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(54) Locking device for a hood

(57) The invention relates to a locking device (1) for an automotive vehicle hood, comprising a rotating latch (2), actuatable by the locking anchor (3) of a hood during the closing operation thereof, an auxiliary safety latch (4) rotating together with the latch, and a corresponding auxiliary safety catch (5) provided with interlocking means (7) intended to cooperate mechanically with complementary stop means (8) provided in the auxiliary safety latch

to interrupt the rotation of the latch; and subsequently automatically move the interlocking means (7) away from the path of the auxiliary safety latch (4), consequently allowing the free rotation of the latch if, after the closing of the hood, it is actuated again by the locking anchor, for example when the latter shifts in the closing direction as a consequence of a crash or of running over a pedestrian.

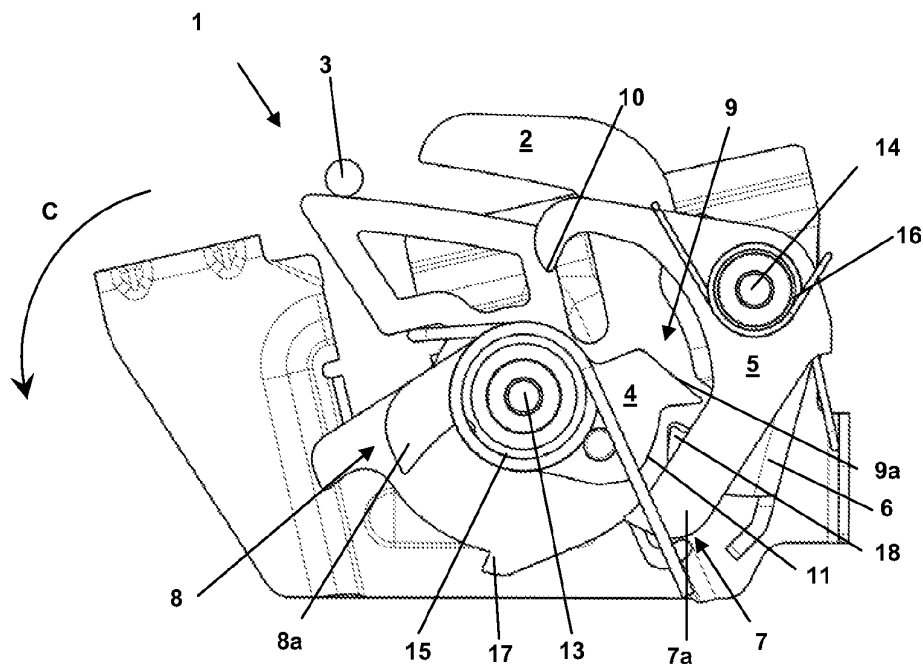


Fig 1

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Description

Technical Field of the Invention

[0001] The present invention relates to a locking device particularly applicable for automotive vehicle hoods.

Background of the Invention

[0002] The hood locking devices that are known in the state of the art allow the hood to be firmly secured to the chassis after it is closed, preventing the hood from being spontaneously released while driving the vehicle.

[0003] For such purpose, the lock of known locking devices incorporates a latch which is actuated during the closing operation by a locking anchor provided in the hood and which is shifted from an initial position until adopting a position in which it is retained by a corresponding catch, coinciding with the situation in which the hood is tightly applied on the bodywork. In order to be able to subsequently open the hood, known locking devices are provided with actuating mechanisms which allow the catch to release the latch and be able to open the hood.

[0004] Nevertheless, during the closing operation of the hood, the latter acquires impulse during the closing path and this impulse is transmitted to the bodywork of the vehicle, being able to damage delicate components incorporated into the bodywork, or of the lock itself if the hood acquires too much impulse during its closing. This situation can occur if the user closes the hood with too much force, for example.

[0005] Different alternatives are known for providing the locking devices with suitable means for protecting the mentioned components of the bodywork or of the lock itself, especially when the hood acquires too much impulse, by means of the sudden interruption of the rotation of the main latch of the lock before it reaches the end of its path by means of the use of fixed stop elements. Known devices have, however, several drawbacks, among which the fact that the same means used in preventing the rotation of the latch during the closing operation of the hood prevent its subsequent rotation, in the closing direction of the hood. Under these circumstances, in the event of running over a pedestrian, the hood will be prevented from shifting downwards, without being able to absorb part of the impact of the pedestrian on the vehicle.

