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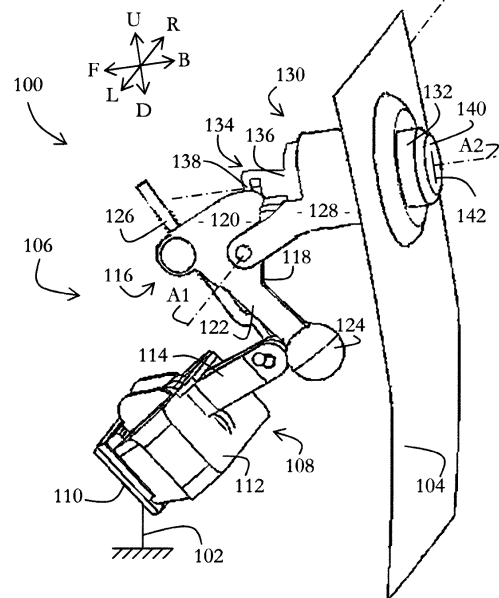
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(54) Locking mechanism, opening system and motor vehicle

(57) The locking mechanism (106) comprises a blocking unit (108) for blocking/unblocking the panel, a blocking unit actuation system (116) comprising a lever (118) having a weight (124) fixed to a lower arm (122) of the lever (118) and a lever actuation device (130) intended to move between a back position and a front position, the lever actuation device (130) comprising a link element (134) providing a link with the lever (118), the link element (134) comprising a pushing portion (136) intended to push the upper arm (120) of the lever (118) frontward so as to rotate the lever (118) from its unblocking position to its blocking position when the lever actuation device (130) moves from its back position to its front position.

The link element (134) further comprises a restoring portion (138) intended to be pushed by the upper arm (120) of the lever (118) when the lever (118) rotates from its blocking position toward its unblocking position, so as to move the lever actuation device (130) toward its front position.

Figure 1



Description

FOREWORD

[0001] In this specification, the terms "front," "forward," "back," "backward," "up" "upper," "low," "lower," "left," "right," and similar such terms are not to be construed as limiting the invention to a particular orientation. Instead, these terms are used only on a relative basis, and with reference to the following directions in the drawing: front-back, up-down and left-right, respectively designated by the pairs of letters: F-B, U-D and L-R.

FIELD

[0002] The invention relates to locking mechanisms, in particular for a motor vehicle.

BACKGROUND

[0003] In a motor vehicle, it is known to lock the trunk panel with a locking mechanism of the type comprising:

- a blocking unit intended to selectively take a blocking configuration in which the blocking system blocks the panel in a closed position, and an unblocking configuration in which the blocking system lets the panel be opened,
- a blocking unit actuation system comprising:
 - a lever intended to rotate around a first axis between a blocking position and an unblocking position, in order to put the blocking unit in respectively the blocking configuration and the unblocking configuration, the lever comprising an upper arm extending above the first axis, a lower arm extending below the first axis, and a weight fixed to the lower arm, and
 - a lever actuation device intended to move between a back position and a front position, the lever actuation device comprising a link element providing a link with the lever, the link element comprising a pushing portion intended to push the upper arm of the lever forward so as to rotate the lever from its unblocking position to its blocking position when the lever actuation device moves from its back position to its front position.

[0004] The blocking unit is often a latch. An advantage of such a mechanism is then to be able to place the latch remotely from the lever actuation device by using a rod, pulled by the lever, to activate the latch.

[0005] Furthermore, the weight prevents unwanted opening of the panel in case of a collision from the front, by forming a counter or balance weight with respect to the lever activation system.

[0006] However, in case of a collision from the back,

the presence of the weight actually worsens the risk of opening of the trunk panel and the consequence of the collision. This is because the weight tends move backward with respect to the rest of the vehicle and in this way drags along the lever from its blocking position to its unblocking position.

[0007] There is therefore a need for a locking mechanism that does not easily give in during a collision from the back.

