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### (54) SAFETY MECHANISM FOR MANUAL CUTTING MACHINES

SICHERHEITSVORRICHTUNG FÜR HANDSCHNEIDMASCHINEN

MÉCANISME DE SÉCURITÉ POUR MACHINES DE COUPE MANUELLES

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## Description

### Field of the invention

**[0001]** The present invention relates to a safety mechanism for manual cutting machines, such as chain-saws or mechanical saws, circular saws, jigsaws, grinders, motor grinders, etc., especially designed to act in the event of an accident from an involuntary reaction of the user, according to the preamble of claim 1. Such a safety mechanism is known from the document US 8 661 951 B2.

### Background of the invention

**[0002]** Manual cutting machines of the indicated type usually consist of a cutting element (toothed chain, disc, saw blade, etc.) actuated by a motor that makes it move (turn, rotate, advance, retreat, etc.) at a high speed. Said motors are usually petrol or electric motors, in the latter case being able to be powered by means of cables or batteries. A throttle trigger connected to the motor enables the user or operator to accelerate or decelerate the motion of the cutting element in order to increase or decrease the speed thereof respectively.

**[0003]** The operation of these cutting machines requires certain practice and experience in order to reduce the risk of accidents, which can be caused by various causes (bouncing, losing control of the machine, the machine and/or the user falling, carelessness, etc.) and that, in many cases, tend to cause cuts, incisions and/or serious injuries to the user. Such that, the most expert users are not exempt from risk when using this type of machines.

**[0004]** Currently, various safety mechanisms for manual cutting machines are known, aimed at protecting users against such situations. The purpose of most of these mechanisms is to stop the cutting element instantaneously, one of the most common being the use of a safety lever which, when activated by the user, causes the locking of said cutting element. However, there are other safety mechanisms of different operation, such as; throttle trigger lock to prevent the accidental actuation thereof, physical protectors to prevent contact with the movable parts of the machine, etc. On many occasions, these machines additionally incorporate more than one of these mechanisms for greater safety.

**[0005]** Document US2010218388A1 shows an example of this type of machine. Specifically, a chainsaw having a safety mechanism which comprises a centrifugal clutch, a brake drum and a strap arranged around said brake drum. The centrifugal clutch is configured to intermesh with and rotate the brake drum in order to enable the advancement of the cutting chain. The strap is configured to contract on the brake drum, in order to immobilise it, instantaneously locking the motion of the chain. The activation of said safety mechanism occurs in two different ways. The first one by means of a safety lever

which, actuated by the user themselves in a risky situation, enables the strap to be contracted on the brake drum. The second one occurs when the user releases the throttle trigger.

**[0006]** Despite these redundant safety measures, current cutting machines do not take into account the reaction of the human body in the event of an accident, which responds to external stimuli and generates an unpredictable response by means of the autonomic nervous system. This involuntary response in the event of an accident can render the safety systems so far installed on these machines ineffective.

**[0007]** One of these involuntary reactions is to press the throttle trigger to the maximum, instead of releasing it, wherein this reaction is usually caused by a risk of the user falling and/or by a sudden/uncontrolled motion of the machine, among other situations. In the event of a fall, for example, the human body tends to unconsciously analyse the surroundings thereof in order to grasp something with the hands to prevent the fall, this involuntary act being the one that causes the user to hold tightly to the handle of the machine, as a reflex action to prevent the fall, pressing the throttle trigger to the maximum and, thus, accelerating the chain to the maximum. With this, the damage produced during the accident is usually much more serious. Often, these involuntary reactions prevent the user from reacting in a more rational way, for example, by pushing the safety lever with the free hand.

**[0008]** The present invention solves the aforementioned problem, thanks to a safety mechanism for manual cutting machines, specially designed to lock the cutting element when a user unconsciously reacts to a risky situation by pressing the throttle trigger to the maximum. Said safety mechanism results in an additional and/or complementary safety measure to those usually present in current cutting machines.

### Description of the invention

**[0009]** The safety mechanism of the present invention is especially applicable in manual cutting machines, such as chainsaws or mechanical saws, circular saws, jigsaws, grinders, motor grinders, etc., either as a serial mechanism integrated in newly manufactured machines, or for it to be assembled in existing machines.

**[0010]** These cutting machines are of the type that comprise at least one cutting element and a motor configured to move said cutting element. Said cutting element can be a toothed chain, a saw blade, a grinding disc, a hacksaw blade, etc. the motion of which can be movement that is rotary or rotational, translational forwards or backwards, etc., depending on the case. In turn, the motor may be a petrol or diesel combustion motor, an electric motor powered by means of cable and/or battery, etc. These types of cutting machines usually have a portable nature, usually having a handle for the handling and transport thereof by the user.

**[0011]** The safety mechanism comprises:

- a throttle trigger connected to the motor, normally arranged in the handle of the cutting machine, configured to accelerate the motion of the cutting element when pulled by a user; and
- a locking device configured to lock the cutting element.

**[0012]** The safety mechanism of the present invention is characterised in that the throttle trigger has:

- a first path starting from a rest position with the throttle trigger released to a safety position, which enables the motion of the cutting element to be accelerated when the throttle trigger is pulled from the rest position to the safety position; and
- a second path that occurs after the first path, which enables the locking device to be activated in order to lock the cutting element by continuing to pull the throttle trigger once the safety position has been exceeded.

**[0013]** Thus, the throttle trigger has a double path, wherein the first path performs the function of accelerating the motor, while the second path enables the locking device to be actuated in order to instantaneously brake the chain when the throttle trigger is pulled to the maximum by an involuntary reaction of the user as a consequence of a risky and/or accidental situation.

**[0014]** Therefore, during the first path a connection occurs between the position of the throttle trigger and the motor, from a rest position with the throttle trigger released, in other words, without receiving any pressure from the user, to a safety position wherein the motion of the cutting element is at the maximum, said motion accelerating from the rest position to the safety position as the pressure exerted by the user on the throttle trigger increases.

**[0015]** Moreover, during the second path a connection occurs between the position of the throttle trigger and the locking device wherein, once the safety position has been exceeded, the activation of the locking device occurs to instantaneously stop the motion of the cutting element when the user continues to pull the throttle trigger once the safety position has been reached.

**[0016]** The first path and the second path occur sequentially as the pressure exerted by the user on the throttle trigger increases, wherein the first path starts from a rest position with the throttle trigger released, while the second path ends in a final position with the throttle trigger pulled to the maximum or fully pulled.

**[0017]** Preferably, the throttle trigger is configured to activate the locking device during the second path by means of electrical, mechanical, electromechanical or hydraulic means, and/or possible combinations thereof.

**[0018]** Moreover, the deactivation of the locking device can be carried out by means of various electrical, mechanical, electromechanical or hydraulic means, and/or possible combinations thereof, starting from a manual

action exerted by the user himself once the situation of risk and/or danger has been controlled. Preferably, the locking device comprises a deactivation element configured to unlock the cutting element when manually actuated by the user once said locking device has been activated. Said deactivation element may adopt the form of a lever, handle, button, push button, etc. Likewise, it can be an element and/or component incorporated in the very locking device of the machine, and/or a complementary and/or additional element thereto.

**[0019]** The locking device may adopt various embodiments to the extent that they enable the cutting element to be instantaneously locked after the activation of said locking device.

**[0020]** According to a preferred embodiment, the locking device comprises:

- a clutch having a traction pinion configured to intermesh with the cutting element and a brake drum joined to said traction pinion; and
- a strap arranged around the brake drum, configured to contract on said brake drum and immobilise same in order to lock the cutting element.

**[0021]** Preferably, the locking device comprises:

- a lever joined to the strap, preferably at a free end thereof, enabling said strap to contract on the brake drum when actuated by the user in one direction, and to expand and/or release said strap when actuated by the user in an opposite direction in order to release the brake drum.

**[0022]** In this case, the lever of the very locking device acts directly as a deactivation element of the safety mechanism of the present invention, regardless of whether other complementary and/or additional deactivation elements are incorporated.

**[0023]** According to an embodiment of mechanical operation of the safety mechanism of the present invention, this comprises an actuating rod having:

- a first end configured to be pushed by the throttle trigger during the second path; and
- a second end connected to the locking device.

**[0024]** Wherein said actuating rod is configured to activate the locking device when the throttle trigger pushes the first end once the safety position has been exceeded.

**[0025]** Preferably, the second end is joined to a free end of the strap, while said actuating rod is configured to contract the strap on the brake drum when pushed by the throttle trigger during the second path.

**[0026]** Preferably, the actuating rod comprises a helical spring on the first end. The function of said helical spring is mainly to keep the actuating rod in the rest state thereof when the locking device is deactivated, in other

words, in the suitable place to be able to be pushed by the throttle trigger. In the event of an accident, and as an involuntary response from the operator, the latter exerts sufficient force to overcome the spring and actuate the locking device.

**[0027]** Preferably, the throttle trigger comprises an actuating pin configured to push the first end of the actuating rod during the second path. Said actuating pin makes it possible to overcome the force of the helical spring and move the actuating rod linearly, making the strap contract in order to stop the clutch and thus causing the cutting element of the machine to brake immediately.

**[0028]** According to an embodiment of electromagnetic operation of the safety mechanism of the present invention, this comprises:

- an electromagnetic actuator configured to activate or deactivate the locking device when receiving an electrical current;
- a power source configured to supply said electrical current to the electromagnetic actuator; and
- a first push button and a second push button connected to the throttle trigger and interposed in the electrical circuit between the power source and the electromagnetic actuator, configured to enable said electrical current to be received by the electromagnetic actuator or to shut it off based on the position of the throttle trigger.

**[0029]** Preferably, the electromagnetic actuator is a linear motion electromagnet, which has a shaft or bolt configured to extend linearly when receiving an electrical current.

**[0030]** Preferably, the electromagnetic actuator is configured to contract the strap on the brake drum and immobilise same in order to lock the cutting element. This is carried out by means of the shaft or bolt that, joined to the free end of the strap, enables same to be pulled when it moves linearly when receiving the electrical current.

**[0031]** Preferably, the throttle trigger comprises:

- a first leg configured to press the first push button in the rest position in order to keep the locking device activated in said rest position; and
- a second leg configured to press the second push button once the safety position is exceeded, to keep the safety mechanism activated once said safety position has been exceeded.

**[0032]** With this system, two functions are achieved. The first one is the objective of preventing the operator from having an accident and, the second one, that the cutting unit or element of the cutting machine is locked whenever the operator is not using it.

**[0033]** In turn, the legs are configured not to press the push buttons during the first path, in order to keep the locking device deactivated between the rest position and

the safety position. Therefore, enabling the acceleration of the cutting element during said first path.

**[0034]** Preferably, the safety mechanism comprises:

- a first spring arranged between the first push button and the first leg; and
- a second spring arranged between the second push button and the second leg.