[0006] Therefore, a main objective of the invention is an alternative locking device provided with stop means which are operative only during the closing of the hood and especially suitable for being automatically disabled in order to not interfere in the subsequent operation of the lock in the event of running over a pedestrian.

Disclosure of the Invention

[0007] The locking device for an automotive vehicle hood of the present invention is of the type comprising a

rotating latch, actuatable by the locking anchor of a hood during the closing operation thereof.

[0008] The device is essentially characterized in that it comprises an auxiliary safety latch, rotating together with the latch, and a corresponding also rotating auxiliary safety catch, stressed by an auxiliary actuating spring according to a first rotation direction and provided with interlocking means intended to cooperate mechanically with complementary stop means provided in the auxiliary safety latch to interrupt the rotation of the latch when the auxiliary safety latch and the auxiliary safety catch simultaneously adopt a respective predetermined angular position, the auxiliary latch being provided with means for transmitting a rotational movement to the auxiliary safety catch when the latch is pushed by the locking anchor of the hood during the mentioned closing operation, and the auxiliary actuating spring being calibrated such that in a first phase of the rotational movement, and the force exerted thereon by the auxiliary actuating spring being initially overcome, the auxiliary catch reaches the predetermined angular position in which the interlocking means are capable of cooperating mechanically with the stop means of the auxiliary latch and consequently of interrupting the rotation of the latch, whereby the impulse acquired by the hood during its closing is absorbed; whereas in a subsequent phase the pushing action exerted by the auxiliary actuating spring on the auxiliary safety catch is sufficient to force it to rotate according to the first rotation direction, automatically moving the interlocking means away from the path of the auxiliary safety latch, consequently allowing the free rotation of the latch if, after the closing of the hood, it is actuated again by the locking anchor of the hood, for example, when the latter shifts in the closing direction as a consequence of a crash or of running over a pedestrian.

[0009] According to another feature of the invention, the interlocking means comprise an appendage formed in the auxiliary safety catch and the complementary stop means comprise a protrusion formed in the auxiliary safety latch, suitably sized for the appendage to interfere in the path of the protrusion when the auxiliary safety latch and the auxiliary safety catch simultaneously adopt the mentioned predetermined angular positions.

[0010] In a variant of interest, the means for transmitting a movement to the auxiliary safety catch comprise a ramp, arranged in the auxiliary safety latch, suitable for shifting or impelling, in a boosting instant, a corresponding support surface provided for such purpose in the auxiliary safety catch.

[0011] According to another feature, when the support surface of the auxiliary catch reaches the upper end of the ramp arranged in the auxiliary latch, the appendage formed in the auxiliary catch is arranged in the path of the protrusion formed in the auxiliary latch, there being a clearance between the mentioned appendage and the body of the auxiliary latch, in the rotation direction of the auxiliary catch.

[0012] In another variant of the invention, the means

for transmitting a movement to the auxiliary safety catch comprise a projection, arranged in the auxiliary safety latch, suitable for impacting, during the boosting instant, a corresponding support surface provided for such purpose in the auxiliary safety catch.

[0013] According to another feature of the invention, the auxiliary actuating spring keeps the auxiliary safety catch applied against a stop rod keeping the mentioned auxiliary catch in a predetermined static position before the auxiliary latch reaches the angular position in which the ramp or the projection impels the support surface of the auxiliary safety catch.

[0014] In a variant of interest, the means for transmitting a movement to the auxiliary safety catch are extended in a cam surface intended to receive the support of the support surface of the auxiliary catch when the hood reaches its normal closed position, the profile of said cam surface being the suitable one so that, in the event that the auxiliary safety latch is actuated in the direction associated with the closing of the hood, for example during a collision, it does not shift the safety catch in the direction opposite to the one exerted thereon by the auxiliary actuating spring.

Brief Description of the Drawings

[0015] The attached drawings illustrate, by way of a non-limiting example, several embodiment variants of the invention. In said drawings,

Figure 1 depicts an embodiment variant of the locking device for a hood object of the invention arranged in a section of the chassis of a vehicle;

Figures 2 to 5 are a sequence showing successive positions adopted by the components of the device of Figure 1 until reaching the boosting instant during the closing of the hood;

Figure 6 depicts the locking device of Figure 1 in a phase immediately after the one shown in Figure 5; Figure 7 depicts the position adopted by the locking device of Figure 1 after adopting the position depicted in Figure 6.