SUMMARY OF THE INVENTION

[0008] It is proposed a locking mechanism for a panel of the previous type, **characterized in that** the link element further comprises a restoring portion intended to be pushed by the upper arm of the lever when the lever rotates from its blocking position toward its unblocking position, so as to move the lever actuation device toward its front position.

[0009] Thanks to the restoring portion, the lever is not likely to reach its unblocking position in case of a collision from the back. The reason being that the restoring portion is pushed by the upper arm of the lever, which moves the lever actuation device towards its front position. However, at the same time, because of the collision from the back, the inertia of the lever actuation device tends to make the lever actuation device move towards its back position. This backward movement makes up for the pushing of the upper arm of the lever, and helps preventing the lever from reaching its unblocking position.

[0010] Optionally, the link element is furthermore intended to move between a coupled position in which the pushing portion is able to push the upper arm of the lever and an uncoupled position in which the pushing portion is unable to push the lever, the lever actuation device further comprises a coupling system intended to move the link element between its coupled position and its uncoupled position, and the restoring element is intended to be pushed by the upper arm of the lever when the lever rotates from its blocking position to its unblocking position, so as to move the lever actuation device from its back position to its front position, whatever the position of the link element - coupled or uncoupled - may be.

[0011] Optionally, the lever actuation device is intended move along a second axis.

[0012] Optionally, the link element is intended to rotate around the second axis in order to move between its coupled position and its uncoupled position.

[0013] Optionally, the link element comprises a base and a wall circumferential with respect to the second axis and projecting frontward from the base, the circumferential wall is provided with a longitudinal slot and a circumferential slot, the circumferential slot joining the longitudinal slot, the return element is formed by the portion of the circumferential wall extending frontward with respect to the circumferential slot, and the lever comprises a pin projecting from the upper arm of the lever and extending in the circumferential slot when the link element is in the

coupled position, and in the longitudinal slot when the link element is in the uncoupled position.

[0014] Optionally, the link element is bistable between its coupled position and its uncoupled position.

[0015] Optionally, the weight has a mass chosen so that, when the locking mechanism is accelerating along the first axis, the upper arm of the lever and the lever actuation device produce a first torque on the lever around the first axis, while the lower arm and the weight of the lever produce a second torque on the lever around the first axis, the first and second torques having opposite signs and equal absolute values, plus or minus 10%.

[0016] Optionally, the blocking unit is a latch.

[0017] Optionally, the lever actuation device further comprises a pushbutton intended to be pushed frontward so as to push the lever actuation device front its back position to its front position.

[0018] It is further provided an opening system comprising a panel and a locking mechanism for the panel, as previously provided.

[0019] It is further provided a motor vehicle comprising an opening system as previously provided, wherein the panel is a trunk panel.

BRIEF DESCRIPTION OF THE DRAWING

[0020] An embodiment of the invention will now be described by way of example only and with reference to the appended figures.

Figure 1 is perspective view of an opening system for a trunk according to the invention.

Figure 2 is a perspective view of is a perspective view of a link element of the opening system of figure 1.

Figure 3 is a side view of the opening system of figure 1, when the link element is in a coupled position.

Figure 4 is a side view of the opening system of figure 1, when the link element is in an uncoupled position.

DETAILED DESCRIPTION OF THE DRAWING

[0021] With reference to figures 1 to 4, an opening system 100 carrying out the invention will now be described. In the described example, the opening system 100 is a trunk opening system for a motor vehicle (not depicted). Furthermore, the directions (front-back, up-down, left-right) correspond to the usual directions of the motor vehicle.

[0022] With reference to figure 1, the opening system 100 comprises a frame 102, for example the body-in-white of the motor vehicle.

[0023] The opening system 100 further comprises a panel 104 intended to move with respect to the frame 102 to selectively take an open position and a closed position. In the described example, the panel 104 is a trunk panel intended to selectively cover and give access to the trunk (not depicted) of the motor vehicle.

[0024] The opening system 100 further comprises a locking mechanism 106 for selectively blocking the panel 104 in its closed position and letting the panel 104 be opened. In the described example, the locking mechanism 106 is located frontward with respect to the panel 104.