**[0035]** Wherein the second spring is configured to keep the throttle trigger in the rest position when it is released, in other words, when it is not being pulled by the user.

**[0036]** According to an embodiment of hydraulic operation of the safety mechanism of the present invention, this comprises:

- a first hydraulic actuator configured to activate or deactivate the locking device when receiving the pressure of a hydraulic fluid;
- a hydraulic pipe configured to supply the pressure of said hydraulic fluid to the first hydraulic actuator; and
- a second hydraulic actuator connected to the throttle trigger and in hydraulic communication with the hydraulic pipe, configured to enable the pressure of said hydraulic fluid to be supplied to the first hydraulic actuator or to shut it off based on the position of the throttle trigger.

**[0037]** Preferably, the hydraulic actuators are linear motion hydraulic cylinders, of the type that have a hydraulic piston configured to extend linearly when receiving the pressure of a hydraulic fluid.

**[0038]** Preferably, the first hydraulic actuator is configured to contract the strap on the brake drum and immobilise same in order to lock the cutting chain. This is carried out by means of the hydraulic piston that, joined to the free end of the strap, enables the same to be pulled when it moves linearly when receiving the pressure of a hydraulic fluid.

**[0039]** Preferably, the throttle trigger comprises an actuating pin configured to press the second hydraulic actuator once the safety position has been exceeded, enabling the pressure of the hydraulic fluid to be supplied to the first hydraulic actuator through the hydraulic pipe in order to keep the locking device activated once said safety position has been exceeded.

**[0040]** Preferably, the safety mechanism comprises a helical spring arranged between the hydraulic piston and the throttle trigger. The function of said helical spring is mainly to keep the hydraulic piston in the rest state thereof when the locking device is deactivated, in other words, in the suitable place to be able to be pressed by the actuating pin of the throttle trigger. In the event of an accident, and as an involuntary response from the operator, the latter exerts sufficient force to overcome the spring and actuate the locking device.

**[0041]** According to an embodiment of electrical opera-

tion of the safety mechanism of the present invention, it comprises two switches and/or push buttons of the limit switch type connected to the rest, work and safety positions of the throttle trigger. Such that, when said limit switches are activated in any of said positions, they act by opening or closing an electrical circuit which, in turn, powers other elements connected to the safety mechanism, the locking mechanism and/or the motor that transmits the motion to the cutting element. This enables the motion of the cutting element until the safety position is reached, or instantaneously locking same by continuing to pull the throttle trigger once the safety position has been exceeded.

**[0042]** The safety mechanism of the present invention, for any of the previously described embodiments, may be part of a newly manufactured manual cutting machine, as a serial element integrated therein, or it can be assembled in existing machines by performing the necessary adjustments and/or adaptations, both structural (housing, grip, etc.) and functional (throttle trigger, mechanisms, motor, etc.).

**[0043]** The present invention also relates to a manual cutting machine, such as a chainsaw or mechanical saw of the type used to cut trees and wood, a circular saw, a jigsaw, a grinder, a motor grinder, etc., comprising the previously described safety mechanism. Wherein said manual cutting machine comprises at least one cutting element (toothed chain, disc, saw blade, etc.) actuated by a motor that makes it move (turn, rotate, advance, retreat, etc.) at a high speed. Wherein said motor may be a petrol or electric motor, in the latter case being able to be powered by means of cables and/or one or more batteries. Wherein said cutting machine further has a throttle trigger connected to the motor which enables the user or operator to accelerate or decelerate the motion of the cutting element in order to increase or reduce the speed thereof respectively.

#### Brief description of the drawings

**[0044]** What follows is a very brief description of a series of drawings that aid in better understanding the invention and which are expressly related to three embodiments of said invention that are presented by way of non-limiting examples of the same.

Figure 1 represents a schematic perspective view of the safety mechanism of the present invention incorporated into a chainsaw, according to a first embodiment.

Figure 2 represents a partially cross-sectional schematic side view of the safety mechanism of the present invention incorporated into a chainsaw, according to a first embodiment, in the rest position.

Figure 3 represents a partially cross-sectional schematic side view of the safety mechanism of the present invention incorporated into a chainsaw, according to a first embodiment, in the safety position.

Figure 4 represents a partially cross-sectional schematic side view of the safety mechanism of the present invention incorporated into a chainsaw, according to a second embodiment, in the rest position. Figure 5 represents a partially cross-sectional schematic side view of the safety mechanism of the present invention incorporated into a chainsaw, according to a second embodiment, in the safety position.

Figure 6 represents a schematic perspective view of the safety mechanism of the present invention incorporated into a chainsaw, according to a third embodiment.

Figure 7 represents a partially cross-sectional schematic side view of the safety mechanism of the present invention incorporated into a chainsaw, according to a third embodiment, in the rest position. Figure 8 represents a partially cross-sectional schematic side view of the safety mechanism of the present invention incorporated into a chainsaw, according to a third embodiment, in the safety position.

#### Detailed description of the invention

**[0045]** Figures 1, 2 and 3 show various schematic views of the safety mechanism (1) of the present invention in a manual cutting machine, in this case a chainsaw, according to a first embodiment of mechanical operation of said safety mechanism (1).

**[0046]** As seen in Figure 1, said chainsaw comprises a cutting element (2) of the toothed chain type, and a motor (3) configured to move said cutting element (2).

**[0047]** The safety mechanism (1) comprises:

- a throttle trigger (4) connected to the motor (3), arranged in the handle of the cutting machine, configured to accelerate the motion of the cutting element (2) when pulled by a user; and
- a locking device (5) configured to lock the cutting element (2).

**[0048]** According to the present example, optionally, the throttle trigger (4) is connected to an additional safety element in the form of an unlocking push button (44), such that in order to enable the actuation of the very throttle trigger (4), the user has to necessarily keep the unlocking push button (44) pressed at the same time. Said action is performed with the same hand with which the throttle trigger (4) is pulled, for which reason both elements (4, 44) are arranged in the handle within reach of said same hand. If the unlocking push button (44) is released, or if it is not pulled sufficiently, the throttle trigger (4) stays locked, the motion of the cutting element (2) not being able to be accelerated.

**[0049]** According to the present example, the locking device (5) comprises:

- a clutch (6) having a traction pinion (61) configured to

intermesh with the cutting element (2) and a brake drum (62) joined to said traction pinion (61); and

- a strap (7) arranged around the brake drum (62), configured to contract on said brake drum (62) and immobilise same in order to lock the cutting element (2).

**[0050]** The locking device (5) comprises:

- a lever (52) joined to the free end (71) of the strap (7), enabling said strap (7) to contract on the brake drum (62) when actuated by the user in one direction, and to expand and/or release said strap (7) when actuated by the user in an opposite direction in order to release the brake drum (62).

**[0051]** In this case, the lever (51) of the very locking device (5) acts directly as a deactivation element (51) of the safety mechanism (1) of the present invention, regardless of whether other complementary and/or additional deactivation elements (51) are incorporated.

**[0052]** As seen in Figures 2 and 3, the throttle trigger (4) has:

- a first path (Ra) starting from a rest position ( $P_0$ ) with the throttle trigger (4) released to a safety position (Ps), which enables the motion of the cutting element (2) to be accelerated when the throttle trigger (4) is pulled from the rest position ( $P_0$ ) to the safety position (Ps), Figure 2; and
- a second path (Rs) that occurs after the first path (Ra), which enables the locking device (5) to be activated in order to lock the cutting element (2) by continuing to pull the throttle trigger (4) once the safety position (Ps) has been exceeded, Figure 3.

**[0053]** Thus, the throttle trigger (4) has a double path (Ra, Rs), wherein the first path (Ra) performs the function of accelerating the motor (3), while the second path (Rs) enables the locking device (5) to be actuated in order to instantaneously brake the chain when the throttle trigger (4) is pulled to the maximum by an involuntary reaction of the user as a consequence of a risky and/or accidental situation.

**[0054]** Therefore, during the first path (Ra) a connection occurs between the position of the throttle trigger (4) and the motor (3), from a rest position ( $P_0$ ) with the throttle trigger (4) released, in other words, without receiving any pressure from the user, to a safety position (Ps) wherein the motion of the cutting element (2) is at the maximum, said motion accelerating from the rest position ( $P_0$ ) to the safety position (Ps) as the pressure exerted by the user on the throttle trigger (4) increases.

**[0055]** Moreover, during the second path (Rs) a connection occurs between the position of the throttle trigger (4) and the locking device (5) wherein, once the safety position (Ps) has been exceeded, the activation of the locking device (5) occurs to instantaneously stop the

motion of the cutting element (2) when the user continues to pull the throttle trigger (4) once the safety position (Ps) has been reached.

**[0056]** The first path (Ra) and the second path (Rs) occur sequentially as the pressure exerted by the user on the throttle trigger (4) increases, wherein the first path (Ra) starts from a rest position ( $P_0$ ) with the throttle trigger (4) released, while the second path (Rs) ends in a final position with the throttle trigger (4) pulled to the maximum or fully pulled.

**[0057]** According to the present example of mechanical operation of the safety mechanism (1) of the present invention, this comprises an actuating rod (8) having:

- a first end (81) configured to be pushed by the throttle trigger (4) during the second path (Rs); and
- a second end (82) connected to the locking device (5).

**[0058]** Said actuating rod (8) is configured to activate the locking device (5) when the throttle trigger (4) pushes the first end (81) once the safety position (Ps) has been exceeded.

**[0059]** Preferably, the second end (82) is joined to a free end (71) of the strap (7), while said actuating rod (8) is configured to contract the strap (7) on the brake drum (62) when pushed by the throttle trigger (4) during the second path (Rs). The actuating rod (8) comprises a helical spring (83) on the first end (81).

**[0060]** The throttle trigger (4) comprises an actuating pin (41) configured to push the first end (81) of the actuating rod (8) during the second path (Rs). Said actuating pin (41) makes it possible to overcome the force of the helical spring (83) and move the actuating rod (8) linearly, making the strap (7) contract in order to stop the clutch (6) and thus causing the cutting element (2) of the machine to brake immediately. The actuating pin (41) may have different configurations, dimensions and/or possible positions in the very throttle trigger (4), depending on the shape/design of the housing and/or the handle of the cutting machine, as well as on the position of the first end (81) of the actuating rod (8), in order to be able to come into contact with said first end (81) in order to push same during the second path (Rs).

**[0061]** Figures 4 and 5 show various schematic views of the safety mechanism (1) of the present invention in a manual cutting machine, in this case a chainsaw, according to a second embodiment of electromagnetic operation of said safety mechanism (1).

**[0062]** Said chainsaw comprises a cutting element (2) of the toothed chain type, and a motor (3) configured to move said cutting element (2).

**[0063]** The safety mechanism (1) comprises:

- a throttle trigger (4) connected to the motor (3), arranged in the handle of the cutting machine, configured to accelerate the motion of the cutting element (2) when pulled by a user; and

- a locking device (5) configured to lock the cutting element (2).