Figure 8 depicts the locking device of Figure 1 in a phase after the one shown in Figure 7 in which the hood collapses due to the effect of a collision; and Figure 9 depicts another variant of the locking device, in which the means for transmitting the impulse of the latch comprise a projection.

Detailed Description of the Invention

[0016] Figures 1 to 7 show the successive positions adopted by the components of the device 1 during the closing of a hood.

[0017] In Figure 1 it is observed that the device 1 comprises a latch 2, of the type that are known in the state of the art, suitable for rotating about a first rotation shaft 13 and provided with a tooth 17 intended to be interlocked

in the pawl 18 of a catch 6, of the type that are also known in the state of the art and which rotates about a second rotation shaft 14.

[0018] Figure 1 shows the instant in which, when the hood is closed, the locking anchor 3 coupled thereto contacts with the latch 2 of the device 1, causing the latter to start a rotational movement about the first rotation shaft 13 and in the direction indicated by arrow C, the spring 15 associated with the latch 2 being compressed. When the closing operation of the hood continues, the locking anchor 3 continues impinging on the latch 2, the rotational movement of the mentioned latch 2 being transmitted to the auxiliary safety latch 4, which in the depicted example is solidly attached to the latch 2, all this as depicted in Figure 2. In turn, the auxiliary catch 5, rotating about a second rotation shaft 14, is initially applied against a stop rod, not depicted in the drawings, due to the effect exerted thereon by the auxiliary spring 16.

[0019] As explained below, the device 1 is provided with means 9 for transmitting a movement to the auxiliary catch 5 as a consequence of the movement of the auxiliary latch 4, which allow the rotation of the latch 2 to be interrupted instants after the tooth 17 surpasses the pawl 18 of the catch 6.

[0020] Indeed, with the provision of the ramp 9a in the outer edge of the auxiliary latch 4, when the auxiliary latch 4 rotates said ramp 9a first moves closer to the support surface 10 of the auxiliary catch 5, and if the closing of the hood continues the auxiliary latch 4 reaches the position shown in Figure 3, in which the support surface 10 of the auxiliary catch 5 contacts with the start of the ramp 9a.

[0021] When the closing operation of the hood continues, in a conventional manner, the support surface 10 is pushed by the ramp 9a, the auxiliary catch 5 being separated from the stop rod upon rotating about the second shaft 14 in the direction indicated by arrow B, the force exerted thereon by the auxiliary spring 16 being overcome, as observed in Figure 4.

[0022] The auxiliary latch 4 transmits to the auxiliary catch 5 an impulse which is proportional to the closing speed of the hood, and when the device 1 adopts the position shown in Figure 5, the auxiliary latch 4 will have transmitted, by means of the ramp 9a, a pushing force to the auxiliary catch 5 which is a determining factor for the operation of the device in the subsequent instants.

[0023] The ramp 9a, as well as the rest of the components involved in the closing, are sized such that when the support surface 10 reaches the upper end of the ramp 9a, adopting the position shown in Figure 5, the appendage 7a is located in the path of the protrusion 8a, the separation between the appendage 7a and the protrusion 8a being small enough for the appendage 7a and the protrusion 8a to cooperate mechanically, when the rotation of the auxiliary latch 4 continues, reaching the angular position depicted in Figure 6. In Figure 5 it can furthermore be seen that there is a clearance 20 between the mentioned appendage 7a and the body of the auxil-

ary latch 4, in the rotation direction of the auxiliary catch 5, advantageously arranged to allow the appendage 7a to move even closer to the auxiliary latch 4 when the auxiliary catch 5 is impelled by the ramp 9a, and thus assure that it cooperates mechanically with the protrusion 8a, reaching the angular position depicted in Figure 6. In said angular position, it is observed that the interlocking means 7 of the auxiliary catch 5, formed by the appendage 7a, interfere in the path of the stop means 8, formed by the protrusion 8a with which the auxiliary latch 4 is provided, the rotation of the auxiliary latch 4 consequently being stopped and the shifting of the locking anchor 3 and of the hood in the closing direction therefore being prevented. In these circumstances, the impulse acquired by the hood during its closing is absorbed by the auxiliary catch 5 instead of being absorbed by the bodywork of the vehicle, damages in the delicate components housed in the bodywork, such as the headlights for example, furthermore being prevented.

