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(54) **DEVICE FOR AUTOMATIC LOWERING AFTER A FALL ARREST AT HEIGHT**

(57) The subject of the invention is the device for automatic lowering after a fall arrest at height in manual and remote version.

The device is equipped with a body with load-carrying elements for components (1), rotary rope drum (4) with self-braking mechanism wherein the supporting element (7) of the ratchet elements (5) of the rope drum (4) is located on the axle (2) in the gear (6) locked by means of a gear lock (10) located on the axle (9) with an arm held by a clamp consisting of two parts, fixed support part (11) with absorbing cushion (12) as well as pressure and rotary part (13) with absorbing cushion (14) locked with a tilting bolt (15) connected with a lock release (16) coupled with the control module (17). In the manual version, the control module (17) consists of a control rope (22) dispenser (21) having a double bottom with a spring, closed with a flap and secured with an electro-lock (23) being a part of the control system coupled with an electrical system that includes the top catch (24) equipped with a terminal switch (25) closing the electrical circuit connecting the supply source (26) with an electronic system, being a time delay (27) actuating the electro-lock (23) of the flap of the control rope (22). In the remote control version, the control module (17) is equipped with a wireless receiver (27) coupled with an electrical system consisting of a top catch (24) fitted with a terminal switch (25) closing the electrical circuit between the supply source (26) and the electronic system being a time delay (27) for the lock release (16).

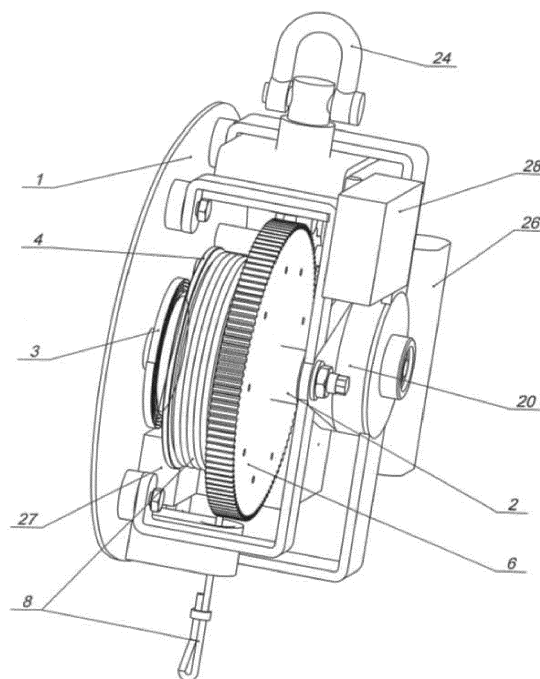


Fig. 1

## Description

**[0001]** The subject of the invention is a device for automatic lowering after fall arrest at height, used especially as a personal protective equipment by workers working at height.

**[0002]** Various types of rope arrays with braking blocks and friction brakes are known in the high altitude rescue operations. Such systems necessitate intervention of third parties, they are additionally complemented with air cushions, platforms, mats, etc. Automatic rescue braking devices known from Polish patent application No. 212484 filed in 28.08.2006, comprises internal load-carrying structure and external C-beam tilting housing, rotary connected with each other via a transverse axle. In the internal load-carrying structure a pressing lever is pivotably located on a top axle that act, via a load-carrying lever, on a face plate controlling the motion of a rescue tape within a guide formed by the internal wall of the external C-beam tilting housing and the face plate surface. The side walls of the external C-beam tilting housing is fitted with notches on both sides receiving the top axle and bottom axle with a grip equipped with a return spring co-operating with the other end of the bottom axle. Middle axle with the load-carrying lever installed is located between the top axle and the bottom axle of the internal load-carrying housing. The pressing lever has two projections that are rectangular and oriented inwards and being in contact at top edges with notches made in the load-carrying lever that control the degree of pressure on the rescue tape. During the first stage of self-evacuation directed vertically downwards, the device allows for using the force of gravity that unlocks the pressure lever locked on the rescue tape at the moment of a jump and while unlocked, it allows lowering down the rescue tape in a way that limits the lowering speed to a safe level.