**[0064]** According to the present example, optionally, the throttle trigger (4) is connected to an additional safety element in the form of an unlocking push button (44), such that in order to enable the actuation of the very throttle trigger (4), the user has to necessarily keep the unlocking push button (44) pressed at the same time. Said action is performed with the same hand with which the throttle trigger (4) is pulled, for which reason both elements (4, 44) are arranged in the handle within reach of said same hand. If the unlocking push button (44) is released, or if it is not pulled sufficiently, the throttle trigger (4) stays locked, the motion of the cutting element (2) not being able to be accelerated.

**[0065]** According to the present example, the locking device (5) comprises:

- a clutch (6) having a traction pinion (61) configured to intermesh with the cutting element (2) and a brake drum (62) joined to said traction pinion (61); and
- a strap (7) arranged around the brake drum (62), configured to contract on said brake drum (62) and immobilise same in order to lock the cutting element (2).

**[0066]** The locking device (5) comprises:

- a lever (52) joined to the free end (71) of the strap (7), enabling said strap (7) to contract on the brake drum (62) when actuated by the user in one direction, and to expand and/or release said strap (7) when actuated by the user in an opposite direction in order to release the brake drum (62).

**[0067]** In this case, the lever (51) of the very locking device (5) acts directly as a deactivation element (51) of the safety mechanism (1) of the present invention, regardless of whether other complementary and/or additional deactivation elements (51) are incorporated.

**[0068]** As seen in Figures 4 and 5, the throttle trigger (4) has:

- a first path (Ra) starting from a rest position ( $P_0$ ) with the throttle trigger (4) released to a safety position (Ps), which enables the motion of the cutting element (2) to be accelerated when the throttle trigger (4) is pulled from the rest position ( $P_0$ ) to the safety position (Ps), Figure 4; and
- a second path (Rs) that occurs after the first path (Ra), which enables the locking device (5) to be activated in order to lock the cutting element (2) by continuing to pull the throttle trigger (4) once the safety position (Ps) has been exceeded, Figure 5.

**[0069]** Thus, the throttle trigger (4) has a double path (Ra, Rs), wherein the first path (Ra) performs the function

of accelerating the motor (3), while the second path (Rs) enables the locking device (5) to be actuated in order to instantaneously brake the chain when the throttle trigger (4) is pulled to the maximum by an involuntary reaction of the user as a consequence of a risky and/or accidental situation.

**[0070]** Therefore, during the first path (Ra) a connection occurs between the position of the throttle trigger (4) and the motor (3), from a rest position ( $P_0$ ) with the throttle trigger (4) released, in other words, without receiving any pressure from the user, to a safety position (Ps) wherein the motion of the cutting element (2) is at the maximum, said motion accelerating from the rest position ( $P_0$ ) to the safety position (Ps) as the pressure exerted by the user on the throttle trigger (4) increases.

**[0071]** Moreover, during the second path (Rs) a connection occurs between the position of the throttle trigger (4) and the locking device (5) wherein, once the safety position (Ps) has been exceeded, the activation of the locking device (5) occurs to instantaneously stop the motion of the cutting element (2) when the user continues to pull the throttle trigger (4) once the safety position (Ps) has been reached.

**[0072]** The first path (Ra) and the second path (Rs) occur sequentially as the pressure exerted by the user on the throttle trigger (4) increases, wherein the first path (Ra) starts from a rest position ( $P_0$ ) with the throttle trigger (4) released, while the second path (Rs) ends in a final position with the throttle trigger (4) pulled to the maximum or fully pulled.

**[0073]** In this case, the safety mechanism (1) of the present invention comprises:

- an electromagnetic actuator (9) configured to activate the locking device (5) when receiving an electrical current (I);
- a power source (10) configured to supply said electrical current (I) to the electromagnetic actuator (9); and
- a first push button (11) and a second push button (12) connected to the throttle trigger (4) and interposed in the electrical circuit between the power source (10) and the electromagnetic actuator (10), configured to enable said electrical current (I) to be received by the electromagnetic actuator (9) or to shut it off based on the position of the throttle trigger (4).

**[0074]** The electromagnetic actuator (9) is a linear motion electromagnet, which has a shaft or bolt (91) configured to extend linearly when receiving the electrical current (I).

**[0075]** Preferably, the electromagnetic actuator (9) is configured to contract the strap (7) on the brake drum (62) and immobilise same in order to lock the cutting element (2). This is carried out by means of the shaft or bolt (91) that, joined to the free end (71) of the strap (7), enables same to be pulled when it moves linearly when receiving the electrical current (I), Figure 5.

**[0076]** The throttle trigger (4) comprises:

- a first leg (42) configured to press the first push button (11) in the rest position ( $P_0$ ), to keep the locking device (5) activated in said rest position ( $P_0$ ); and
- a second leg (43) configured to press the second push button (12) once the safety position ( $P_s$ ) has been exceeded, to keep the safety mechanism (5) activated once said safety position ( $P_s$ ) has been exceeded.

**[0077]** With this system, two functions are achieved. The first one is the objective of preventing the operator from having an accident and, the second one, that the cutting unit or element (2) of the cutting machine is locked whenever the operator is not using it.

**[0078]** In turn, the legs (42, 43) are configured not to press the push buttons (11, 12) during the first path ( $R_a$ ), in order to keep the locking device (5) deactivated between the rest position ( $P_0$ ) and the safety position ( $P_s$ ). Therefore, enabling the acceleration of the cutting element (2) during said first path ( $R_a$ ).

**[0079]** The legs (42, 43) may have different possible configurations, dimensions and/or positions in the very throttle trigger (4), depending on the shape/design of the housing and/or the handle of the cutting machine, as well as on the position of the push buttons (11, 12) in order to carry out the actions described.

**[0080]** The safety mechanism (1) comprises:

- a first spring (21) arranged between the first push button (11) and the first leg (42); and
- a second spring (22) arranged between the second push button (12) and the second leg (43).

**[0081]** Wherein the second spring (22) is configured to keep the throttle trigger (4) in the rest position ( $P_0$ ) when it is released, in other words, when it is not being pulled by the user.

**[0082]** Figures 6, 7 and 8 show various schematic views of the safety mechanism (1) of the present invention in a manual cutting machine, in this case a chainsaw, according to a second embodiment of hydraulic operation of said safety mechanism (1).

**[0083]** As seen in Figure 6, said chainsaw comprises a cutting element (2) of the toothed chain type, and a motor (3) configured to move said cutting element (2).

**[0084]** The safety mechanism (1) comprises:

- a throttle trigger (4) connected to the motor (3), arranged in the handle of the cutting machine, configured to accelerate the motion of the cutting element (2) when pulled by a user; and
- a locking device (5) configured to lock the cutting element (2).

**[0085]** According to the present example, optionally,

the throttle trigger (4) is connected to an additional safety element in the form of an unlocking push button (44), such that in order to enable the actuation of the very throttle trigger (4), the user has to necessarily keep the unlocking push button (44) pressed at the same time. Said action is performed with the same hand with which the throttle trigger (4) is pulled, for which reason both elements (4, 44) are arranged in the handle within reach of said same hand. If the unlocking push button (44) is released, or if it is not pulled sufficiently, the throttle trigger (4) stays locked, the motion of the cutting element (2) not being able to be accelerated.

**[0086]** According to the present example, the locking device (5) comprises:

- a clutch (6) having a traction pinion (61) configured to intermesh with the cutting element (2) and a brake drum (62) joined to said traction pinion (61); and
- a strap (7) arranged around the brake drum (62), configured to contract on said brake drum (62) and immobilise same in order to lock the cutting element (2).

**[0087]** The locking device (5) comprises:

- a lever (52) joined to the free end (71) of the strap (7), enabling said strap (7) to contract on the brake drum (62) when actuated by the user in one direction, and to expand and/or release said strap (7) when actuated by the user in an opposite direction in order to release the brake drum (62).

**[0088]** In this case, the lever (51) of the very locking device (5) acts directly as a deactivation element (51) of the safety mechanism (1) of the present invention, regardless of whether other complementary and/or additional deactivation elements (51) are incorporated.

**[0089]** As seen in Figures 7 and 8, the throttle trigger (4) has:

- a first path ( $R_a$ ) starting from a rest position ( $P_0$ ) with the throttle trigger (4) released to a safety position ( $P_s$ ), which enables the motion of the cutting element (2) to be accelerated when the throttle trigger (4) is pulled from the rest position ( $P_0$ ) to the safety position ( $P_s$ ), Figure 7; and
- a second path ( $R_s$ ) that occurs after the first path ( $R_a$ ), which enables the locking device (5) to be activated in order to lock the cutting element (2) by continuing to pull the throttle trigger (4) once the safety position ( $P_s$ ) has been exceeded, Figure 8.

**[0090]** Thus, the throttle trigger (4) has a double path ( $R_a$ ,  $R_s$ ), wherein the first path ( $R_a$ ) performs the function of accelerating the motor (3), while the second path ( $R_s$ ) enables the locking device (5) to be actuated in order to instantaneously brake the chain when the throttle trigger (4) is pulled to the maximum by an involuntary reaction of



the user as a consequence of a risky and/or accidental situation.

**[0091]** Therefore, during the first path (Ra) a connection occurs between the position of the throttle trigger (4) and the motor (3), from a rest position ( $P_0$ ) with the throttle trigger (4) released, in other words, without receiving any pressure from the user, to a safety position (Ps) wherein the motion of the cutting element (2) is at the maximum, said motion accelerating from the rest position ( $P_0$ ) to the safety position (Ps) as the pressure exerted by the user on the throttle trigger (4) increases.

**[0092]** Moreover, during the second path (Rs) a connection occurs between the position of the throttle trigger (4) and the locking device (5) wherein, once the safety position (Ps) has been exceeded, the activation of the locking device (5) occurs to instantaneously stop the motion of the cutting element (2) when the user continues to pull the throttle trigger (4) once the safety position (Ps) has been reached.

**[0093]** The first path (Ra) and the second path (Rs) occur sequentially as the pressure exerted by the user on the throttle trigger (4) increases, wherein the first path (Ra) starts from a rest position ( $P_0$ ) with the throttle trigger (4) released, while the second path (Rs) ends in a final position with the throttle trigger (4) pulled to the maximum or fully pulled.

**[0094]** In this case, the safety mechanism (1) of the present invention comprises:

- a first hydraulic actuator (100) configured to activate the locking device (5) when receiving the pressure of a hydraulic fluid (F);
- a hydraulic pipe (101) configured to supply the pressure of said hydraulic fluid (F) to the first hydraulic actuator (100); and
- a second hydraulic actuator (102) connected to the throttle trigger (4) and in hydraulic communication with the hydraulic pipe (101), configured to enable the pressure of said hydraulic fluid (F) to be supplied to the first hydraulic actuator (100) or to shut it off based on the position of the throttle trigger (4).

