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(54) **ANTI-VIBRATION DOOR LOCK**

(57) Door lock which comprises a latch and a latch-locking system which comprises a short lever and a long lever which maintain their resting position through the action of their respective short lever spring and long lever spring, enabling the unlocking of the latch through the engagement of the long lever and enabling the unlocking of the long lever through the engagement of the short lever, and which additionally comprises an anti-vi-

bration security system, comprising said anti-vibration security system:

- one or more masses with freedom of movement,
 - a latch-locking component,
 - a locking component for one or more latch-locking components,
- in which the movement of the mass activates the locking component.

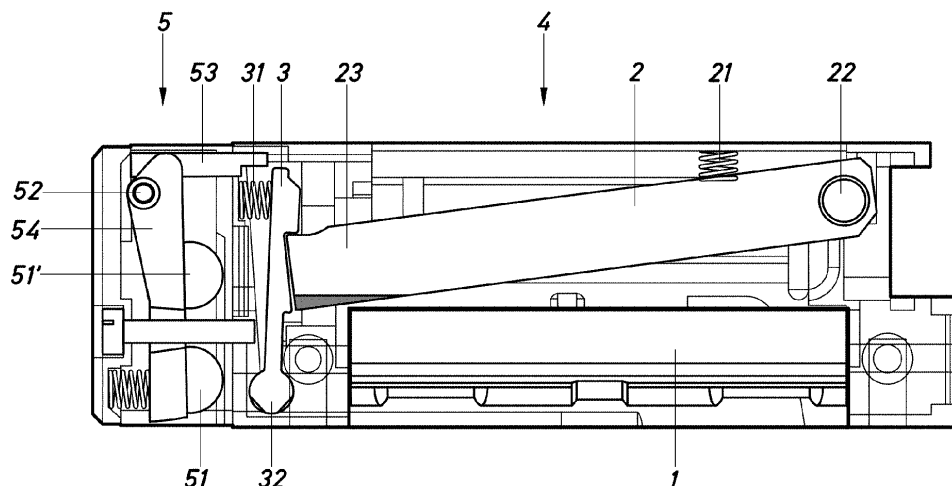


Fig.1

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Description

[0001] The present invention relates to a door lock. More particularly, the present invention relates to a door lock that has an anti-theft system. Even more particularly, the present invention relates to a door lock that has a system to protect it from incidental vibrations or intentional vibrations with the aim of forcing the door lock.

[0002] Door locks lock or close via their internal components. The most common types are short levers (or locking lever) and long levers, which maintain their resting position thanks to the action of their respective lever springs. The long lever receives the movement of the latch keeper, as its function is to keep the latch keeper locked along with the short bar. In general, when the short lever is engaged and freed by the springing of the electric coil, a load or pressure on the latch displaces the long lever, allowing it to unlock.

[0003] The terms long lever and short lever are usually used in the sector and relate to their most common size. However, naming them as such in this application does not necessarily imply any size relation between the same.

[0004] On some occasions, an installation can be vandalised and/or forced using specific, intrusive methods (e.g. by inserting a hard but flexible piece of laminate through the slot of the door). The intrusive methods need to be more complex when more protective methods are present in the lock. In any case, it becomes difficult to force an entry, requiring some degree of skill on the intruder's part in order to open the lock. However, it has become known that unwanted methods of opening doors are aided or accelerated if the door is hit at the same time as it is opened using the intrusive manoeuvre.

[0005] The object of the present invention is to disclose methods that provide a solution to the above-mentioned problem.

[0006] Studies conducted for the present application have shown that hitting a door when opening the door in an act of vandalism produces vibrations that are transferred to the lock. These vibrations could affect the lever springs of the long or short levers or the levers themselves, changing their position and causing the system to unlock accidentally. Similarly, some methods used to try to force door locks include producing vibrations with the aim of achieving the previously mentioned situation in which the lever springs change the position of the levers as a result of the vibration.

[0007] To this effect, the present invention discloses a type of door lock which comprises a latch and a latch-locking system that comprises, in addition, a second locking system which itself comprises a vibration sensing system that engages the second locking system, so that the second locking system activates its locking action in the presence of a vibration.

[0008] The present invention can be used as an added function in door locks with the aim of ruling out this possibility of opening via vibration and preventing the accidental unlocking or opening of the mechanism as a result

of movement or vibrations.

[0009] The latch locking from the second locking system can be performed directly on the latch, or even indirectly. Indirectly, it can be performed by locking any component of the main locking system or first locking system (e.g. directly locking the short lever, or the short lever) or even locking the latch of the lock if necessary.

[0010] When the second locking system is activated due to vibrations, it prevents the lock from being forced by hitting it.

[0011] The second locking system according to the present invention can be configured to activate in the presence of any kind of vibration, or even in the presence of a specific kind of vibration, e.g. vibration or oscillation in a specific direction.

[0012] The vibration can be detected via a sensor, or even via mechanical systems, e.g. systems in which a component has some freedom to move.

[0013] The activation of the second locking system as a result of a vibration sensor can be triggered using electronic, pneumatic, hydraulic, or even mechanical methods, e.g. a component activated by a component with free movement as previously stated.