[0024] In the instants after the appendage 7a cooperates mechanically with the protrusion 8a, the latch 2 retreats slightly, rotating in the direction indicated by arrow D of Figure 7 due to the effect of the spring 15, until the pawl 18 of a conventional catch 6 retains the tooth 17 of the latch 2. For this purpose, when the appendage 7a and the protrusion 8a cooperate mechanically, there must be a gap 19 between the pawl 18 and the tooth 17 mentioned above, as shown in Figure 6.

[0025] Simultaneously to the retreat of the latch 2, the auxiliary catch 5 rotates in the direction indicated by arrow Z of Figure 7, due to the effect of the auxiliary spring 16, until the support surface 10 of the auxiliary catch 5, surpassing the step 12, contacts with the cam surface 11 arranged in the auxiliary latch 4 after the ramp 9a, as shown in the same Figure 7.

[0026] The shifting of the auxiliary catch 5 allows the appendage 7a to be automatically and sufficiently separated from the protrusion 8a of the auxiliary catch 5, such that the latter can rotate freely and without obstacles in both directions. This fact allows, for example, that in the event of running over a pedestrian the auxiliary catch 5 does not hinder the movement of the auxiliary latch 4 and therefore the shifting of the hood in the closing direction, as depicted in Figure 8 and as explained in detail below, part of the impact of the pedestrian on the hood thus being able to be absorbed.

[0027] It should be emphasized that the profile of the cam surface 11 must be the suitable one so that, if the rotation of the auxiliary latch 4 in the closing direction of the hood occurs, as depicted in Figure 8, as a consequence of running over a pedestrian, the auxiliary catch 5, due to the contact of the support surface 10 on the cam surface 11, is not shifted in the direction in which its appendage 7a manages to be arranged such that it can cooperate mechanically with the protrusion 8a of the auxiliary latch 4. In other words, it must be assured that the auxiliary latch 4 can shift without obstacles in the closing direction of the hood.

[0028] Figure 9 shows another variant of the invention, in which the means 9 for the transmission of the impulse generated by the rotational movement of the hood comprise a projection 9b arranged in the auxiliary latch 4 suitable for impacting the support surface 10 arranged in the auxiliary catch 5.

[0029] In another variant, not depicted, eliminating the cam surface 11 is envisaged, therefore after passing through the means 9 for the transmission, the auxiliary catch 4 would be directly applied against the stop rod, placed such that it will be assured that the position of the auxiliary catch 5, when thus occurs, is suitable to allow the free rotation of the latch 2 in the event of a collision.

Claims

1. A locking device (1) for an automotive vehicle hood, comprising a rotating latch (2), actuable by the locking anchor (3) of a hood during the closing operation thereof, **characterized in that** it comprises an auxiliary safety latch (4), rotating together with the latch, and a corresponding also rotating auxiliary safety catch (5), stressed by an auxiliary actuating spring (16) according to a first rotation direction and provided with interlocking means (7) intended to cooperate mechanically with complementary stop means (8) provided in the auxiliary safety latch to interrupt the rotation of the latch when the auxiliary safety latch and the auxiliary safety catch simultaneously adopt a respective predetermined angular position, the auxiliary latch being provided with means (9) for transmitting a rotational movement to the auxiliary safety catch when the latch is pushed by the locking anchor of the hood during the mentioned closing operation, and the auxiliary actuating spring being calibrated such that in a first phase of the rotational movement, and the force exerted thereon by the auxiliary actuating spring being initially overcome, the auxiliary catch reaches the predetermined angular position in which the interlocking means are capable of cooperating mechanically with the stop means of the auxiliary latch and consequently of interrupting the rotation of the latch; while in a subsequent phase the pushing action exerted by the auxiliary actuating spring (16) on the auxiliary safety catch (5) is sufficient to force it to rotate according to the first rotation direction, automatically moving the interlocking means (7) away from the path of the auxiliary safety latch (4), consequently allowing the free rotation of the latch if, after the closing of the hood, it is actuated again by the locking anchor of the hood, for example, when the latter shifts in the closing direction as a consequence of a crash or of running over a pedestrian.
2. The device (1) according to the previous claim, **characterized in that** the interlocking means (7) com-

prise an appendage (7a) formed in the auxiliary safety catch (5) and the complementary stop means (8) comprise a protrusion (8a) formed in the auxiliary safety latch (4), suitably sized for the appendage to interfere in the path of the protrusion when the auxiliary safety latch and the auxiliary safety catch simultaneously adopt the mentioned predetermined angular positions.

iliary safety catch (5) in the direction opposite to the one exerted thereon by the auxiliary actuating spring (16).