**[0095]** The hydraulic actuators (100, 102) are linear motion hydraulic cylinders, of the type that have a hydraulic piston (104, 105) configured to extend linearly when receiving the pressure of a hydraulic fluid (F). Two fittings (103) enable the hydraulic connection between the hydraulic pipe (101) and the hydraulic actuators (100, 102).

**[0096]** The first hydraulic actuator (100) is configured to contract the strap (7) on the brake drum (62) and immobilise same in order to lock the cutting chain (2). This is carried out by means of the hydraulic piston (104) which, joined to the free end (71) of the strap (7), enables said free end (71) to be pulled when it moves linearly when receiving the pressure of a hydraulic fluid (F).

**[0097]** The throttle trigger (4) comprises an actuating pin (41) configured to press the hydraulic piston (105) of

the second hydraulic actuator (102) once the safety position (Ps) has been exceeded, enabling the pressure of the hydraulic fluid (F) to be supplied to the first hydraulic actuator (100) through the hydraulic pipe (101) in order to keep the locking device (5) activated once said safety position (Ps) has been exceeded. The actuating pin (41) may have different configurations, dimensions and/or possible positions on the throttle trigger (4) itself, depending on the shape/design of the housing and/or the handle of the cutting machine, as well as on the second hydraulic actuator (102), in order to be able to press the hydraulic piston (105) of said second hydraulic actuator (102) during the second path (Rs).

**[0098]** The safety mechanism (1) comprises a helical spring (83) arranged between the hydraulic piston (102) and the throttle trigger (4).

**[0099]** In all the previous embodiments, the throttle trigger (4) performs the double function of acceleration and safety. Newly manufactured cutting machines can be designed to directly have a single throttle trigger (4) configured to perform both functions. Moreover, in existing cutting machines, the throttle trigger of same can be adapted to perform both functions, without needing to add an additional trigger with a safety function.

## Claims

1. A safety mechanism for manual cutting machines comprising a cutting element (2) and a motor (3) configured to move said cutting element (2); wherein said safety mechanism (1) comprises:

- a throttle trigger (4) connected to the motor (3), configured to accelerate the motion of the cutting element (2) when pulled by a user; and
- a locking device (5) configured to lock the cutting element (2);

said mechanism (1), **characterised in that** the throttle trigger (4) has:

- a first path (Ra) starting from a rest position ( $P_0$ ) to a safety position (Ps), which enables the motion of the cutting element (2) to be accelerated when the throttle trigger (4) is pulled from the rest position ( $P_0$ ) to the safety position (Ps), wherein the motion of the cutting element (2) is at the maximum in the safety position (Ps); and
- a second path (Rs) that occurs after the first path (Ra), which activates the locking device (5) to instantaneously stop the motion of the cutting element (2) when the user continues to pull the throttle trigger (4) once the safety position (Ps) has been exceeded by an involuntary reaction of the user as a consequence of a risky and/or accidental situation;

wherein the first path (Ra) and the second path (Rs) occur sequentially as the pressure exerted by the user on the throttle trigger (4) increases.

2. The safety mechanism according to claim 1, **characterised in that** the throttle trigger (4) is configured to activate the locking device (5) during the second path (Rs) by means of electrical, mechanical, electromechanical or hydraulic means.

3. The safety mechanism according to any of claims 1 to 2, **characterised in that** the locking device (5) comprises a deactivation element (51) with manual actuation, configured to unlock the cutting element (2) when actuated by the user once said locking device (5) has been activated.

4. The safety mechanism according to any of claims 1 to 3, **characterised in that** the locking device (5) comprises:

- a clutch (6) having a traction pinion (61) configured to intermesh with the cutting element (2) and a brake drum (62) joined to said traction pinion (61); and
- a strap (7) arranged around the brake drum (62), configured to contract on said brake drum (62) and immobilise same in order to lock the cutting element (2).

5. The safety mechanism according to claim 4, **characterised in that** the locking device (5) comprises:

- a lever (52) joined to the strap (7), enabling said strap (7) to contract on the brake drum (62) when actuated by the user in one direction, and to expand said strap (7) when actuated by the user in an opposite direction in order to release the brake drum (62).

6. The safety mechanism according to any of claims 1 to 5, **characterised in that** it comprises an actuating rod (8) having:

- a first end (81) configured to be pushed by the throttle trigger (4) during the second path (Rs); and
- a second end (82) connected to the locking device (5);

wherein said actuating rod (8) is configured to activate the locking device (5) when the throttle trigger (4) pushes the first end (81) once the safety position (Ps) has been exceeded.

7. The safety mechanism according to claims 4 and 6, **characterised in that** the second end (82) is joined to a free end (71) of the strap (7); **and in that** said

actuating rod (8) is configured to contract the strap (7) on the brake drum (62) when pushed by the throttle trigger (4) during the second path (Rs).

8. The safety mechanism according to any of claims 6 to 7, **characterised in that** the throttle trigger (4) comprises an actuating pin (41) configured to push the first end (81) of the actuating rod (8).

9. The safety mechanism according to any of claims 1 to 8, **characterised in that** it comprises:

- an electromagnetic actuator (9) configured to activate or deactivate the locking device (5) when receiving an electrical current (I);
- a power source (10) configured to supply said electrical current (I) to the electromagnetic actuator (9); and
- a first push button (11) and a second push button (12) connected to the throttle trigger (4) and interposed in the electrical circuit between the power source (10) and the electromagnetic actuator (9), configured to enable said electrical current (I) to be received by the electromagnetic actuator (9) or to shut it off based on the position of the throttle trigger (4).

10. The safety mechanism according to claims 4 and 9, **characterised in that** the electromagnetic actuator (9) is configured to contract the strap (7) on the brake drum (62) and immobilise same in order to lock the cutting element (2).

11. The safety mechanism according to any of claims 9 to 10, **characterised in that** the throttle trigger (4) comprises:

- a first leg (42) configured to press the first push button (11) in the rest position (P<sub>0</sub>), to keep the locking device (5) activated in said rest position (P<sub>0</sub>); and
- a second leg (43) configured to press the second push button (12) once the safety position (Ps) has been exceeded, to keep the safety mechanism (5) activated once said safety position (Ps) has been exceeded;

wherein said legs (42, 43) are configured not to press the push buttons (11, 12) during the first path (Ra), in order to keep the locking device (5) deactivated between the rest position (P<sub>0</sub>) and the safety position (Ps).

12. The safety mechanism according to any of claims 1 to 11, **characterised in that** it comprises:

- a first hydraulic actuator (100) configured to activate or deactivate the locking device (5)

when receiving the pressure of a hydraulic fluid (F);

- a hydraulic pipe (101) configured to supply the pressure of said hydraulic fluid (F) to the first hydraulic actuator (100); and

- a second hydraulic actuator (102) connected to the throttle trigger (4) and in hydraulic communication with the hydraulic pipe (101), configured to enable the pressure of said hydraulic fluid (F) to be supplied to the first hydraulic actuator (100) or to shut it off based on the position of the throttle trigger (4).

13. The safety mechanism according to claims 4 and 12, **characterised in that** the first hydraulic actuator (100) is configured to contract the strap (7) on the brake drum (62) and immobilise same in order to lock the cutting chain (2).

14. The safety mechanism according to any of claims 12 to 13, **characterised in that** the throttle trigger (4) comprises an actuating pin (41) configured to press the second hydraulic actuator (102) once the safety position (Ps) has been exceeded, enabling the pressure of the hydraulic fluid (F) to be supplied to the first hydraulic actuator (100) through the hydraulic pipe (101) in order to keep the locking device (5) activated once said safety position (Ps) has been exceeded.

15. A manual cutting machine, **characterised in that** it comprises a safety mechanism (1) according to any of claims 1 to 14.

16. A chainsaw, **characterised in that** it comprises a safety mechanism (1) according to any of claims 1 to 14.

17. A method for actuating a safety mechanism according to any of claims 1 to 14, **characterised in that** it comprises the following steps:

- enabling the motion of the cutting element (2) to be accelerated when the throttle trigger (4) is pulled from the rest position ( $P_0$ ) to the safety position (Ps), wherein the motion of the cutting element (2) is at the maximum in the safety position (Ps); and

- activating the locking device (5) to instantaneously stop the motion of the cutting element (2) when the user continues to pull the throttle trigger (4) once the safety position (Ps) has been exceeded by an involuntary reaction of the user as a consequence of a risky and/or accidental situation.

## Patentansprüche

1. Sicherheitsmechanismus für Handschneidmaschinen umfassend ein Schneidelement (2) und einen Motor (3), welcher dazu ausgebildet ist, das genannte Schneidelement (2) zu bewegen;

wobei der genannte Sicherheitsmechanismus (1) Folgendes umfasst:

- einen mit dem Motor (3) verbundenen Gashebel (4), welcher dazu ausgebildet ist, die Bewegung des Schneidelements (2) zu beschleunigen, wenn ein Benutzer daran zieht; und
- eine Sperrvorrichtung (5), welche dazu ausgebildet ist, das Schneidelement (2) zu sperren;

der genannte Mechanismus (1) **dadurch gekennzeichnet, dass** der Gashebel (4) Folgendes aufweist:

- einen ersten Weg (Ra) von einer Ruhestellung ( $P_0$ ) beginnend bis zu einer Sicherheitsstellung (Ps), welcher es ermöglicht die Bewegung des Schneidelements (2) zu beschleunigen, wenn der Gashebel (4) von der Ruhestellung ( $P_0$ ) in die Sicherheitsstellung (Ps) gezogen wird, wobei die Bewegung des Schneidelements (2) am Maximum in der Sicherheitsstellung (Ps) ist; und
- einen zweiten Weg (Rs), welcher nach dem ersten Weg (Ra) stattfindet, welcher die Sperrvorrichtung (5) aktiviert, um die Bewegung des Schneidelements (2) sofort zu stoppen, wenn der Benutzer weiter am Gashebel (4) zieht, sobald die Sicherheitsstellung (Ps) durch eine unbeabsichtigte Reaktion des Benutzers überschritten worden ist, infolge einer gefährlichen und/oder unfallartigen Situation;

wobei der erste Weg (Ra) und der zweite Weg (Rs) sequenziell stattfinden, als sich der vom Benutzer auf den Gashebel (4) ausgeübten Druck erhöht.

2. Sicherheitsmechanismus nach Anspruch 1, **dadurch gekennzeichnet, dass** der Gashebel (4) dazu ausgebildet ist, die Sperrvorrichtung (5) während des zweiten Weges (Rs) mittels elektrischer, mechanischer, elektromechanischer oder hydraulischer Mittel zu aktivieren.

3. Sicherheitsmechanismus nach einem der Ansprüche 1 bis 2, **dadurch gekennzeichnet, dass** die

Sperrvorrichtung (5) ein Deaktivierungselement (51) mit manueller Betätigung umfasst, welches dazu ausgebildet ist, das Schneidelement (2) zu entsperren, wenn es vom Benutzer betätigt wird, sobald die genannte Sperrvorrichtung (5) aktiviert worden ist.

