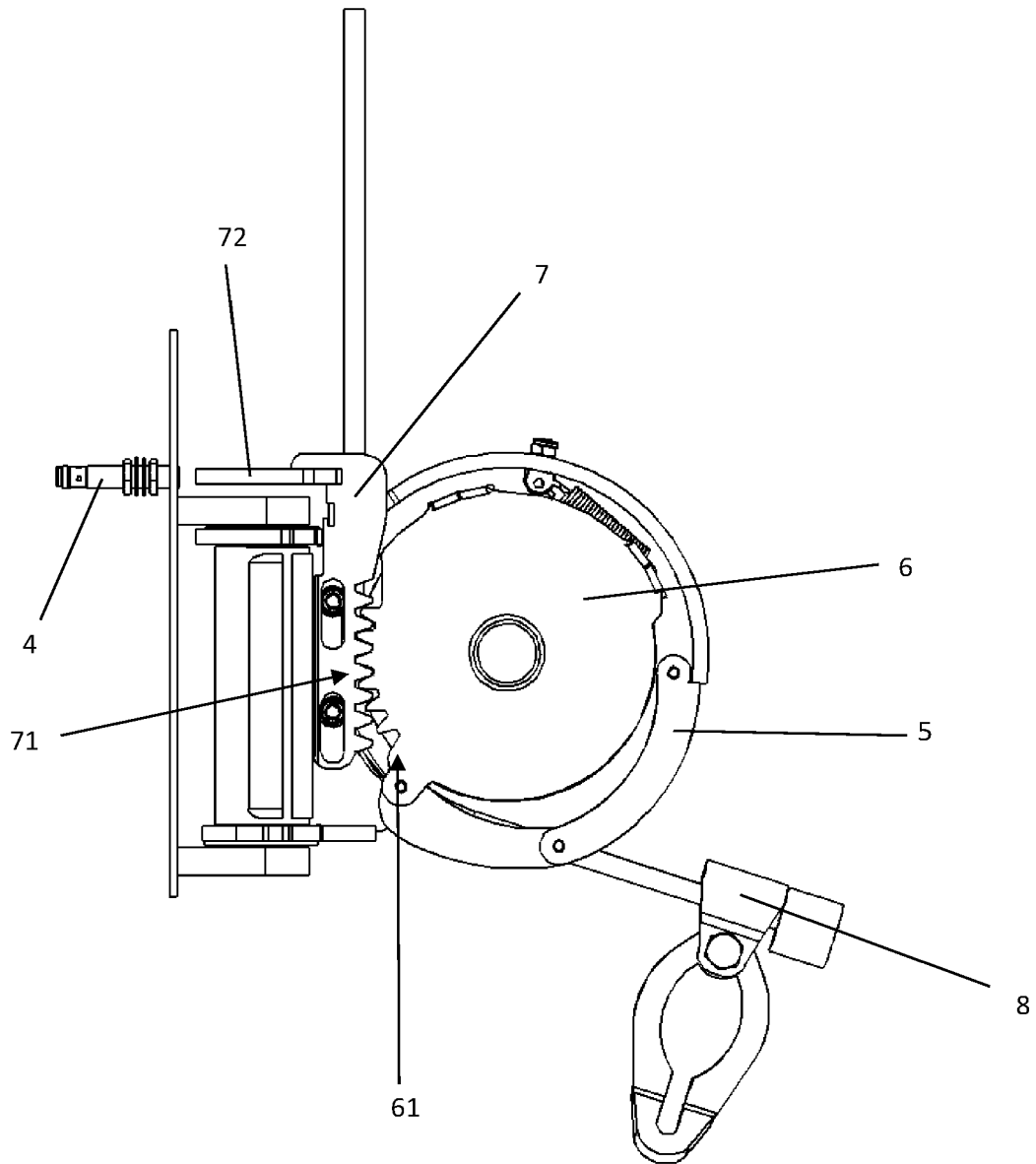


Figure 2

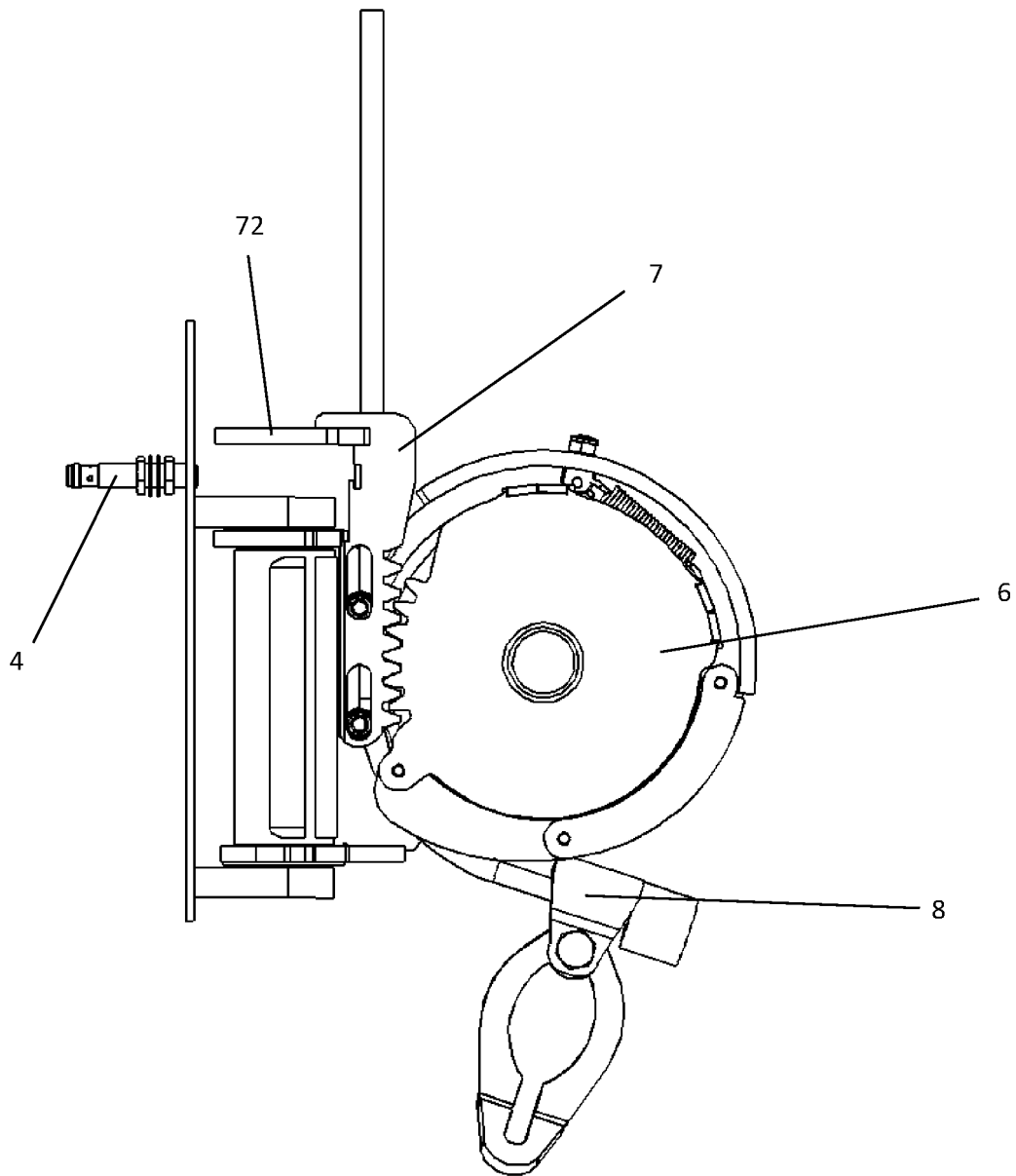


Figure 3



EUROPEAN SEARCH REPORT

Application Number

EP 23 21 0477

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X,D	EP 3 095 748 A1 (PISEK VITLI KRPAN DOO [SI]) 23 November 2016 (2016-11-23)	1, 2, 4, 5, 7-13	INV. B66D1/56
Y	* paragraph [0010] - paragraph [0016]; figures *	6, 14, 15	B66D3/24
Y,D	EP 3 919 427 A1 (PISEK VITLI KRPAN DOO [SI]) 8 December 2021 (2021-12-08)	6, 14, 15	
	* paragraph [0016] - paragraph [0020]; figures *		
A	CN 114 233 020 A (MEDIUM IRON 24 BUREAU GROUP LTD COMPANY ET AL.) 25 March 2022 (2022-03-25)	3	
	* abstract; figures 2, 3 *		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC)
			B66D
Place of search		Date of completion of the search	Examiner
The Hague		21 March 2024	Popescu, Alexandru
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 23 21 0477

5

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21-03-2024

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 3095748 A1	23-11-2016	EP 3095748 A1	23-11-2016
		SI 24997 A	30-11-2016
		SI 3095748 T1	31-01-2018
EP 3919427 A1	08-12-2021	EP 3919427 A1	08-12-2021
		SI 26002 A	30-11-2021
CN 114233020 A	25-03-2022	NONE	

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EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- EP 3095748 B1 [0003]
- SI 25045 [0003]
- SI 25043 [0003]
- EP 3919427 A [0005] [0008]