3. The device (1) according to any one of the previous claims, **characterized in that** the means (9) for transmitting a movement to the auxiliary safety catch (5) comprise a ramp (9a), arranged in the auxiliary safety latch (4), suitable for shifting or impelling, in a boosting instant, a corresponding support surface (10) provided for such purpose in the auxiliary safety catch. 5 10
4. The device (1) according to the previous claim, **characterized in that** when the support surface (10) of the auxiliary catch (5) reaches the upper end of the ramp (9a) arranged in the auxiliary latch (4), the appendage (7a) formed in the auxiliary catch (5) is arranged in the path of the protrusion (8a) formed in the auxiliary latch (4), there being a clearance (20) between the mentioned appendage and the body of the auxiliary latch, in the rotation direction of the auxiliary catch. 15 20 25
5. The device (1) according to any one of claims 1 or 2, **characterized in that** the means (9) for transmitting a movement to the auxiliary safety catch (5) comprise a projection (9b), arranged in the auxiliary safety latch (4), suitable for impacting, during the boosting instant, a corresponding support surface (10) provided for such purpose in the auxiliary safety catch. 30 35
6. The device (1) according to any one of the previous claims, **characterized in that** the auxiliary actuating spring (16) keeps the auxiliary safety catch (5) applied against a stop rod keeping the mentioned auxiliary catch in a predetermined static position before the auxiliary latch (4) reaches the angular position in which the ramp (9a) or the projection (9b) shifts or impels the support surface (10) of the auxiliary safety catch. 40 45
7. The device (1) according to any one of the previous claims, **characterized in that** the means (9) for transmitting a movement to the auxiliary safety catch (5) are extended in a cam surface (11) intended to receive the support of the support surface (10) of the auxiliary catch when the hood reaches its normal closed position, the profile of said cam surface being the suitable one so that, in the event that the auxiliary safety latch (4) is actuated in the direction associated with the closing of the hood, it does not shift the aux- 50 55