[0025] In the described example, the locking mechanism 106 first comprises a blocking unit intended to selectively take a blocking configuration in which the blocking unit blocks the panel 104 in its closed position, and an unblocking configuration in which the blocking unit lets the panel 104 be opened.

[0026] In the described example, the blocking unit is a latch 108, for example, a mechanical latch, an electro-mechanical latch or a magnetic latch.

[0027] The latch 108 comprises a base 110 fixed to the frame 102, and a casing 112 fixed to the panel 104 in a manner not depicted on figure 1.

[0028] The latch 108 further comprises a bolt 114 mounted on the casing 112 in a movable way, so as to selectively take an engaged position and a disengaged position. In the engaged position, if the casing 112 is against the base 110, the bolt 114 engages the casing 112 in order to attach the casing 112 to the base 110, and thus maintain the panel 104 in its closed position. In the disengaged position, the bolt 114 is disengaged from the base 112 in order to allow separation of the casing 112 from the base 110, and thus opening of the panel 104.

[0029] The locking mechanism 106 further comprises a blocking unit actuation system 116. In the described example, because the blocking unit is a latch, the system 116 will from now on be called latch actuation system 116.

[0030] In the described example, the latch actuation system 116 is intended to be activated by a user in order to make the latch 108 let the panel 104 be opened.

[0031] The latch actuation system 116 first comprises a lever 118 intended to rotate around a left-right axis A1 between a blocking position (which is the position depicted on figure 1) and an unblocking position, in order to put the latch 108 in respectively its blocking configuration and unblocking configuration.

[0032] The lever 118 comprises an upper arm 120 extending above the axis A1 and a lower arm 122 extending below the axis A1. The lever 118 further comprises a weight 124 fixed to the lower arm 122.

[0033] The latch actuation system 116 further comprises a rod 126 connecting the lever 118 to the bolt 114. The rod 126 is intended to move the bolt 114 of the latch 108 between its engaged position and its disengaged position when the lever 118 respectively moves between its blocking position and its unblocking position.

[0034] The latch actuation system 116 further comprises a housing 128 fixed to the panel 104 and projecting frontward from the panel 104. The housing 128 is cylindrical and extends around a front-back axis A2.

[0035] The latch actuation system 116 further comprises a lever actuation device 130 partially contained into the housing 128, and intended to move along the axis

A2 between a back position and a front position.

[0036] The lever actuation device 130 first comprises a pushbutton 132 passing through the panel 104 and projecting backward from the panel 104, behind the housing 128. The pushbutton 132 is intended to be pushed frontward, for instance by a user wanting to open the panel 104, so as to push the lever actuation device 130 from its back position to its front position.

[0037] The lever actuation device 130 further comprises a restoration means (not depicted), such as a restoration spring, for moving the lever actuation device 130 from its back position to its front position.

[0038] The lever actuation device 130 further comprises a link element 134 providing a link with the lever 118.

[0039] The link element 134 first comprises a pushing portion 136 intended to push the upper arm 120 of the lever 118 frontward so as to rotate the lever 118 from its unblocking position to its blocking position when the lever actuation device 130 moves from its back position to its front position.

[0040] The link element 134 further comprises a return portion 138 intended to be pushed by the upper arm 120 of the lever 118 when the lever 118 rotates from its blocking position to its unblocking position, so as to move the lever actuation device 130 from its back position to its front position. In the described example, the return portion 138 is fixed to the pushing portion 136.

[0041] The link element 134 is furthermore intended to move between a coupled position in which the pushing portion 136 is able to push the lever 118 and an uncoupled position in which the pushing portion 136 is unable to push the lever 118, so that pushing the pushbutton 132 does not activate the lever 118. In the described example, the link element 134 is intended to rotate with respect to the housing 128 around the axis A2 for moving between its coupled position and its uncoupled position. Preferably, the link element 134 is bistable between its coupled and uncoupled position.