[0014] In a particularly preferred embodiment, the present invention describes the addition of a locking system that is activated by a mass with free movement. The additional locking system of the present invention is activated by the presence of a vibration, owing to the movement that the vibration produces in the previously mentioned mass, which does not remain fixed to the rest of the locking system or the door lock, which additionally enables the system to lock just at the moment when the vibration can open the door lock.

[0015] Even more particularly, in a preferred embodiment, the present invention describes a type of door lock which comprises a latch and a latch-locking system which comprises a short lever and a long lever which maintain their locked position through the action of their respective short lever spring and long lever spring, enabling the unlocking of the latch through the engagement of the long lever and enabling the unlocking of the long lever through the engagement of the short lever, and which additionally comprises an anti-vibration security system or second locking system, with the lock comprising a component with freedom of movement to detect the vibration and in which the second locking system acts on the short lever and/or the long lever.

[0016] The component with free movement can be, preferably, a free mass.

[0017] The component with free movement or the free mass, not being fixed, can be moved by a vibration, activating the system. Preferably, the free mass comprises at least one component that is free to move in a confined space. Also, preferably, the free mass can comprise one or more components. In an advantageous way, the components are rolling components, especially spheres, though they take any shape.

[0018] The present invention foresees that the compo-

nent for locking the position of the short lever and/or the long lever remains pivoted. Pivot joining is a very simple method for transforming the movement of the mass triggered by vibration into a locking action in the opposite direction to the movement of the short lever and/or long lever. Thus, in particularly preferred embodiments, the component for locking the position of the short lever and/or long lever has a pivot point around which, one end of the lock of the short lever and one end of reception of the action of the mass with free movement, having the locking end of the short lever and the end that receives the action of the mass on opposite sides with respect to the pivot point.

[0019] Preferably, the component for locking the position of the short lever and/or long lever comprises a recovery component, e.g. they could be magnets or a resilient component, e.g. a spring, which acts on the component to maintain its resting position. The resilient or lever spring present various advantages, one of which includes enabling the recovery of the resting position. Another use is that, in the resting position, it allows the component to exercise an action on the free mass, in a way that allows the free mass to stay between the locking component of the short lever and a threshold or wall. In this case, it should be taken into account, therefore, that in order for the mass to activate the anti-vibration security system it should surmount the force that the lever spring exerts in the resting position. To do so, it may be advisable that in the resting position, the resilient or lever spring component should be such that it does not exert any substantial resilient force greater than that needed to maintain the locked system. In such an embodiment, the said force in the resting position can be basically null.

[0020] In an advantageous way, the invention allows the component for locking the position of the short lever to be located in a unit that is fixed, e.g. screwed, to the main body of the door lock. This makes adaptation possible for existing door locks. Certainly, the intention can also be implemented integrally with door locks.

[0021] To understand this better, some drawings are attached as an explanatory illustration, though not a limited one, of an embodiment of the door lock featured in the present invention.

Fig. 1 is a schematic view of the internal components of an example of an embodiment of the door lock according to the present invention, in a closed or resting position.

Fig. 2 is a view of the door lock in an open and un-resting position.

Fig. 3 is a view of the door lock in a resting position, and the effects of a vibration on the same are represented.

Fig. 4 is a detailed view of the vibration action on the anti-vibration security system on the door lock

shown.

Fig. 5 is a detailed view of the reaction that the vibration in the anti-vibration security system of the door lock shown triggers.

Fig. 6 is a schematic view of an alternative embodiment of the anti-vibration security system.

Fig. 7 is a schematic view of another alternative embodiment of the anti-vibration security system.

Fig. 8 is a schematic view of yet another alternative embodiment of the anti-vibration security system.

[0022] Figs. 1 to 5 show a door lock comprising a housing or body -4- which has a latch -1-, and a latch-locking mechanism that comprises a long lever -2- positioned around a pivot point -22- and which comprises a recovery lever spring -21- and a locking lever or short lever -3- also with a pivot point -32- and a recovery lever spring -31-. The short lever -3- presents a recess -33- in which a conjugated projection -23- of the long lever -2- is located. When the projection -23- of the long lever is in the recess -33- of the short lever, the long lever is prevented from pivoting, as it is necessary for it to move forward prior to the pivoting of the short lever -3-.

[0023] In the example shown in the figures, the anti-vibration security system comprises a second locking system drawn up in a unit -5- that is screwed into the body -4- of the door lock at the end in which the short lever -3- is located.

[0024] Inside, the unit -5- comprises a metal strip -54- that pivots around a pivot point -52-. When locked, the metal strip maintains its position thanks to a lever spring located on one of its two sides. Two steel spheres -51-, -51'- are located in housings. In this case, the housings are located at the side of the metal strip -54- that is opposite the lever spring. Due to the action of the lever spring, the spheres come into contact with the wall and bring the metal strip -54- into the resting position. At the other end, the metal strip features a puncher -53- which, at the required moment, will come into contact with the short lever -3- to lock its opening, preventing it from being displaced.