**[0003]** Polish patent application P.408397 filed in 2 June 2014 discloses a device for automatic lowering after a fall arrest that consists of a body with fixed elements for components, axles wherein one of them is fitted with a rope drum with a wound rope and a rack and the other with a centrifugal and disk brake with a rack. The racks represent a transmission from the drum to brake system that cooperates with a control system consisting of a dispenser with a control rope and a flap. The dispenser has a double bottom with extension spring. The whole is coupled with an electrical system supplied from a power pack and coupling pin connected via a terminal switch transmitting an electrical system to an electronic system being a time delay actuating an electro-bolt upon a set time delay. The power pack is supplied from the power supply network or a battery-accumulator system. The load-carrying elements are fitted with a catch used to suspend the device to an anchoring point over a place of work. Rope or tape wound on the rope drum can be wound or unwound using a spring in normal mode of operation, however during a fall, drum rotation is stopped and the device switches to an emergency mode with an ejection

of a control rope. Pulling the ejected control rope releases the disk brake calliper and the process of lowering at speed controlled by the centrifugal brake starts.

**[0004]** There are self-braking devices known in the art and used as fall arrest systems wherein the acceleration of unwinding of the rope wound on the drum causes it to stop and therefore the fall to arrest. Rescue procedure consists in time-consuming approach to a person suspended on a locked device, its reception and safe lowering.

**[0005]** The object of the invention it to provide a device for automatic lowering after a fall arrest that eliminates drawbacks of known solutions. Moreover the objective of the invention is to allow immediate rescue operations in a situation after a fall arrest at height without taking an excessive risk by a rescuer.

**[0006]** The above is achieved by a device for automatic lowering after a fall arrest at height that was made in manual and remote version. Device for automatic lowering after a fall arrest at height includes a body with fixed load-carrying elements for components, rotary rope drum with self-braking mechanism, wherein a supporting element of a ratchet elements of the rope drum is located on an axle in a gear locked by means of a gear lock located on an axle with an arm held by a clamp consisting of two parts, fixed support part with absorbing cushion as well as pressure and rotary part with absorbing cushion locked with a tilting bolt connected with a lock release coupled with a control module. In a manual version, the control module consists of a control rope dispenser having a double bottom with a spring, closed with a flap and secured with an electro-lock being a part of a control system coupled with an electrical system that includes a top catch equipped with a terminal switch closing an electrical circuit connecting a supply source with an electronic system, being a time delay actuating the electro-lock of the flap of the control lock. In the remotely controlled version, the control module is equipped with a wireless receiver coupled with an electrical system consisting of a top catch equipped with a terminal switch closing the electrical circuit between a supply source and an electronic system being a time delay for the lock release. The used time delay is necessary to differentiate between a situation of accidental loading the device and actual life threatening situation. Long-term, for example 40 second, loading of the device in case of a fall arrest at height results in switching the device from stand-by mode to rescue mode. Safe lowering of a person endangered to fall at height is possible already within the first minute from the occurrence of a dangerous situation.

**[0007]** The invention is presented in embodiments on the drawing, wherein, fig. 1 presents an axonometric view of the device, whereas fig. 2 presents cross-section of the device in manual version, and fig. 3 presents a variant with remote control.

**[0008]** The device for automatic lowering after a fall arrest will be described in two embodiments.

**[0009]** According to the first embodiment, the device

consists of a body with load-carrying elements for components 1, wherein on a first axle 2 is located a return spring 3, rope drum 4 with ratchet elements 5 and locked gear 6 with supporting elements 7 for rotary ratchet elements 5 of the rope drum 4. Rope or tape 8 wound on the drum 4 can freely wind or unwind by means of a spring 3 during slow rotation of the drum 4 in normal operation mode. On a second axle 9 is located a gear lock 10 with locked arm in a clamp consisting of a fixed support part 11 with absorbing cushion 12 and the other pressure and rotary part 13 also with absorbing cushion 14 locked from the top by means of a bolt 15 connected with a lock release 16 coupled with a control module 17. On a third axle 18 is located a rack 19 that represents transmission of rotation from the gear 6 to the centrifugal brake 20 decelerating the lowering operation in a rescue mode after release of the lock 10. The control module 17 consists of a control rope 22 dispenser 21 having a double bottom with a spring. The control rope 22 wound in the dispenser 21 is closed with a flap secured with an electro-lock 23 that is a control system coupled with the electrical system. The electrical system includes the top catch 24 with a terminal switch 25 closing the electrical circuit between the supply source 26 and the electronic system being a time delay 27 actuating the electro-lock 23 of the flap of the control rope 22 after a set time delay by means of an electric pulse (for example 40 seconds after arresting fall at height). Electric pulse generated in the electro-lock 23 causes the flap to open and to eject the control rope 22. Pulling the ejected control rope 22 removes the lock from the gear 6 and the process of lowering at speed controlled by the centrifugal brake 20 starts.

**[0010]** According to the second embodiment, the control module 17 is equipped with wireless receiver 28 coupled with the electrical system consisting of the top catch 24 with a terminal switch 25 closing the electrical circuit between the supply source 26 and the electronic system being the time delay 27 allowing for switching from the stand-by mode to rescue mode after a set time delay by transmitting an electric voltage from the transmitter to the control receiver 28.