[0042] The lever actuation device 130 further comprises a coupling system 140 intended to move the link element 134 between its coupled position and its uncoupled position. In the described example, the coupling system 140 is activated by use of a key and is therefore provided with a key insertion slot 142 located for example in the center of the pushbutton 132.

[0043] It should be noted that the return portion 138 is intended to be pushed by the upper arm 120 of the lever 118, whatever the position of the link element 134 - coupled or uncoupled - may be.

[0044] With reference to figure 2, the link element 134 will now be described in greater detail.

[0045] The link element 134 first comprises a disk-shaped base 202 centered on the axis A2.

[0046] The link element 134 further comprises a circumferential wall 204 projecting frontward from the disk-shaped base 202. The circumferential wall 204 is provided with a longitudinal slot 206 and a circumferential slot 208. The circumferential slot 208 joins the longitudinal

slot 206 at a front end of the latter.

[0047] The return element 138 is formed by the portion of the circumferential wall 204 extending frontward with respect to the circumferential slot 208.

5 **[0048]** Furthermore, the portion of the circumferential wall 204 extending backward with respect to the circumferential slot 208 forms a stop 210 intended to push the lever 118, as it will be explained below.

10 **[0049]** With reference to figures 3 and 4, the lever 118 further comprises a pin 302 projecting from the upper arm 120 of the lever 118 and extending in the circumferential slot 206 when the link element 134 is in the coupled position, and in the longitudinal slot 208 when the link element 134 is in the uncoupled position.

15 **[0050]** The lever 118 further comprises a restoration means 304 intended to restore the lever 118 from its unblocking position to its blocking position. In the described example the restoration means 304 is a restoration spring.

20 **[0051]** Operation of the opening system 100 will now be explained.

[0052] The link element 134 is first assumed to be in its coupled position while the panel 104 is closed and blocked in this closed position by the latch 108.

25 **[0053]** Because the link element 134 is in its coupled position, the pin 302 of the lever 118 is located in the circumferential slot 208 of the link element 134 and aligned with the stop 210 of the link element 134 with respect to the front-back direction.

30 **[0054]** When an user activates the lever actuation device 130 by pushing the pushbutton 132, the lever actuation device 130 moves from its back position to its front position.

35 **[0055]** Because the pin 302 is aligned with the stop 210, the stop 210 pushes the upper arm 120 of the lever 118 frontward so as to move the lever 118 from its blocking position to its unblocking position. In turn, the rod 126 moves the bolt 114 of the latch 118 from its engaged position to its disengaged position, allowing opening of the panel 104.

40 **[0056]** When the user releases the pushbutton 132, the restoration means 304 restores the lever 118 to its blocking position. During this restoration movement, the pin 302 pushed the link element 134 backward to make the lever actuation device 130 move from its front position to its back position. At the same time, the rod 126 moves the bolt 114 of the latch 108 from its disengaged position to its engaged position. If the casing 112 is against the base 110, the latch 108 blocks the panel 104 in its closed position.

45 **[0057]** In case of a collision from the front, the inertia of the lever actuation device 130 tends to make the lever actuation device 130 move from its back position toward its front position. The stop 210 pushes the pin 302 of the lever 118, so that the lever 118 tends to move from its blocking position toward its unblocking position, which poses a danger of opening of the panel 104. At the same time, the inertia of the lower arm 122 and the weight 124

of the lever 118 tends to make the lower arm 122 move frontward, so that the lever 118 tends to move from its unblocking position toward its blocking position. The mass of the weight 124 is chosen so that, when the locking mechanism 106 is accelerating along the axis A1, for instance as a result of a front or back collision, the upper arm 120 of the lever 118 and the lever actuation device 130 produce a first torque on the lever 118 around the axis A1, while the lower arm 122 of the lever 118 and the weight 124 of the lever 118 produce a second torque on the lever 118 around the axis A1, the first and second torques having opposite signs and equal absolute values, plus or minus 10%. With such a mass for the weight 124, the inertia of the lower arm 122 and the weight 124 of the lever 118 compensates the inertia of the lever actuation device 130, and prevents the lever 118 from reaching its unblocking position. Opening of the panel 104 is therefore prevented.