[0025] In a situation where there is vibration, the balls -51-, -51'- will be displaced from their resting position, occupying more space and, owing to the shape of their housings, generating a movement in the direction of the lever spring exceeding its pressure, this movement forces the metal strip to pivot on its pivot point and rotate the puncher -53- until it comes into contact with the short lever -3-, blocking possible movement of the same.

[0026] When the vibration stops, the lever spring of the metal strip -54- returns to its position, realigning all the components of its starting position.

Functioning without vibration (see figs. 1 and 2)

[0027] As is known, the functioning of door locks is that they generate the locking or unlocking between the short -3- and long -2- levers, ensuring locking or enabling opening.

[0028] In figs. 1 to 5 a door lock with an integrated anti-vibration system can be seen. Fig. 1 shows the mechanism in a locked state (without vibration). Fig. 2 shows the door lock in an unlocked state (and open). The step from one state to another involves the displacement of the levers -2-, -3-, turning of the latch -1-, etc.

[0029] Given that the anti-vibration security system is normally in an inactive position, it does not interfere with the normal functioning of the door lock if there is no vibration.

Functioning with vibration (see figs. 3 to 5)

[0030] The door lock is in a resting position (closed/locked) when a vibration is produced. In fig. 3, the door lock has been shown in a resting position with the initial action of the vibration. As can be seen, there is a risk that the lever spring -31- of the short lever will be squeezed and if the vibration manages to squeeze the lever spring -31- and a load is simultaneously exerted on the latch -1-, the mechanism will open.

[0031] In this situation, the anti-vibration security system comes into action.

[0032] As has been shown in fig. 4, the two steel spheres -51-, -51'- start to vibrate in their housings, trying to displace themselves, occupying more space. The spheres -51-, -51'-, being limited in their movement by a ceiling or end (in this case, a dividing wall between the unit -5- and the main body -4- of the door lock), put pressure on the metal strip -54- and force it to pivot around its own pivot point -52-, while also squeezing the lever spring of the metal strip. At the same time, the puncher -53- displaces itself from its contact position with the short lever -3-.

[0033] When the action is complete (see fig. 5), the puncher -53- is in contact with the lower part of the short lever -3-, forming a threshold or lock that prevents it from being displaced by the vibration, keeping the system locked and ensuring that the door will be closed.

[0034] When the state of vibration ceases, the lever spring of the metal strip -54- returns the system to its prior position.

[0035] The unit -5- shown in the examples also has a connecting bolt -59- with the main body -4- of the door lock, and which crosses the metal strip -54- via an opening -58-, the dimensions of which allow the previously mentioned metal strip -54- to pivot. Furthermore, the end -532- of the puncher -53- features a recess -531- to prevent the short lever -3- from jamming in the punch during authorised opening shown in fig. 2.

[0036] On the other hand, the component -51- can be integrated into the spring -511-, it can be integrated into

any door lock system.

[0037] Preferred embodiments are those in which the second locking system is activated with the same vibration as that which would open or contribute to the opening of the mechanism. The second locking system can lock other components at the edge of the short lever, e.g. the long lever -2- with the same system as the short lever, or by using either of the two systems. The system could also lock the latch of the lock.

[0038] Other embodiments can use a sensor that detects vibrations and activates a coil (electric, pneumatic, etc.) which secures the short lever, long lever or latch.

[0039] In another embodiment, the same locking vibration can offset the short lever, long lever or latch, preventing it from moving to its normal open position, and, thus, automatically locking the components.

[0040] Figs. 6 to 8 are three conceptual schematic views corresponding to the respective possible alternative embodiments. Components that are equal to or the equivalent of those previously described have been indicated with identical numerals and will not be described in detail. Likewise, components that facilitate the explanation have been omitted.

[0041] In fig. 6, the shaft -532- remains slightly outside of the opening -39- when the short lever -3- is in a locked-door position. If there is no vibration, the short lever -3- moves with its opening -39- aligning with the shaft -532-. Thus, without vibration, the system allows the short lever to pivot -3-. However, if there is a vibration, the shaft -532- moves in relation to the position shown in fig. 6 and no longer stays centred in relation to the opening -39- thus preventing the short lever -3- from rotating. Once the vibration stops, the lever spring -511- returns the system to the starting position, pivoting around the pivot point -52- until the shaft -532- aligns with the opening -39-.

[0042] Fig. 7 features a sensor -100- (e.g. an electronic motion sensor, e.g. an accelerometer) which is responsible for detecting a vibration. When the vibration reaches a value greater than the detection value, or a predetermined value, it sends a signal to a coil -101- (it could also be any type of driver) that activates the second locking system which locks the movement of, for example, the short lever -3-.

[0043] Fig. 8 shows a second locking system that acts directly on the latch. Similarly, in this embodiment, the second locking system comprises two shafts -532-, -532'- which have free movement and are connected to spring passages that are fixed, for example, to the body of the door lock. The two shafts are facing each other, and the springs are aligned or parallel. Similarly, in a resting position, each one of the shafts are aligned facing openings -11-, -11'- that are both worked into the latch -1-. In the presence of either of the two types of vibration, the action of the springs will make at least one of the shafts enter its corresponding opening, preventing or at least making it difficult to move it.