**[0011]** At the moment the device switches to the rescue mode, it is ready to receive a remote signal from the transmitter held by a person assisting and supervising the works, causing immediate reaction of the lock release 16 causing the bolt 15 to tilt and releasing the arm of the lock 10 from clamp parts 11 and 13 in order to allow automatic lowering of a sufferer with controlled speed using the centrifugal brake 20.

rope drum (4) is located on an axle (2) in a gear (6) locked by means of a gear lock (10) located on an axle (9) with an arm held by a clamp consisting of two parts, fixed support part (11) with absorbing cushion (12) as well as pressure and rotary part (13) with absorbing cushion (14) locked with a tilting bolt (15) connected with a lock release (16) coupled with a control module (17).

2. Device according to claim 1 **characterized in that** the control module (17) consists of a control rope (22) dispenser (21) having a double bottom with a spring, closed with a flap and secured with an electro-lock (23) being a part of the control system coupled with an electrical system that includes a top catch (24) equipped with a terminal switch (25) closing an electrical circuit connecting a supply source (26) with an electronic system, being a time delay (27) actuating the electro-lock (23) of the flap of the control rope (22).
3. Device according to claim 1 **characterized in that** the control module (17) is equipped with a wireless receiver (27) coupled with an electrical system consisting of a top catch (24) equipped with a terminal switch (25) closing the electrical circuit between a supply source (26) and an electronic system being a time delay (27) for the lock release (16).

## Claims

1. The device for automatic lowering after a fall arrest at height equipped with a body with load-carrying elements for components, rotary rope drum with self-braking mechanism **characterized in that** a supporting element (7) of a ratchet elements (5) of the