[0058] In case of a collision from the back, the inertia of the lower arm 122 and the weight 124 of the lever 118, tends to make the lower arm 122 move backward, so that the lever 118 tends to move from its blocking position toward its unblocking position, which poses a danger of opening of the panel 104. At the same time, the inertia of the lever actuation device 130 tends to make the lever actuation device 130 move backward and drag along the upper arm 120 of the lever by means of the return portion 138. The inertia of lever actuation device 130 compensates the inertia of the lower arm 122 and weight 124 and prevents the lever 118 from reaching its unblocking position. Opening of the panel 104 is therefore prevented.

[0059] When the user activates the coupling system 140, the link element 134 moves from its coupled position to its uncoupled position. As a result, the pin 302 of the lever 118 travels into the circumferential slot 208 and reaches the front end of the longitudinal slot 210, so that the stop 210 is shifted from the pin 302 and is unable to push the pin 302 frontward, and thus also to move the lever 118 from its blocking position to its unblocking position. Pushing the pushbutton 132 does not open the panel 104 anymore.

[0060] In case of a collision from the front, the inertia of the lever actuation device 130 tends to make the lever actuation device 130 move from its back position toward its front position. However, because the link element 134 is not coupled to the lever 118, the movement of the lever actuation device 130 toward the front does not make the lever 118 move toward its unblocking position, so that the panel 104 stays blocked by the latch 108.

[0061] In case of a collision from the back, the inertia of the lower arm 122 and the weight 124 of the lever 118, tends to make the lower arm 122 move backward, so that the lever 118 tends to move from its blocking position toward its unblocking position, which poses a danger of opening of the panel 104. At the same time, the inertia of the lever actuation device 130 tends to make the lever actuation device 130 move backward and drag along the upper arm 120 of the lever by means of the return portion

138, which is still located in front of the pin 302. The inertia of lever actuation device 130 compensates the inertia of the lower arm 122 and weight 124 and prevents the lever 118 from reaching its unblocking position. Opening of the panel 104 is therefore prevented.

[0062] When the user activates again the coupling system 140, the link element 134 moves back from its uncoupled position to its coupled position.

[0063] The present invention is not limited to the embodiment previously described, but instead defined by the appended claims. It will in fact be apparent to the one skilled in the art that modifications can be applied to the embodiments previously described.

[0064] Furthermore, the terms used in the appended claims shall not be understood as limited to the elements of the embodiments previously described, but on the contrary shall be understood as including all equivalent elements that the one skilled in the art is able to derive using their general knowledge.

Claims

1. Locking mechanism (106) for a panel (104) comprising :

- a blocking unit (108) intended to selectively take a blocking configuration in which the blocking system blocks the panel (104) in a closed position, and an unblocking configuration in which the blocking system (108) lets the panel (104) be opened,
- a blocking unit actuation system (116) comprising:

- a lever (118) intended to rotate around a first axis (A1) between a blocking position and an unblocking position, in order to put the blocking unit (108) in respectively the blocking configuration and the unblocking configuration, the lever (118) comprising an upper arm (120) extending above the first axis (A1), a lower arm (122) extending below the first axis (A1), and a weight (124) fixed to the lower arm (122), and
- a lever actuation device (130) intended to move between a back position and a front position, the lever actuation device (130) comprising a link element (134) providing a link with the lever (118), the link element (134) comprising a pushing portion (136) intended to push the upper arm (120) of the lever (118) frontward so as to rotate the lever (118) from its unblocking position to its blocking position when the lever actuation device (130) moves from its back position to its front position,