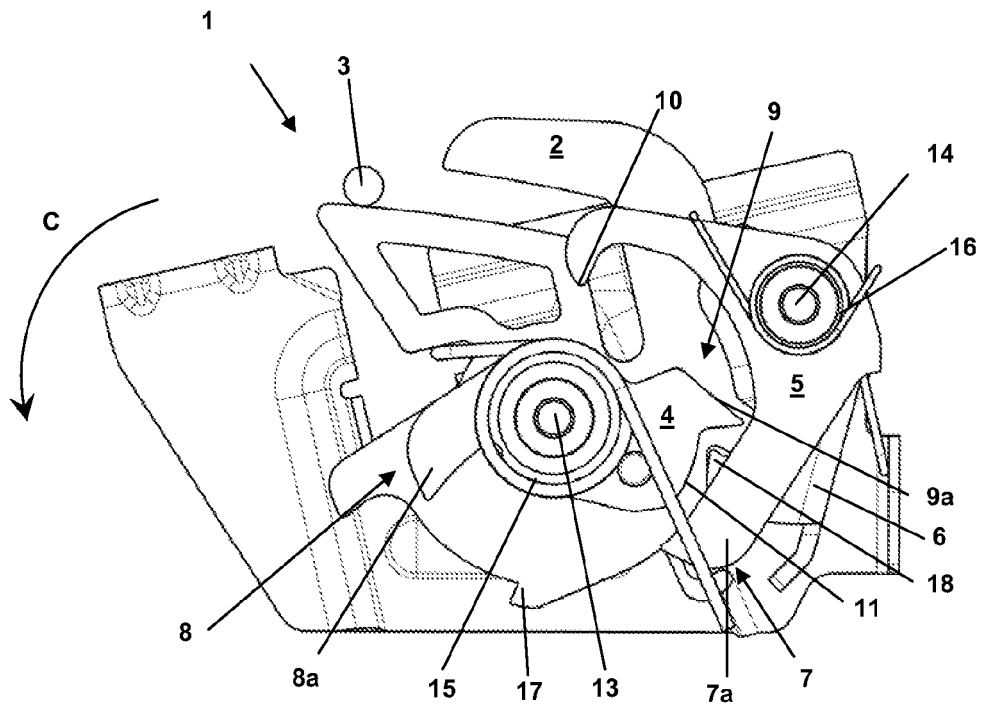


Fig 1

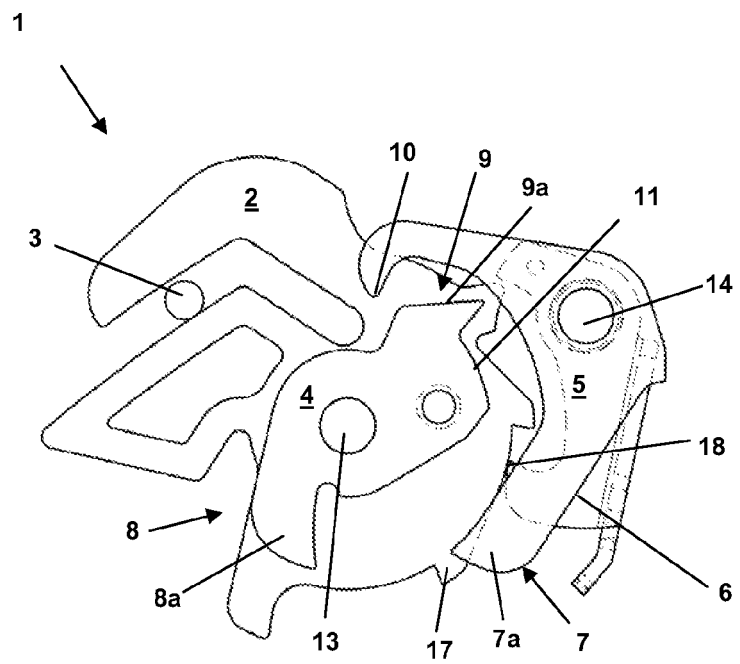


Fig 2

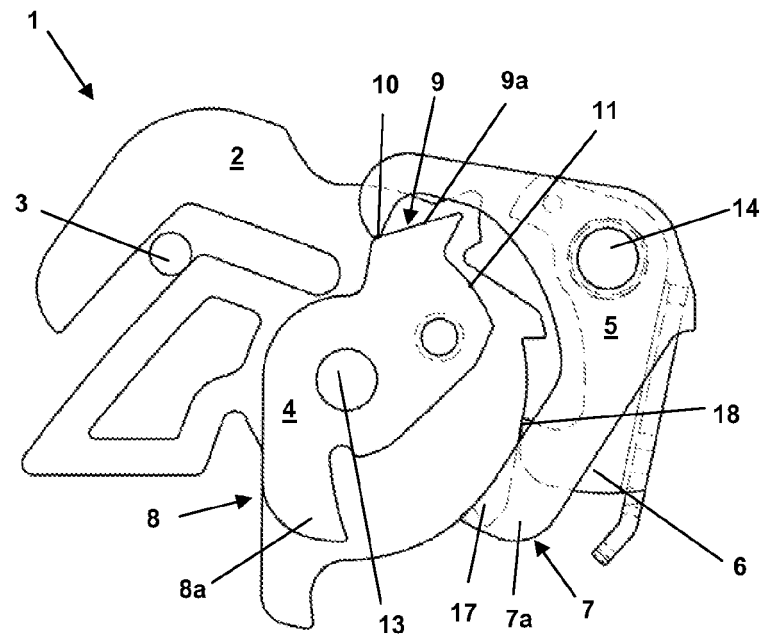


Fig 3