4. Sicherheitsmechanismus nach einem der Ansprüche 1 bis 3, **dadurch gekennzeichnet, dass** die Sperrvorrichtung (5) Folgendes umfasst:

- eine Kupplung (6) aufweisend eine Zugritzel (61), welche dazu ausgebildet ist, sich mit dem Schneidelement (2) ineinanderzugreifen, und eine Bremsstrommel (62), welche an die genannte Zugritzel (61) angeschlossen ist; und
- ein Band (7), welches um die Bremsstrommel (62) herum angeordnet und dazu ausgebildet ist, sich auf der genannten Bremsstrommel (62) zu schrumpfen und dieselbe zu immobilisieren, um das Schneidelement (2) zu sperren.

5. Sicherheitsmechanismus nach Anspruch 4, **dadurch gekennzeichnet, dass** die Sperrvorrichtung (5) Folgendes umfasst:

- einen Hebel (52), welcher an das Band (7) angeschlossen ist und es ermöglicht, dass sich das genannte Band (7) auf der Bremsstrommel (62) schrumpft, wenn er vom Benutzer in eine Richtung betätigt wird, und dass sich das genannte Band (7) ausdehnt, wenn er vom Benutzer in eine entgegengesetzte Richtung betätigt wird, um die Bremsstrommel (62) zu befreien.

6. Sicherheitsmechanismus nach einem der Ansprüche 1 bis 5, **dadurch gekennzeichnet, dass** er eine Betätigungsstange (8) umfasst, welche Folgendes aufweist:

- ein erstes Ende (81), welches dazu ausgebildet ist, vom Gashebel (4) während des zweiten Weges (Rs) gedrückt zu werden; und
- ein zweites Ende (82), welches mit der Sperrvorrichtung (5) verbunden ist;

wobei die genannte Betätigungsstange (8) dazu ausgebildet ist, die Sperrvorrichtung (5) zu aktivieren, wenn der Gashebel (4) das erste Ende (81) drückt, sobald die Sicherheitsstellung (Ps) überschritten worden ist.

7. Sicherheitsmechanismus nach den Ansprüchen 4 und 6, **dadurch gekennzeichnet, dass** das zweite Ende (82) an ein freies Ende (71) des Bandes (7) angeschlossen ist; **und dass** die genannte Betätigungsstange (8) dazu ausgebildet ist, das Band (7) auf der Bremsstrommel (62) zu schrumpfen, wenn sie vom Gashebel (4) während des zweiten Weges (Rs)

gedrückt wird.

8. Sicherheitsmechanismus nach einem der Ansprüche 6 bis 7, **dadurch gekennzeichnet, dass** der Gashebel (4) einen Betätigungsstift (41) umfasst, welcher dazu ausgebildet ist, das erste Ende (81) der Betätigungsstange (8) zu drücken.

9. Sicherheitsmechanismus nach einem der Ansprüche 1 bis 8, **dadurch gekennzeichnet, dass** er Folgendes umfasst:

- ein elektromagnetisches Stellglied (9), welches dazu ausgebildet ist, die Sperrvorrichtung (5) zu aktivieren oder deaktivieren, wenn es einen elektrischen Strom (I) aufnimmt;
- eine Leistungsquelle (10), welche dazu ausgebildet ist, den genannten elektrischen Strom (I) dem elektromagnetischen Stellglied (9) einzuspeisen; und
- einen ersten Druckknopf (11) und einen zweiten Druckknopf (12), welche mit dem Gashebel (4) verbunden sind und im elektrischen Kreislauf zwischen der Leistungsquelle (10) und dem elektromagnetischen Stellglied (9) zwischengeschaltet sind, welche dazu ausgebildet sind, die Aufnahme des genannten elektrischen Stroms (I) durch das elektromagnetische Stellglied (9) zu ermöglichen oder denjenigen basierend auf der Stellung des Gashebels (4) abzuschalten.

10. Sicherheitsmechanismus nach den Ansprüchen 4 und 9, **dadurch gekennzeichnet, dass** das elektromagnetische Stellglied (9) dazu ausgebildet ist, das Band (7) auf der Bremsstrommel (62) zu schrumpfen und dieselbe zu immobilisieren, um das Schneidelement (2) zu sperren.

11. Sicherheitsmechanismus nach einem der Ansprüche 9 bis 10, **dadurch gekennzeichnet, dass** der Gashebel (4) Folgendes umfasst:

- ein erstes Bein (42), welches dazu ausgebildet ist, den ersten Druckknopf (11) in die Ruhestellung ( $P_0$ ) zu drücken, um die Sperrvorrichtung (5) in der genannten Ruhestellung ( $P_0$ ) aktiviert zu halten; und
- ein zweites Bein (43), welches dazu ausgebildet ist, den zweiten Druckknopf (12) zu drücken, sobald die Sicherheitsstellung (Ps) überschritten worden ist, um den Sicherheitsmechanismus (5) aktiviert zu halten, sobald die genannte Sicherheitsstellung (Ps) überschritten worden ist;

wobei die genannten Beine (42, 43) dazu ausgebildet sind, die Druckknöpfe (11, 12) während des ersten Weges (Ra) nicht zu drücken, um die Sperr-

vorrichtung (5) zwischen der Ruhestellung ( $P_0$ ) und der Sicherheitsstellung ( $P_s$ ) deaktiviert zu halten.

12. Sicherheitsmechanismus nach einem der Ansprüche 1 bis 11, **dadurch gekennzeichnet, dass** er Folgendes umfasst:

- ein erstes hydraulisches Stellglied (100), welches dazu ausgebildet ist, die Sperrvorrichtung (5) zu aktivieren oder deaktivieren, wenn es den Druck eines hydraulischen Fluids (F) aufnimmt;
- ein Hydraulikrohr (101), welches dazu ausgebildet ist, den Druck des genannten hydraulischen Fluids (F) zum ersten hydraulischen Aktuator (100) zuzuführen; und
- ein zweites hydraulisches Stellglied (102), welches an den Gashebel (4) angeschlossen und in hydraulischer Kommunikation mit dem Hydraulikrohr (101) ist, welches dazu ausgebildet ist, die Zuführung des Drucks des genannten hydraulischen Fluids (F), welches zum ersten hydraulischen Aktuator (100) zugeführt werden soll, zu ermöglichen oder denjenigen basierend auf der Stellung des Gashebels (4) abzuschalten.

13. Sicherheitsmechanismus nach den Ansprüchen 4 und 12, **dadurch gekennzeichnet, dass** das erste hydraulische Stellglied (100) dazu ausgebildet ist, das Band (7) auf der Bremsstrommel (62) zu schrumpfen und dieselbe zu immobilisieren, um die Schneidkette (2) zu sperren.

14. Sicherheitsmechanismus nach einem der Ansprüche 12 bis 13, **dadurch gekennzeichnet, dass** der Gashebel (4) einen Betätigungsstift (41) umfasst, welcher dazu ausgebildet ist, das zweite hydraulische Stellglied (102) zu drücken, sobald die Sicherheitsstellung ( $P_s$ ) überschritten worden ist, sodass die Zuführung des Drucks des hydraulischen Fluids (F) zum ersten hydraulischen Aktuator (100) über das Hydraulikrohr (101) ermöglicht wird, um die Sperrvorrichtung (5) aktiviert zu halten, sobald die genannte Sicherheitsstellung ( $P_s$ ) überschritten worden ist.

15. Handschneidmaschine, **dadurch gekennzeichnet, dass** sie einen Sicherheitsmechanismus (1) nach einem der Ansprüche 1 bis 14 umfasst.

16. Kettensäge, **dadurch gekennzeichnet, dass** sie einen Sicherheitsmechanismus (1) nach einem der Ansprüche 1 bis 14 umfasst.

17. Verfahren zur Betätigung eines Sicherheitsmechanismus nach einem der Ansprüche 1 bis 14, **dadurch gekennzeichnet, dass** es die folgenden Schritte umfasst:

- das Ermöglichen, dass die Bewegung des Schneidelements (2) beschleunigt wird, wenn der Gashebel (4) von der Ruhestellung ( $P_0$ ) in die Sicherheitsstellung ( $P_s$ ) gezogen wird, wobei die Bewegung des Schneidelements (2) am Maximum in der Sicherheitsstellung ( $P_s$ ) ist; und
- das Aktivieren der Sperrvorrichtung (5), um die Bewegung des Schneidelements (2) sofort zu stoppen, wenn der Benutzer weiter am Gashebel (4) zieht, sobald die Sicherheitsstellung ( $P_s$ ) durch eine unbeabsichtigte Reaktion des Benutzers überschritten worden ist, infolge einer gefährlichen und/oder unfallartigen Situation.

## Revendications

1. Mécanisme de sécurité pour machines de coupe manuelles comprenant un élément de coupe (2) et un moteur (3) configuré pour déplacer ledit élément de coupe (2) ;

dans lequel ledit mécanisme de sécurité (1) comprend :

- une gâchette d'accélérateur (4) reliée au moteur (3), configurée pour accélérer le mouvement de l'élément de coupe (2) lorsqu'elle est tirée par un utilisateur ; et
- un dispositif de verrouillage (5) configuré pour verrouiller l'élément de coupe (2) ;

ledit mécanisme (1) étant **caractérisé en ce que** la gâchette d'accélérateur (4) présente :

- un premier trajet ( $R_a$ ) partant d'une position de repos ( $P_0$ ) vers une position de sécurité ( $P_s$ ), qui permet d'accélérer le mouvement de l'élément de coupe (2) lorsque la gâchette d'accélérateur (4) est tirée de la position de repos ( $P_0$ ) vers la position de sécurité ( $P_s$ ), dans lequel le mouvement de l'élément de coupe (2) est maximal dans la position de sécurité ( $P_s$ ) ; et
- un deuxième trajet ( $R_s$ ) qui se produit après le premier trajet ( $R_a$ ), activant le dispositif de verrouillage (5) pour arrêter immédiatement le mouvement de l'élément de coupe (2) lorsque l'utilisateur continue à tirer sur la gâchette d'accélérateur (4) une fois que la position de sécurité ( $P_s$ ) a été dépassée par une réaction involontaire de l'utilisateur en conséquence d'une situation de risque et/ou accidentelle ;

dans lequel le premier trajet ( $R_a$ ) et le deuxième trajet ( $R_s$ ) se produisent séquentiellement à

mesure que la pression exercée par l'utilisateur sur la gâchette d'accélérateur (4) augmente.