- characterized in that** the link element (134) further comprises a restoring portion (138) intended to be pushed by the upper arm (120) of the lever (118) when the lever (118) rotates from its blocking position toward its unblocking position, so as to move the lever actuation device (130) toward its front position.
2. Locking mechanism (106) according to anyone of claims 1, wherein the link element (134) is furthermore intended to move between a coupled position in which the pushing portion (136) is able to push the upper arm (120) of the lever (118) and an uncoupled position in which the pushing portion (136) is unable to push the lever (118), wherein the lever actuation device (130) further comprises a coupling system (140) intended to move the link element (134) between its coupled position and its uncoupled position, and and wherein the restoring element (138) is intended to be pushed by the upper arm (120) of the lever (118) when the lever (118) rotates from its blocking position to its unblocking position, so as to move the lever actuation device (130) from its back position to its front position, whatever the position of the link element (134) - coupled or uncoupled - may be.
 3. Locking mechanism (106) according to claim 1 or 2, wherein the lever actuation device (130) is intended move along a second axis (A2).
 4. Locking mechanism (106) according to claims 2 and 3, wherein the link element (134) is intended to rotate around the second axis (A2) in order to move between its coupled position and its uncoupled position.
 5. Locking mechanism (106) according to claim 4, wherein the link element (134) comprises a base (202) and a wall (204) circumferential with respect to the second axis (A2) and projecting frontward from the base (202), wherein the circumferential wall (204) is provided with a longitudinal slot (206) and a circumferential slot (208), the circumferential slot (208) joining the longitudinal slot (206), wherein the return element (138) is formed by the portion of the circumferential wall (204) extending frontward with respect to the circumferential slot (208), and wherein the lever comprises a pin (302) projecting from the upper arm (120) of the lever (118) and extending in the circumferential slot (206) when the link element (134) is in the coupled position, and in the longitudinal slot (208) when the link element (134) is in the uncoupled position.
 6. Locking mechanism (106) according to anyone of claims 2 to 5, wherein the link element (134) is bistable between its coupled position and its uncoupled position.
 7. Locking mechanism (106) according to anyone of claims 1 to 6, wherein the weight (124) has a mass chosen so that, when the locking mechanism (106) is accelerating along the first axis (A1), the upper arm (120) of the lever (118) and the lever actuation device (130) produce a first torque on the lever (118) around the first axis (A1), while the lower arm (122) and the weight (124) of the lever (118) produce a second torque on the lever (118) around the first axis (A1), the first and second torques having opposite signs and equal absolute values, plus or minus 10%.
 8. Locking mechanism (106) according to anyone of claims 1 to 7, wherein the blocking unit (108) is a latch.
 9. Locking mechanism (106) according to anyone of claims 1 to 8, wherein the lever actuation device (130) further comprises a pushbutton (132) intended to be pushed frontward so as to push the lever actuation device (130) front its back position to its front position.
 10. Opening system (100) comprising a panel (104) and a locking mechanism (106) for the panel (104), according to anyone of claims 1 to 9.
 11. Motor vehicle comprising an opening system (100) according to claim 10, wherein the panel (104) is a trunk panel.