[0044] Although the invention has been presented and described with reference to embodiments thereof, it

should be understood that these are not limiting to the invention, such that multiple variable constructive or other details may be evident to the technicians of the sector after interpreting the embodiment disclosed in the present description, claims and drawings. Thus, all variants and equivalents will be included within the scope of the present invention if they can be considered to fall within the broader scope of the following claims.

Claims

1. Door lock that comprises a first latch-locking system **characterised in that** it comprises, in addition, a second locking system which itself comprises a vibration sensing system that engages the second locking system, so that the second locking system activates its locking action in the presence of a vibration. 5
2. Door lock, according to claim 1, **characterised in that** the second locking system acts directly on the latch. 10
3. Door lock, according to claim 1, **characterised in that** the second locking system acts indirectly on the latch. 15
4. Door lock, according to any one of the preceding claims, **characterised in that** it comprises a vibration sensor that produces a signal for detecting vibrations. 20
5. Door lock, according to any one of claims 1 to 4, **characterised in that** it comprises at least one component with freedom of movement, arranged in a way that it can be moved by vibration. 25
6. Door lock, according to claim 5, in which the component or components with freedom of movement comprise at least one mass that can move freely in a confined space. 30
7. Door lock, according to any one of claims 5 to 6, in which the component for locking the position of the short lever and/or the long lever has a resilient or magnetic component that acts on the component in a direct or indirect way so as to maintain its resting position. 35
8. Door lock, according to any one of claims 5 to 7, **characterised in that** the locking system comprises one or more short levers, a long lever, one or more rolling or swinging parts, an electronic or pneumatic motor, which allow the latch to unlock and act directly or indirectly on any one of the mobile components which act on the latch lock. 40
9. Door lock, according to any one of claims 5 to 8, in which the component for locking the position of the lever features a zone that comes into contact with the locking component when the mass is displaced. 45
10. Door lock, according to any one of claims 5 to 9, in which the component for locking the position of the short lever and/or long lever and/or rolling or swinging component has a pivot point around which one locking end of the short lever and one receiving end of the action of the mass with freedom of movement can pivot, with the locking end of the short lever and the end that receives the action of the mass being at opposite sides with respect to the pivot point. 50
11. Door lock, according to any one of claims 5 to 10 in which the component for locking the position of the short lever and/or long lever comprises a metal strip, which comprises at least one housing which contains the previously mentioned mass. 55
12. Door lock, according to any one of claims 5 to 11, in which the mass with freedom of movement and the component for locking the position of the short lever and/or long lever are positioned in a single unit to the main body of the door lock.
13. Door lock, according to any one of the preceding claims in which the component for locking the first locking system comes into action owing to the signal emitted from a vibration sensor.
14. Door lock, according to any one of the preceding claims in which the anti-vibration system is integrated into the main body of the door lock.