2. Mécanisme de sécurité selon la revendication 1, **caractérisé en ce que** la gâchette d'accélérateur (4) est configurée pour activer le dispositif de verrouillage (5) pendant le deuxième trajet (Rs) par le biais de moyens électriques, mécaniques, électromécaniques ou hydrauliques. 5
3. Mécanisme de sécurité selon l'une quelconque des revendications 1 à 2, **caractérisé en ce que** le dispositif de verrouillage (5) comprend un élément de désactivation (51) à actionnement manuel, configuré pour déverrouiller l'élément de coupe (2) lorsqu'il est actionné par l'utilisateur une fois que ledit dispositif de verrouillage (5) a été activé. 10
4. Mécanisme de sécurité selon l'une quelconque des revendications 1 à 3, **caractérisé en ce que** le dispositif de verrouillage (5) comprend : 20
  - un embrayage (6) ayant un pignon de traction (61) configuré pour s'engrener avec l'élément de coupe (2) et un tambour de frein (62) relié audit pignon de traction (61) ; et 25
  - une sangle (7) disposée autour du tambour de frein (62), configurée pour se contracter sur ledit tambour de frein (62) et immobiliser celui-ci afin de verrouiller l'élément de coupe (2). 30
5. Mécanisme de sécurité selon la revendication 4, **caractérisé en ce que** le dispositif de verrouillage (5) comprend : 35
  - une levier (52) reliée à la sangle (7), permettant à ladite sangle (7) de se contracter sur le tambour de frein (62) lorsqu'elle est actionnée par l'utilisateur dans une direction, et pour étendre ladite sangle (7) lorsqu'elle est actionnée par l'utilisateur dans une direction opposée afin de libérer le tambour de frein (62). 40
6. Mécanisme de sécurité selon l'une quelconque des revendications 1 à 5, **caractérisé en ce qu'il** comprend une tige d'actionnement (8) ayant : 45
  - une première extrémité (81) configurée pour être poussée par la gâchette d'accélérateur (4) lors du deuxième trajet (Rs) ; et 50
  - une deuxième extrémité (82) reliée au dispositif de verrouillage (5) ;

dans lequel ladite tige d'actionnement (8) est configurée pour activer le dispositif de verrouillage (5) lorsque la gâchette d'accélérateur (4) pousse la première extrémité (81) une fois que la position de sécurité (Ps) a été dépassée. 55

7. Mécanisme de sécurité selon les revendications 4 et 6, **caractérisé en ce que** la deuxième extrémité (82) est reliée à une extrémité libre (71) de la sangle (7) ; **et en ce que** ladite tige d'actionnement (8) est configurée pour contracter la sangle (7) sur le tambour de frein (62) lorsqu'elle est poussée par la gâchette d'accélérateur (4) lors du deuxième trajet (Rs). 5
8. Mécanisme de sécurité selon l'une quelconque des revendications 6 à 7, **caractérisé en ce que** la gâchette d'accélérateur (4) comprend une broche d'actionnement (41) configurée pour pousser la première extrémité (81) de la tige d'actionnement (8). 10
9. Mécanisme de sécurité selon l'une quelconque des revendications 1 à 8, **caractérisé en ce qu'il** comprend : 15
  - un actionneur électromagnétique (9) configuré pour activer ou désactiver le dispositif de verrouillage (5) lorsqu'il reçoit un courant électrique (I) ;
  - une source de puissance (10) configuré pour fournir ledit courant électrique (I) à l'actionneur électromagnétique (9) ; et
  - un premier bouton poussoir (11) et un deuxième bouton poussoir (12) reliés à la gâchette d'accélérateur (4) et interposés dans le circuit électrique entre la source de puissance (10) et l'actionneur électromagnétique (9), configurés pour permettre la réception dudit courant électrique (I) par l'actionneur électromagnétique (9) ou pour le couper en fonction de la position de la gâchette d'accélérateur (4). 20
10. Mécanisme de sécurité selon les revendications 4 et 9, **caractérisé en ce que** l'actionneur électromagnétique (9) est configuré pour contracter la sangle (7) sur le tambour de frein (62) et immobiliser celui-ci afin de verrouiller l'élément de coupe (2). 25
11. Mécanisme de sécurité selon l'une quelconque des revendications 9 à 10, **caractérisé en ce que** la gâchette d'accélérateur (4) comprend : 30
  - une première patte (42) configurée pour appuyer sur le premier bouton poussoir (11) dans la position de repos ( $P_0$ ), pour maintenir le dispositif de verrouillage (5) activé dans ladite position de repos ( $P_0$ ) ; et
  - une deuxième patte (43) configurée pour appuyer sur le deuxième bouton poussoir (12) une fois que la position de sécurité (Ps) a été dépassée, pour maintenir le mécanisme de sécurité (5) activé une fois que ladite position de sécurité (Ps) a été dépassée ; 35

dans lequel lesdites pattes (42, 43) sont configurées 40

pour ne pas appuyer sur les boutons poussoirs (11, 12) lors du premier trajet (Ra), afin de maintenir le dispositif de verrouillage (5) désactivé entre la position de repos ( $P_0$ ) et la position de sécurité (Ps).

12. Mécanisme de sécurité selon l'une quelconque des revendications 1 à 11, **caractérisé en ce qu'il** comprend :

- un premier actionneur hydraulique (100) configuré pour activer ou désactiver le dispositif de verrouillage (5) lorsqu'il reçoit la pression d'un fluide hydraulique (F) ;
- un tuyau hydraulique (101) configuré pour fournir la pression dudit fluide hydraulique (F) au premier actionneur hydraulique (100) ; et
- un deuxième actionneur hydraulique (102) relié à la gâchette d'accélérateur (4) et en communication hydraulique avec le tuyau hydraulique (101), configuré pour permettre de fournir la pression dudit fluide hydraulique (F) au premier actionneur hydraulique (100) ou pour la couper en fonction de la position de la gâchette d'accélérateur (4).

13. Mécanisme de sécurité selon les revendications 4 et 12, **caractérisé en ce que** le premier actionneur hydraulique (100) est configuré pour contracter la sangle (7) sur le tambour de frein (62) et immobiliser celui-ci afin de verrouiller la chaîne de coupe (2).

14. Mécanisme de sécurité selon l'une quelconque des revendications 12 à 13, **caractérisé en ce que** la gâchette d'accélérateur (4) comprend une broche d'actionnement (41) configurée pour appuyer sur le deuxième actionneur hydraulique (102) une fois que la position de sécurité (Ps) a été dépassée, permettant de fournir la pression de the fluide hydraulique (F) au premier actionneur hydraulique (100) à travers le tuyau hydraulique (101) afin de maintenir le dispositif de verrouillage (5) activé une fois que ladite position de sécurité (Ps) a été dépassée.

15. Machine de coupe manuelle, **caractérisée en ce qu'elle** comprend un mécanisme de sécurité (1) selon l'une quelconque des revendications 1 à 14.

16. Tronçonneuse, **caractérisée en ce qu'elle** comprend un mécanisme de sécurité (1) selon l'une quelconque des revendications 1 à 14.

17. Procédé pour actionner un mécanisme de sécurité selon l'une quelconque des revendications 1 à 14, **caractérisé en ce qu'il** comprend les étapes suivantes :

- permettre d'accélérer le mouvement de l'élément de coupe (2) lorsque la gâchette d'accé-

lérateur (4) est tirée de la position de repos ( $P_0$ ) vers la position de sécurité (Ps), dans lequel le mouvement de l'élément de coupe (2) est maximal dans la position de sécurité (Ps) ; et

- activer le dispositif de verrouillage (5) pour arrêter immédiatement le mouvement de l'élément de coupe (2) lorsque l'utilisateur continue à tirer sur la gâchette d'accélérateur (4) une fois que la position de sécurité (Ps) a été dépassée par une réaction involontaire de l'utilisateur en conséquence d'une situation de risque et/ou accidentelle.