Figure 1

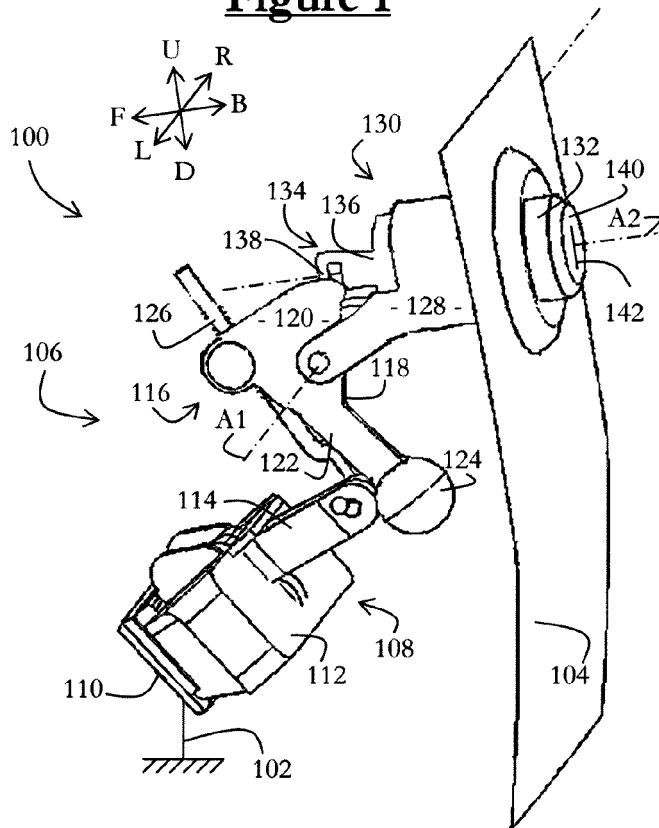


Figure 2

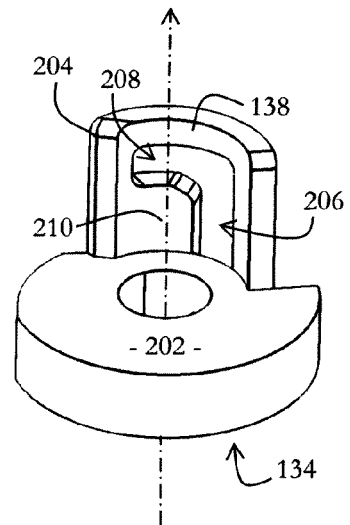


Figure 3

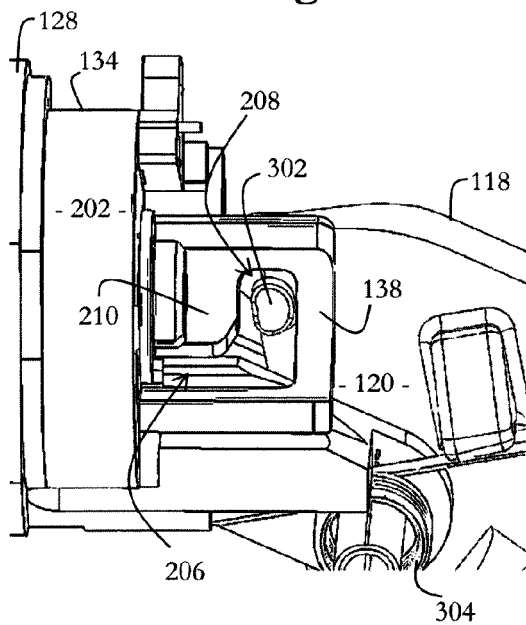
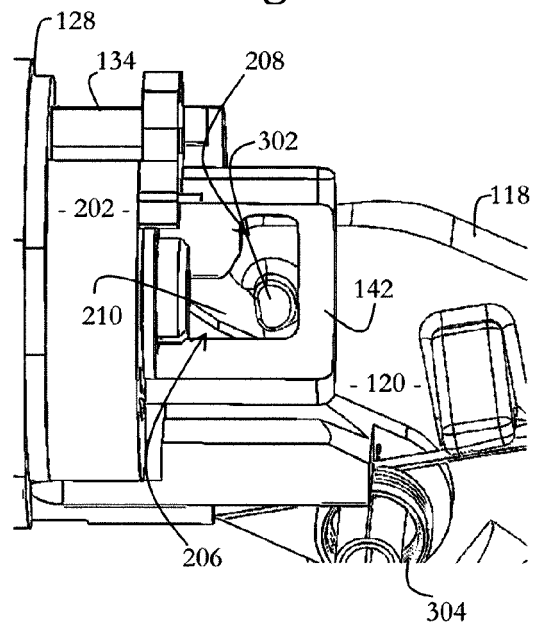


Figure 4





EUROPEAN SEARCH REPORT

Application Number
EP 13 29 0125

DOCUMENTS CONSIDERED TO BE RELEVANT			
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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 5 December 2013	Examiner Robelin, Fabrice
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	

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

EP 13 29 0125

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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