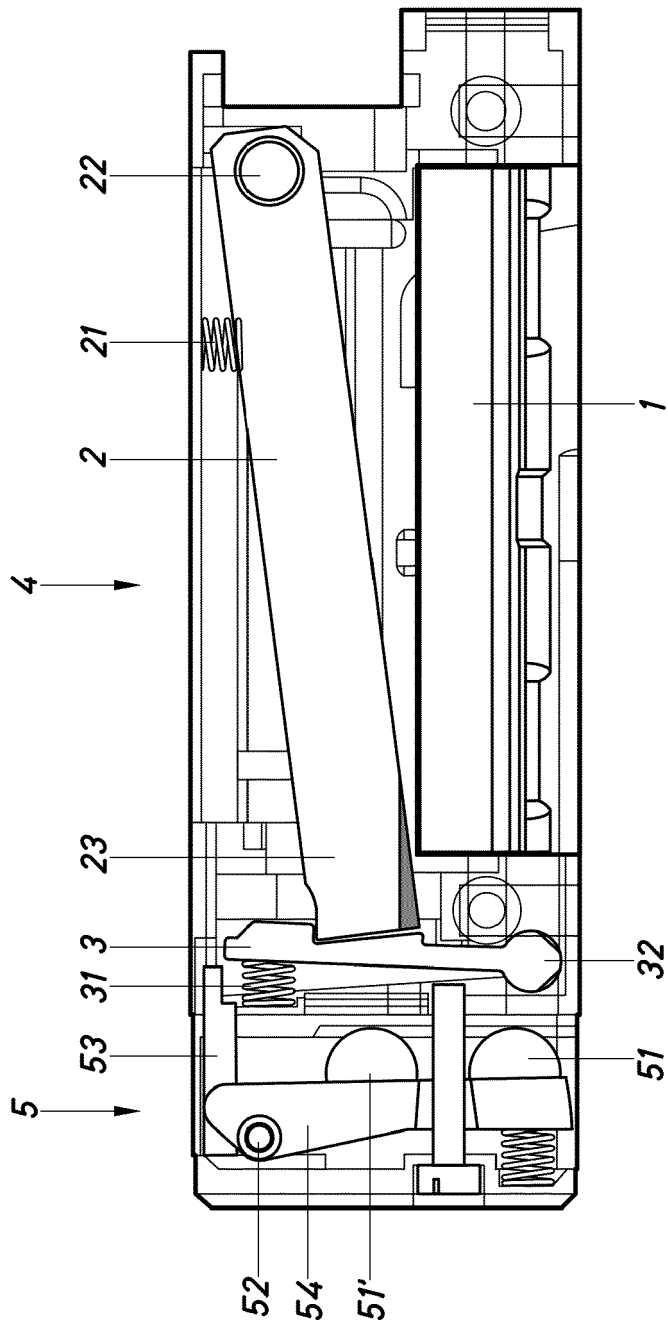


Fig.1

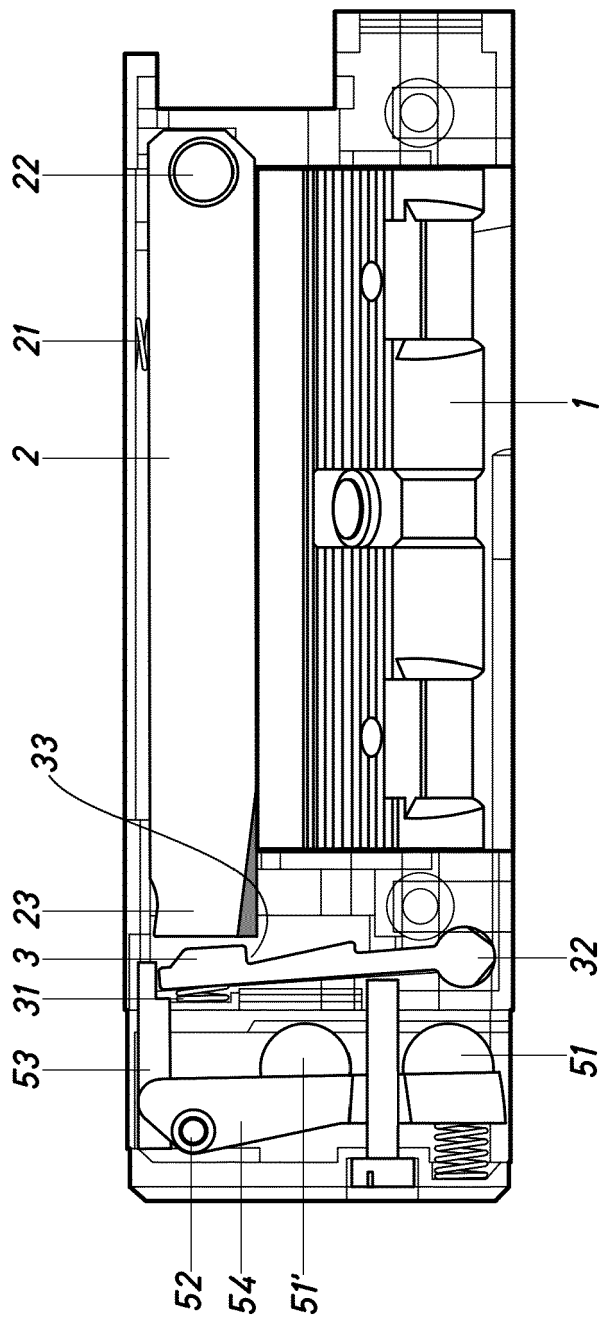


Fig.2

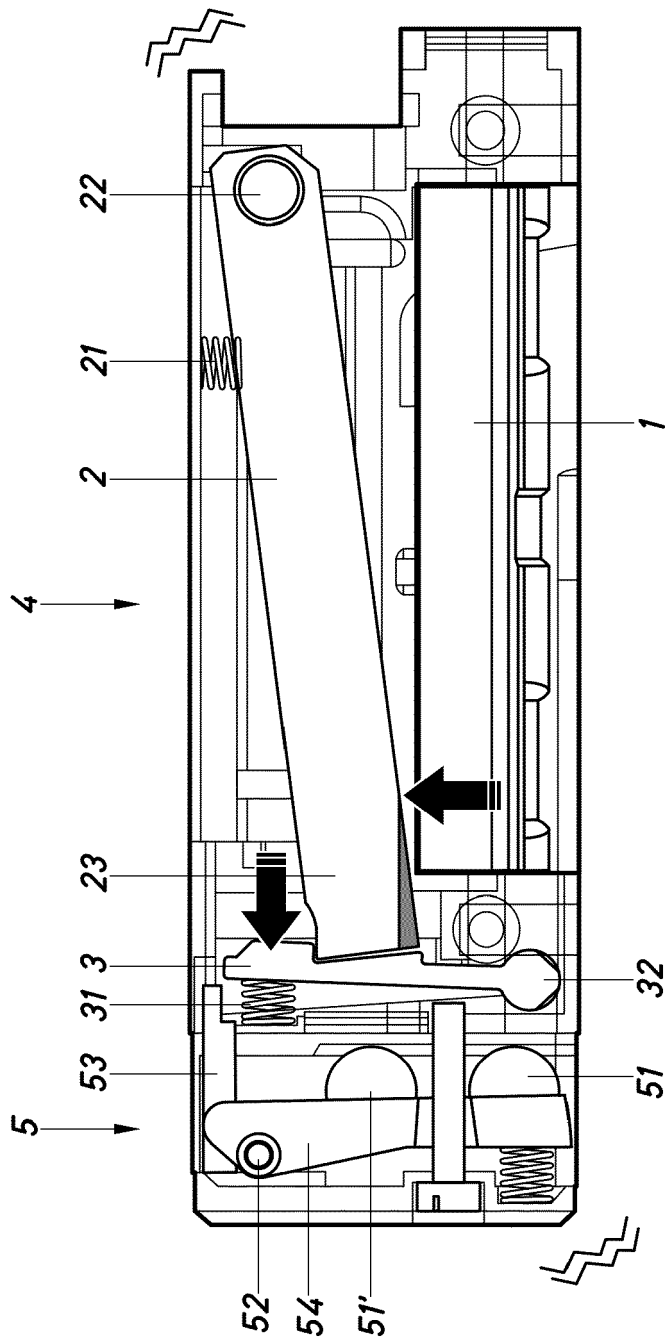


Fig.3

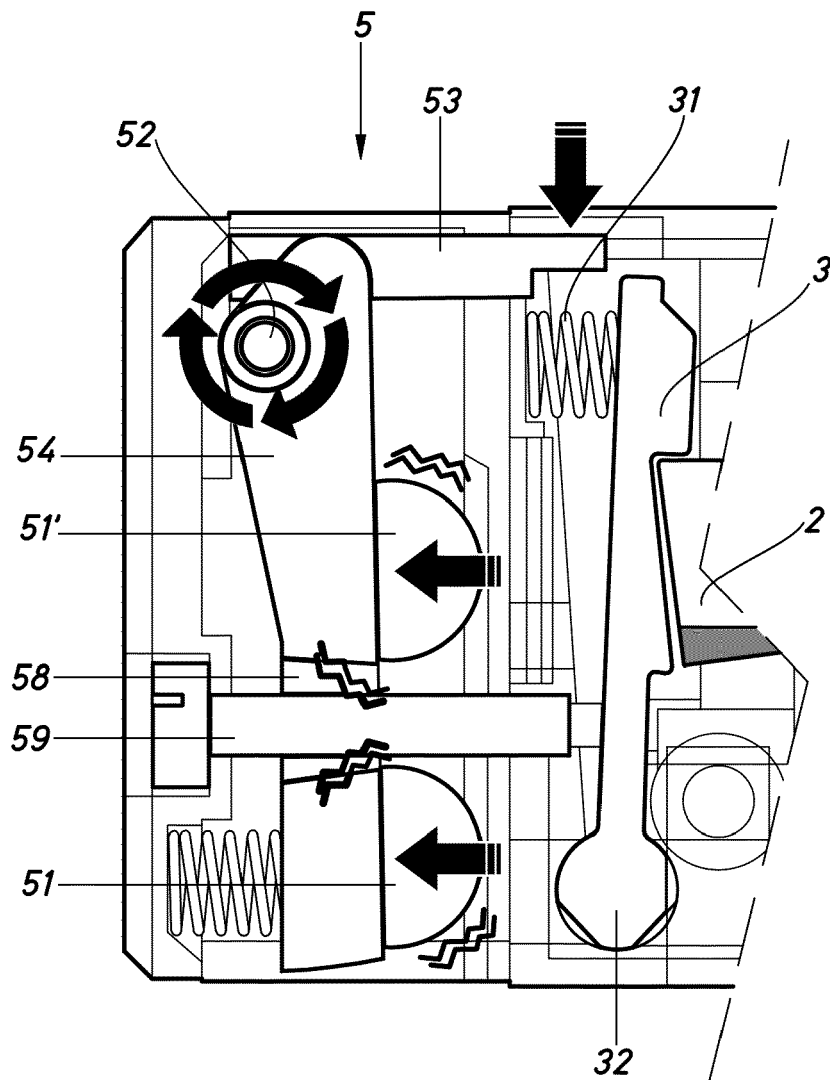


Fig.4