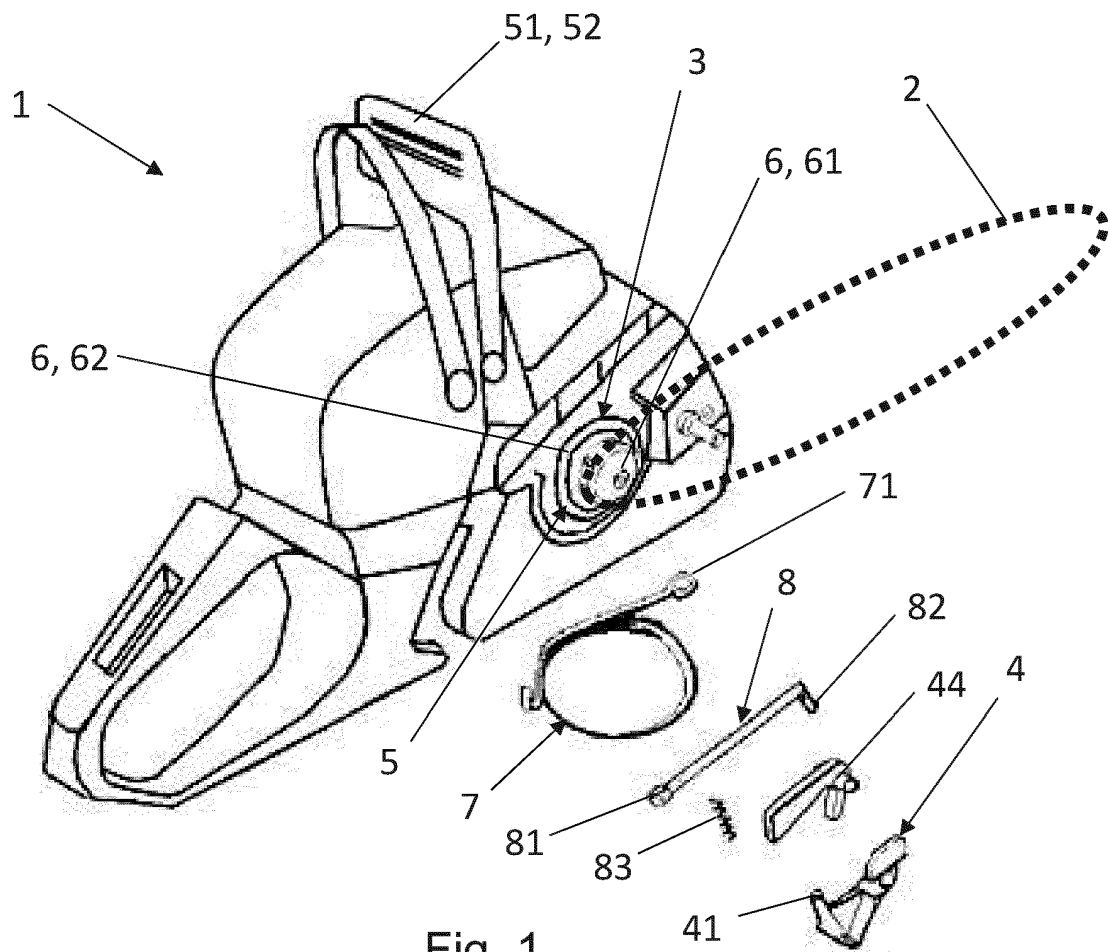


Fig. 1

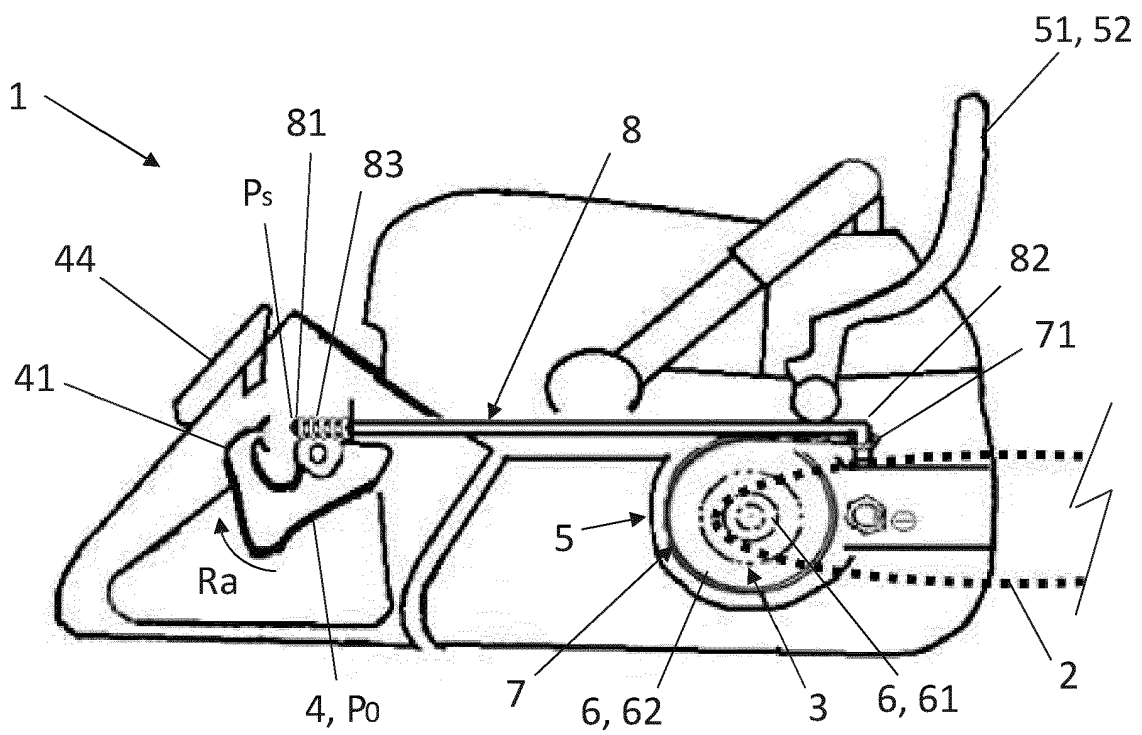


Fig. 2



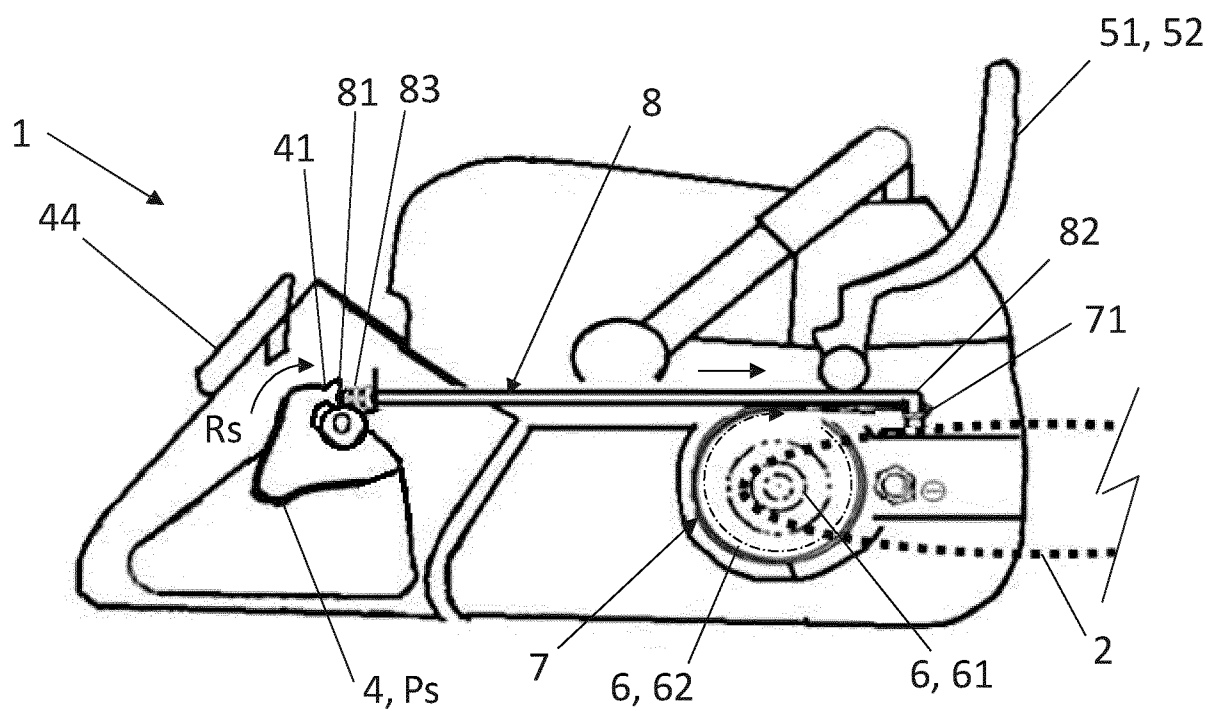


Fig. 3

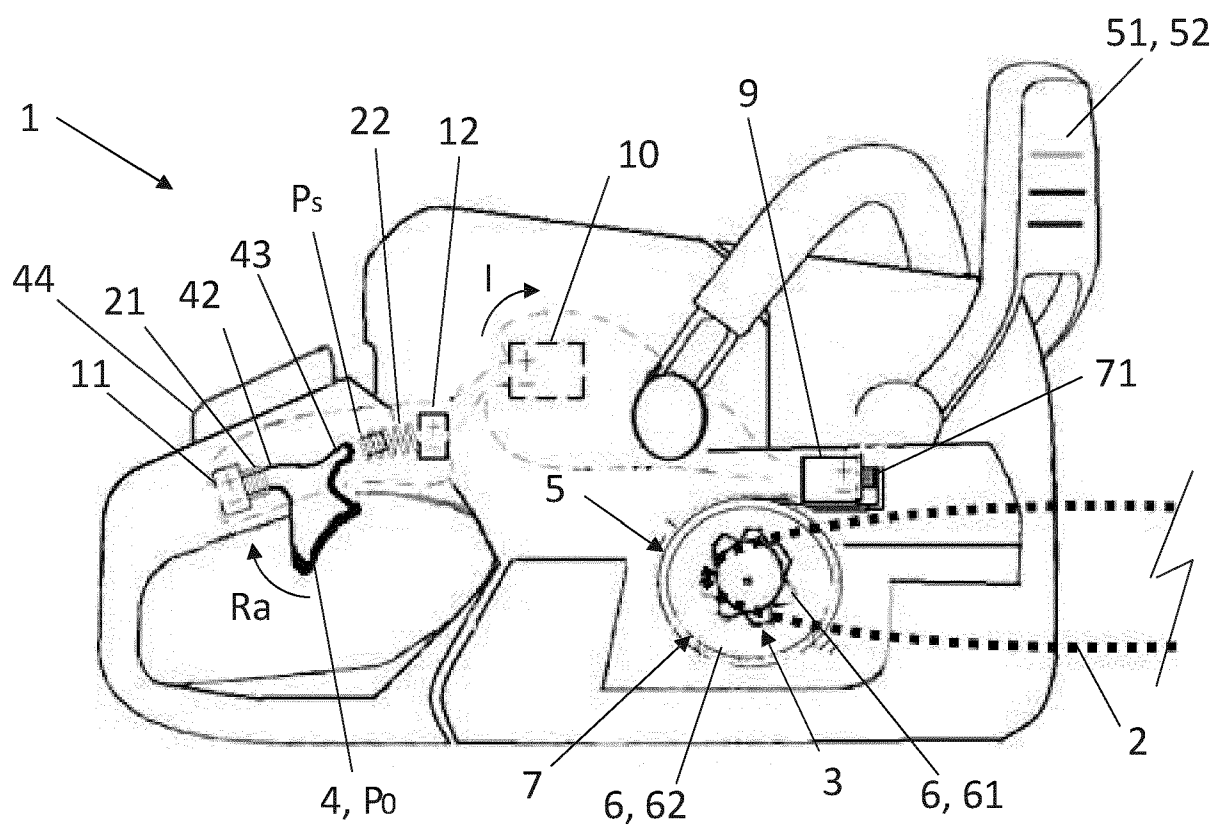


Fig. 4

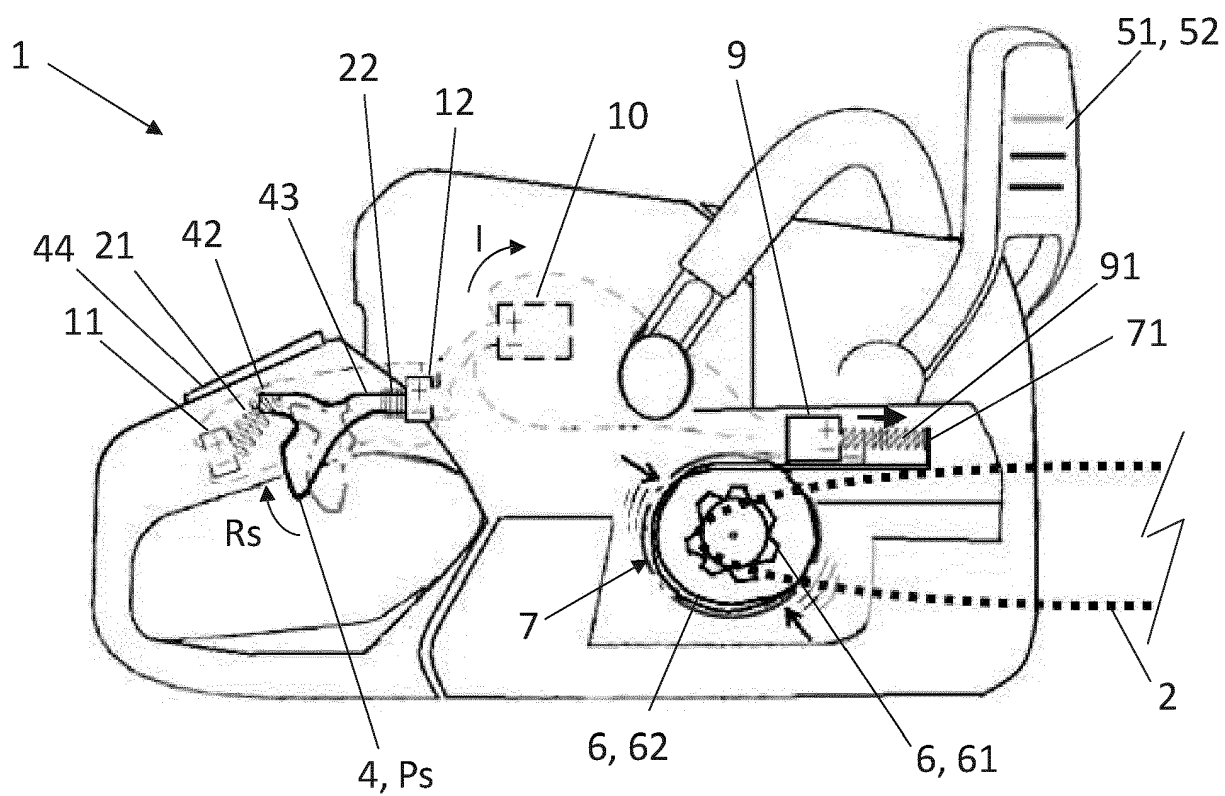