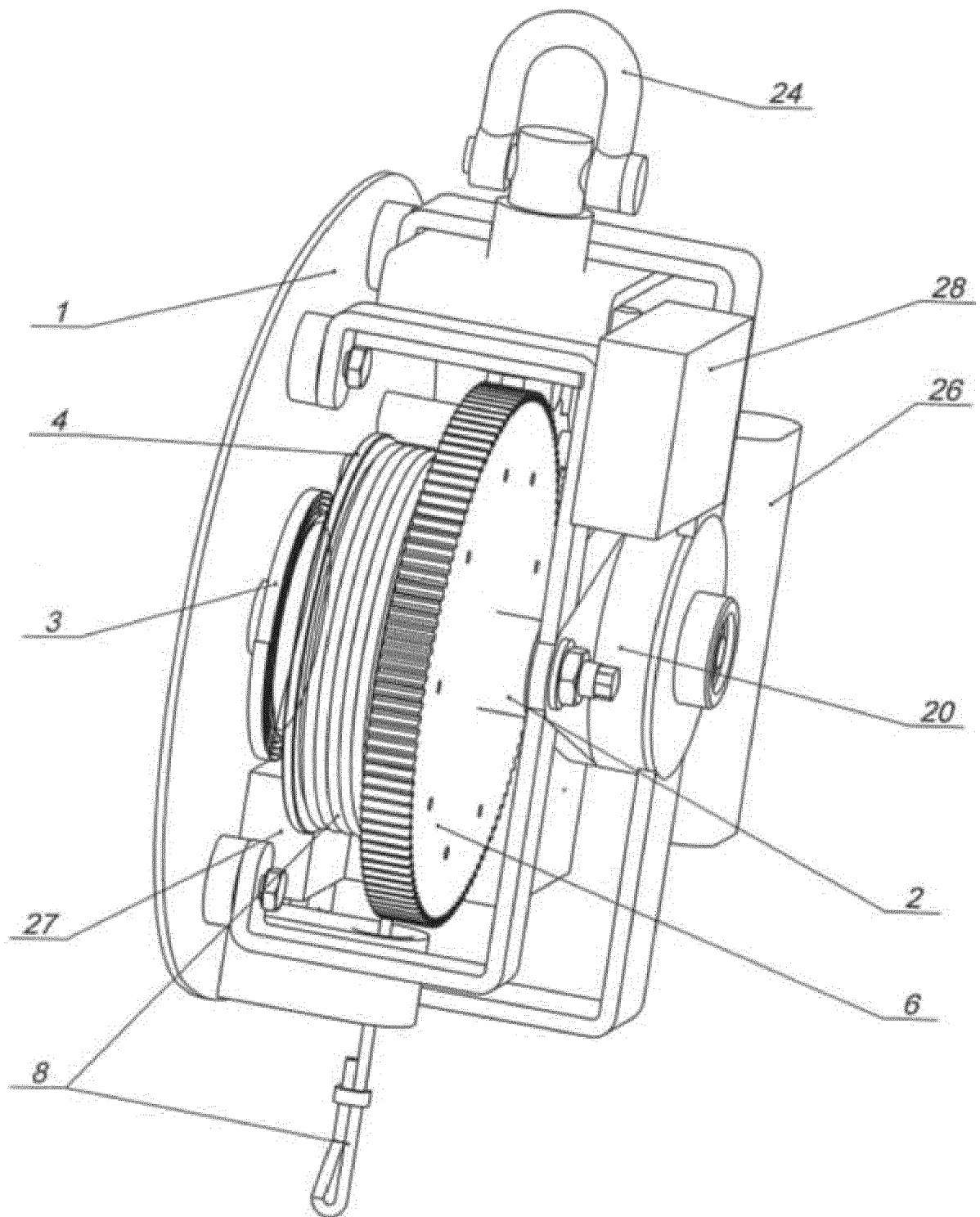


Fig. 1

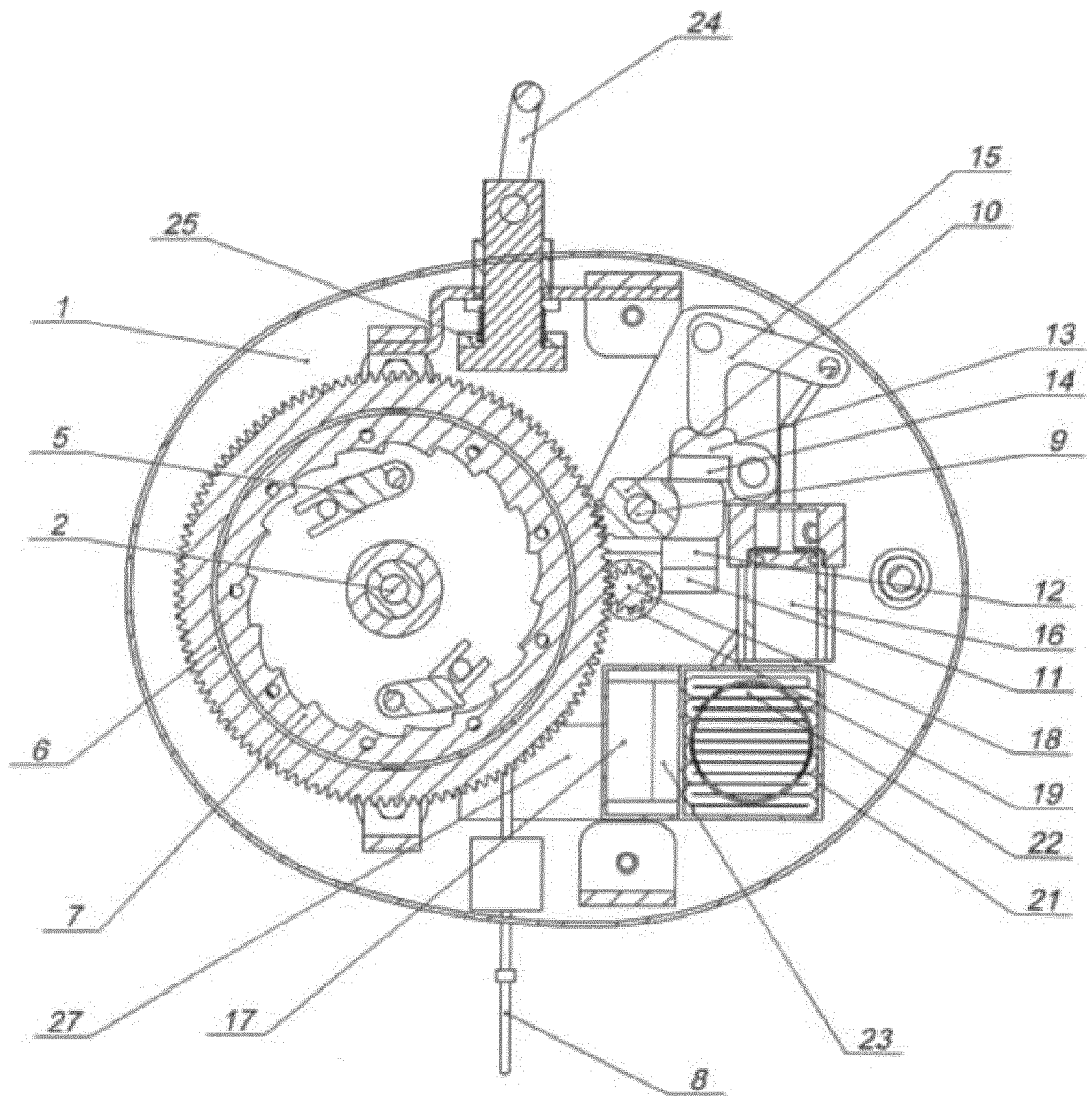


Fig. 2

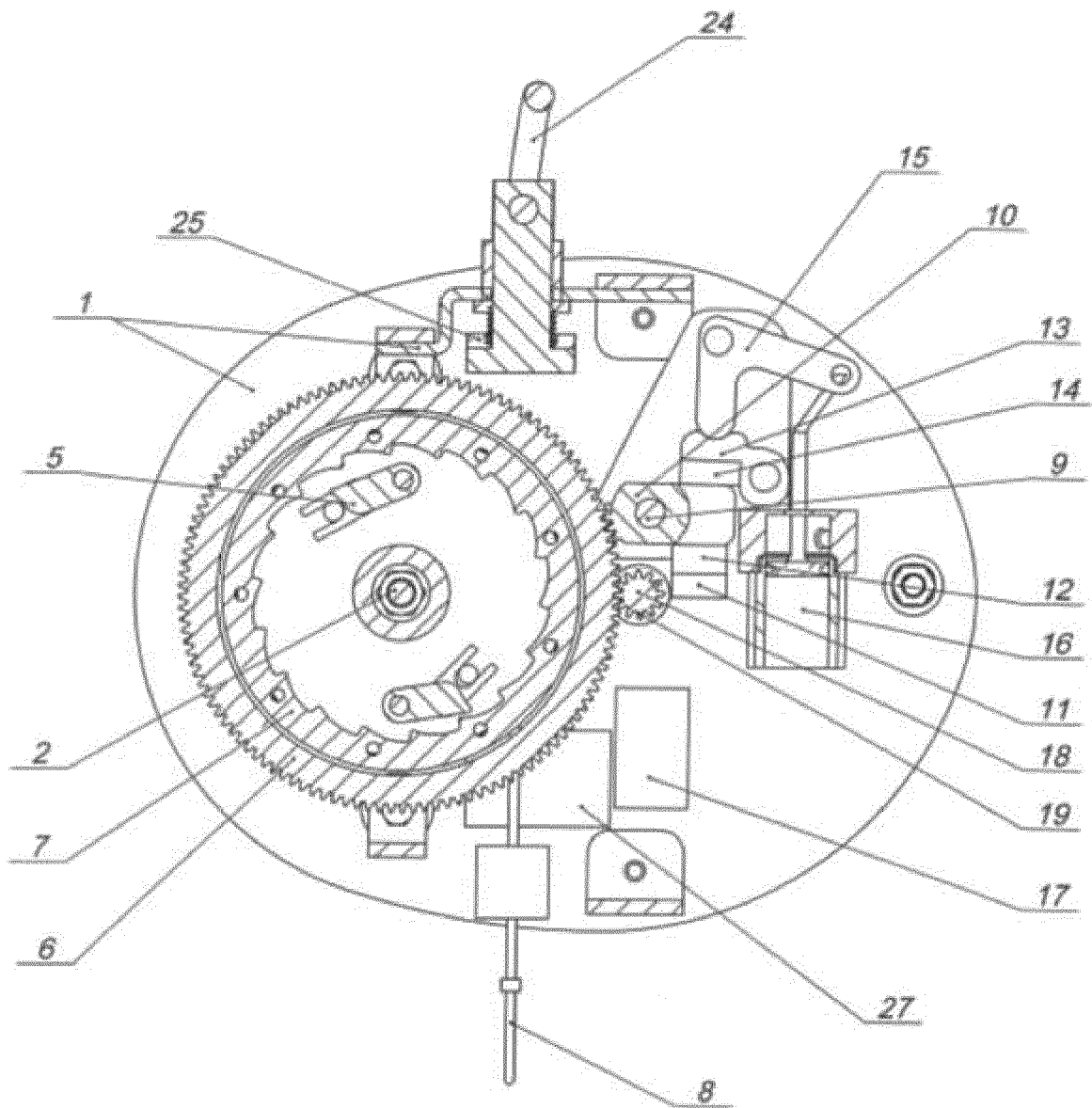


Fig. 3



## EUROPEAN SEARCH REPORT

Application Number  
EP 19 17 4457

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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 9 September 2019	Examiner Andlauer, Dominique
<p>CATEGORY OF CITED DOCUMENTS</p> <p>X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document</p> <p>T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ..... &amp; : member of the same patent family, corresponding document</p>			

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 19 17 4457

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