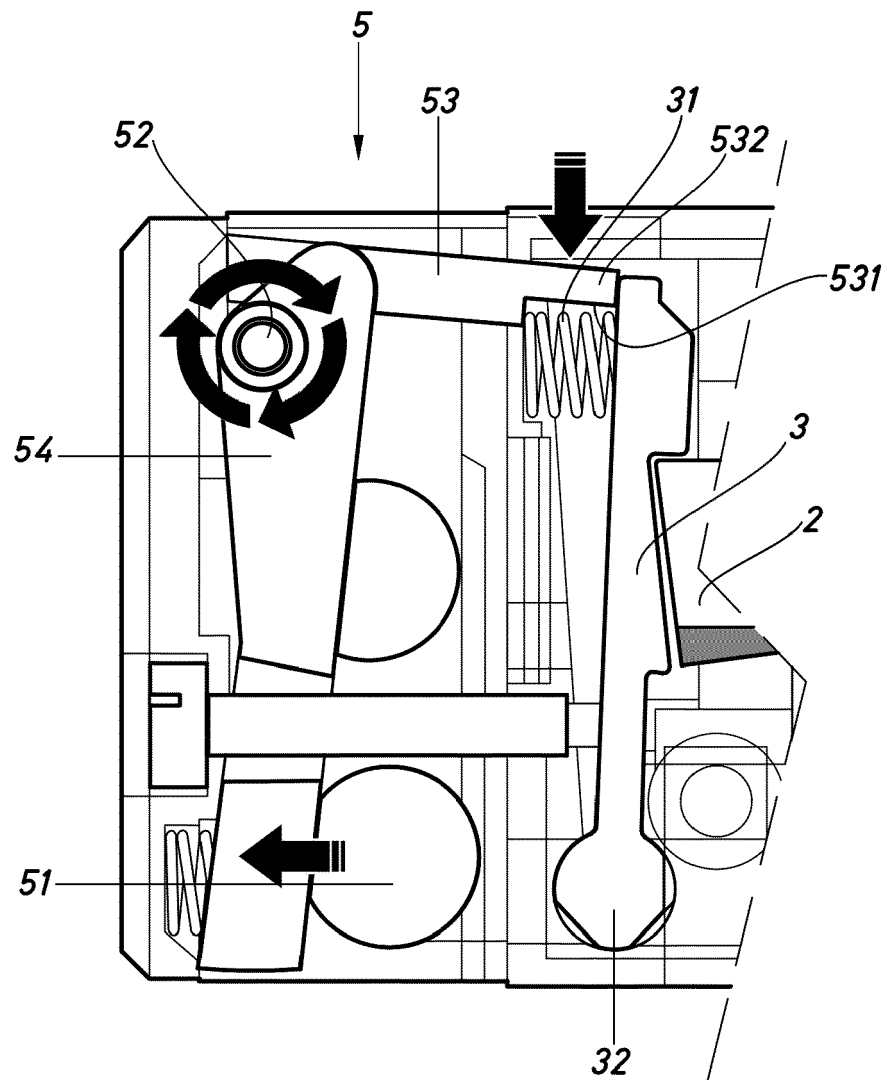


Fig.5

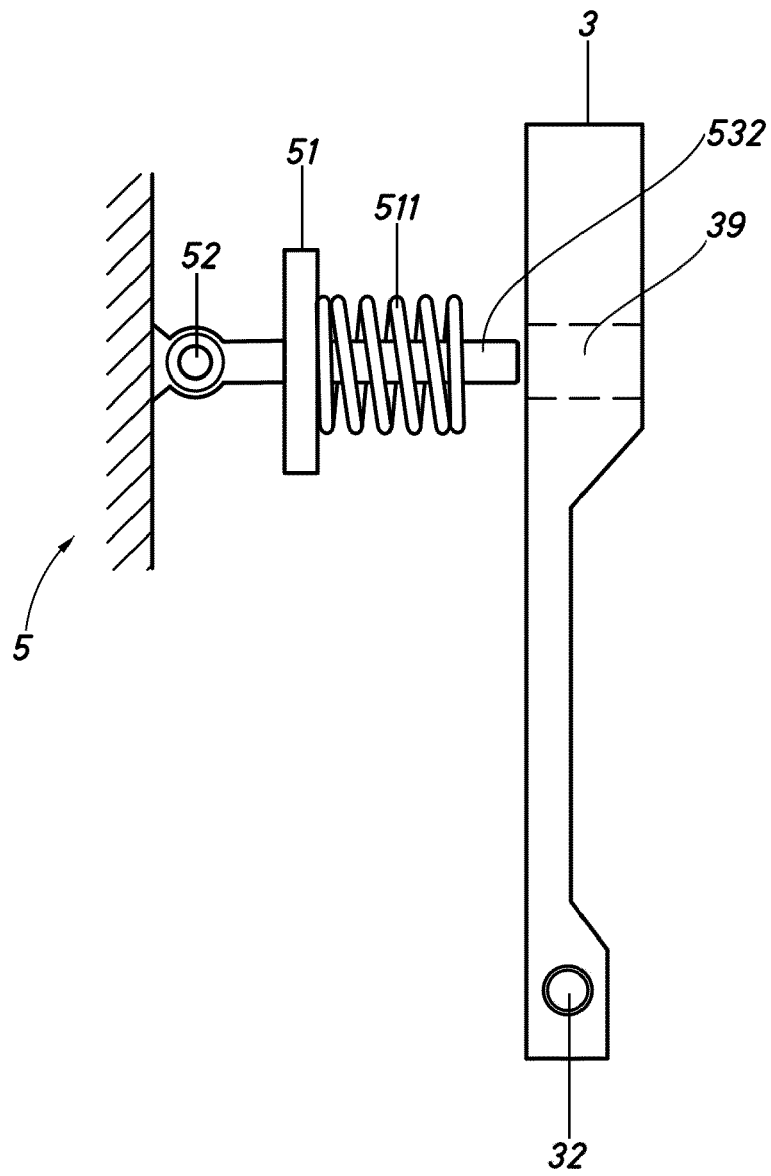


Fig.6

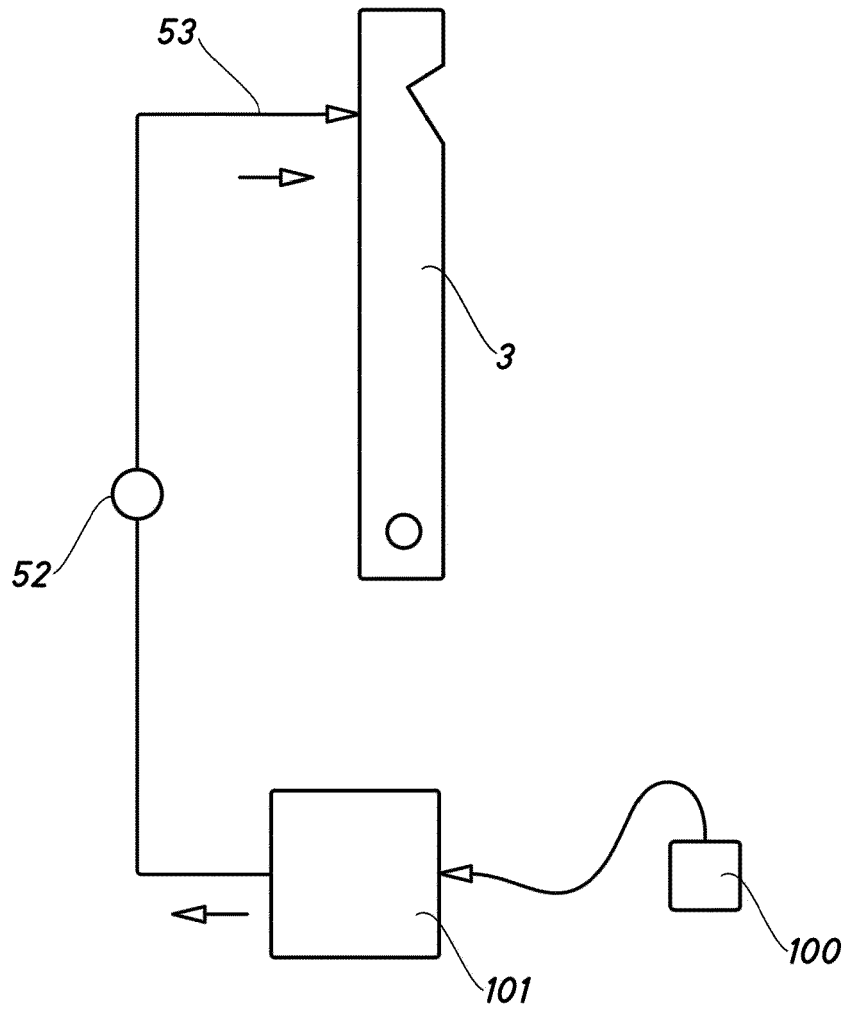


Fig.7

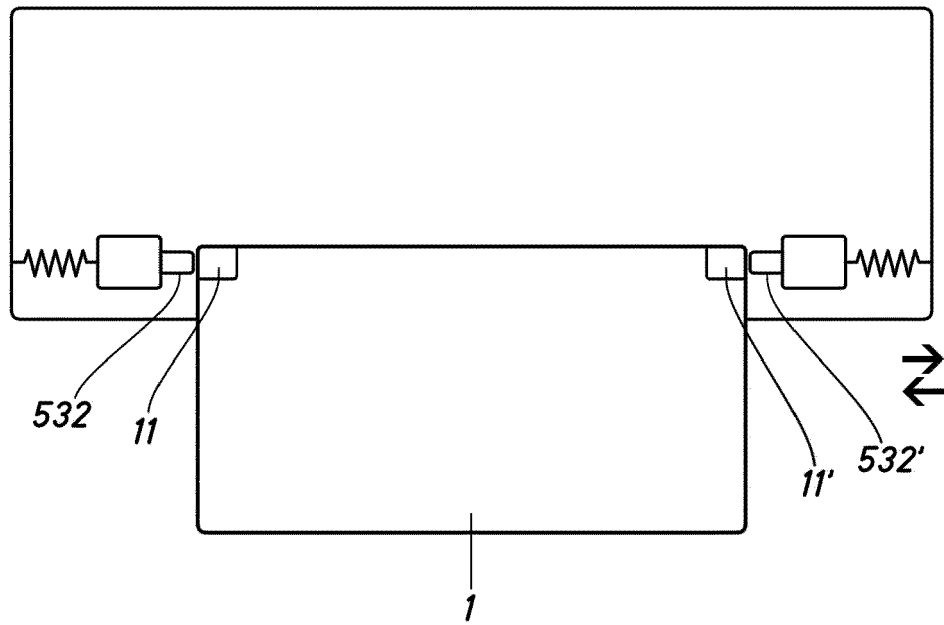


Fig.8



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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 11 February 2020	Examiner Antonov, Ventseslav
CATEGORY OF CITED DOCUMENTS 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 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 & : member of the same patent family, corresponding document			

EPO FORM 1503 03/82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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