Fig. 5

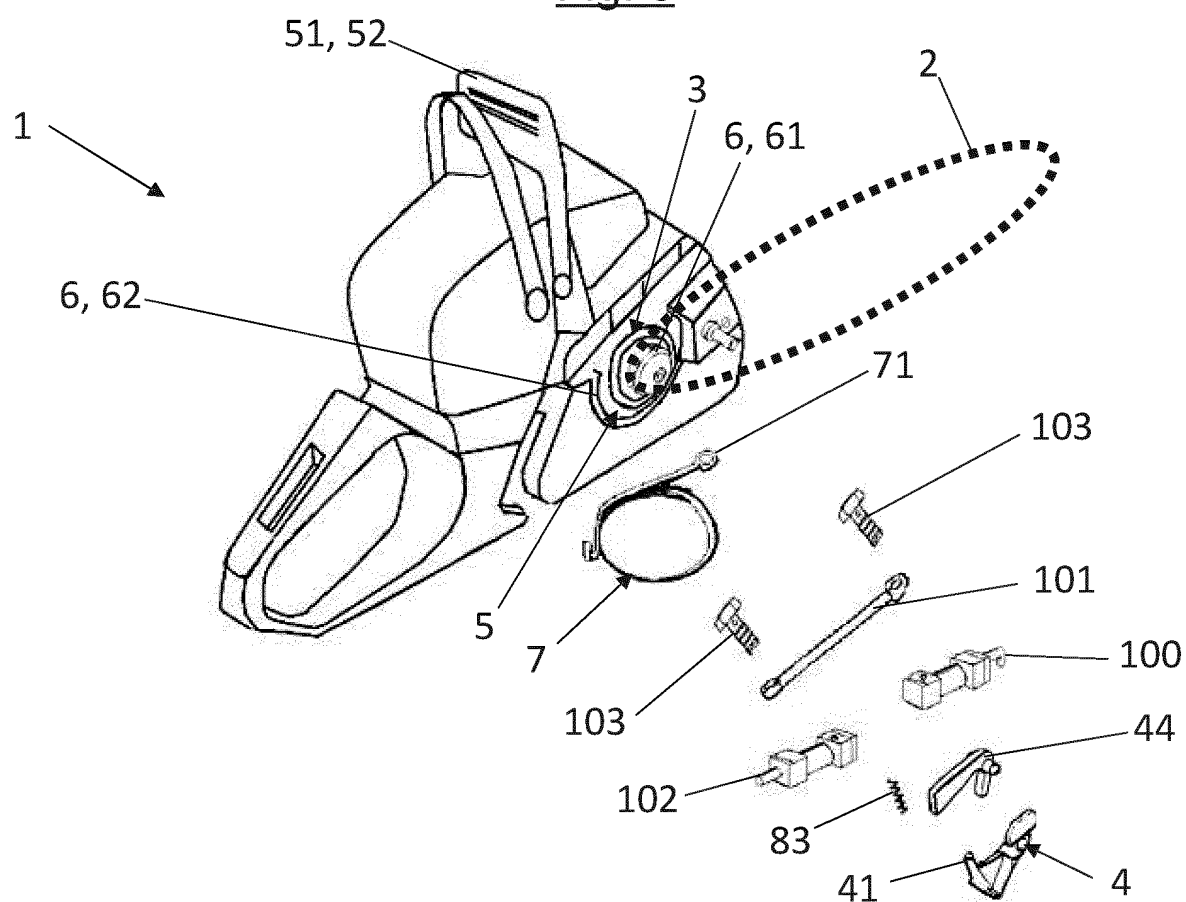


Fig. 6

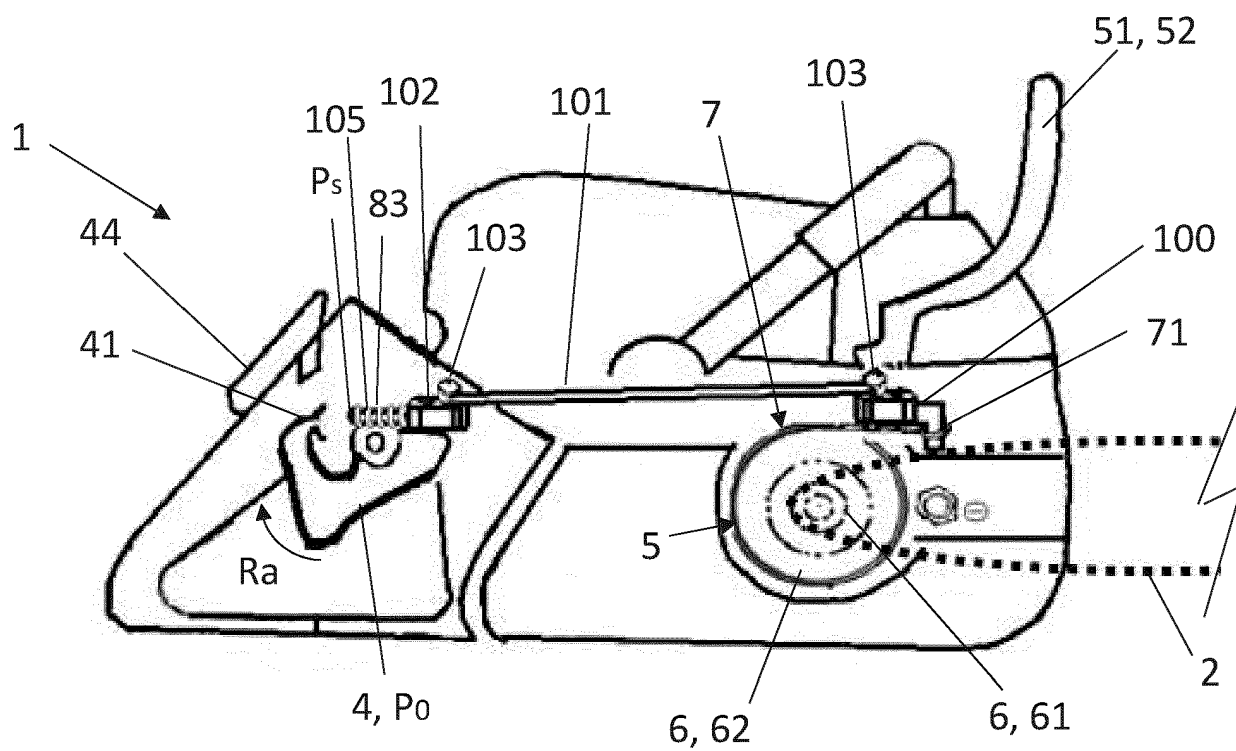


Fig. 7

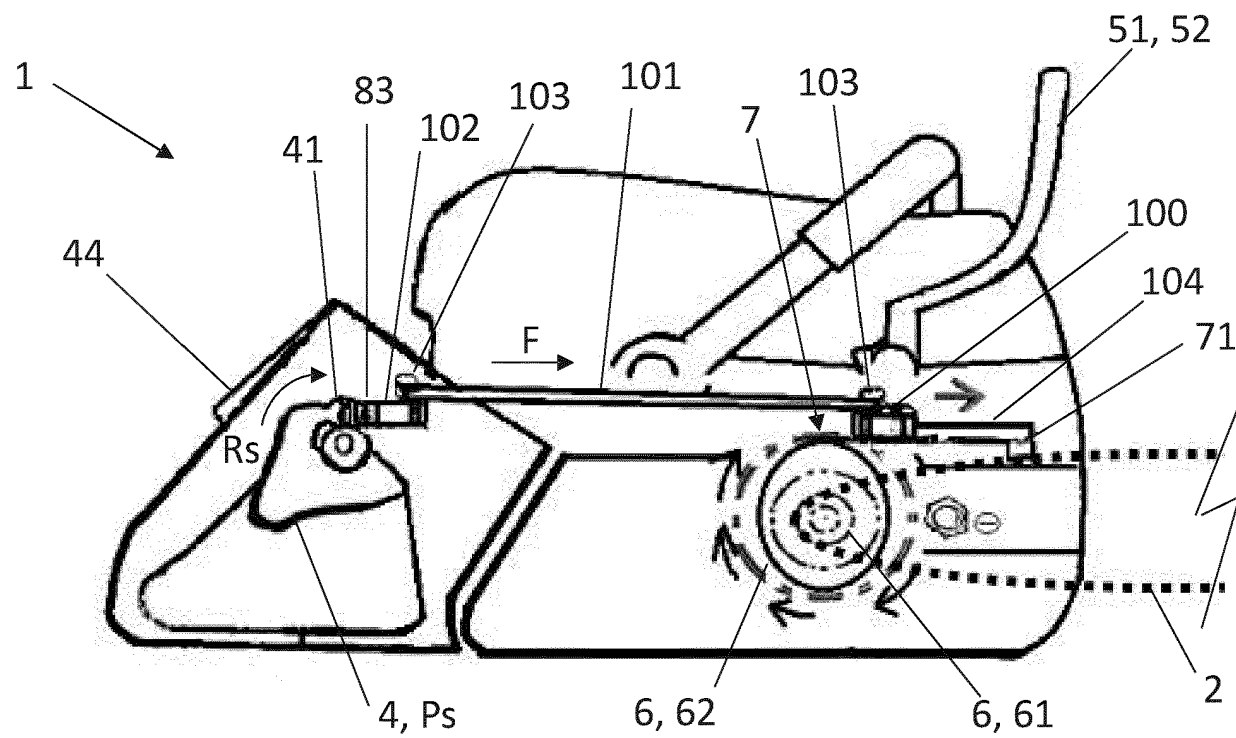


Fig. 8

**REFERENCES CITED IN THE DESCRIPTION**

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