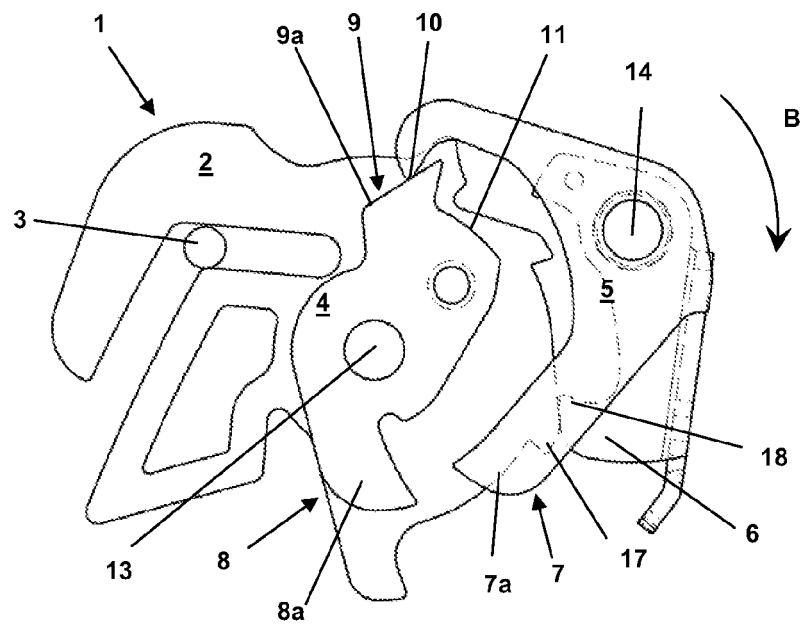


Fig 4

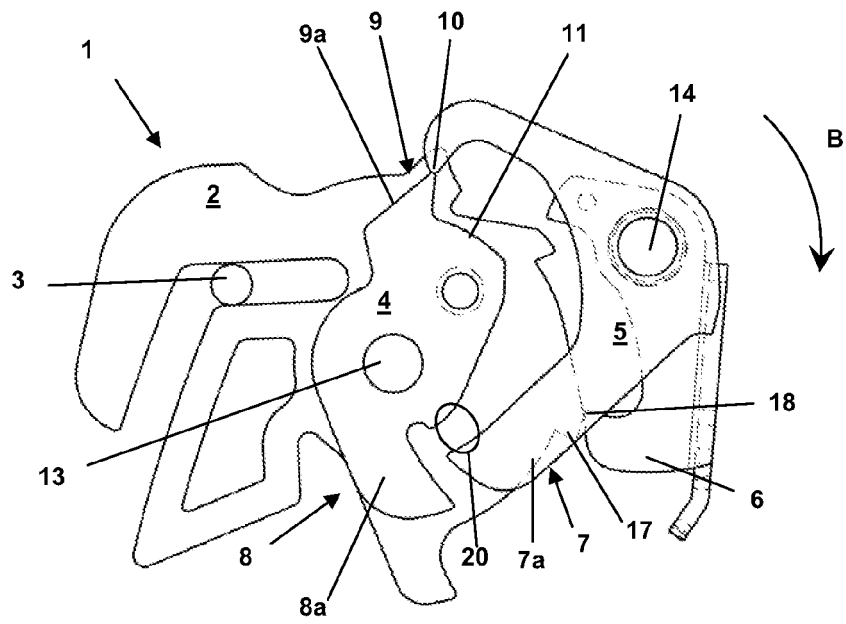


Fig 5

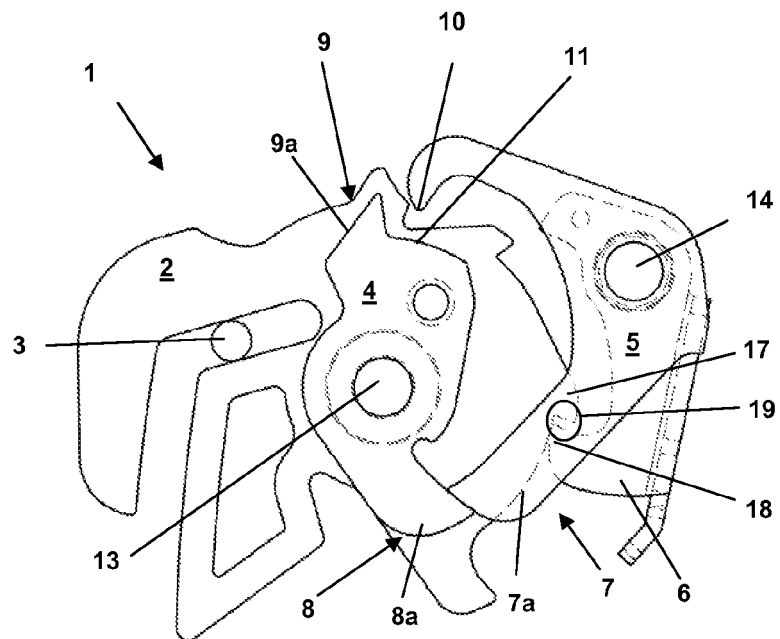


Fig 6

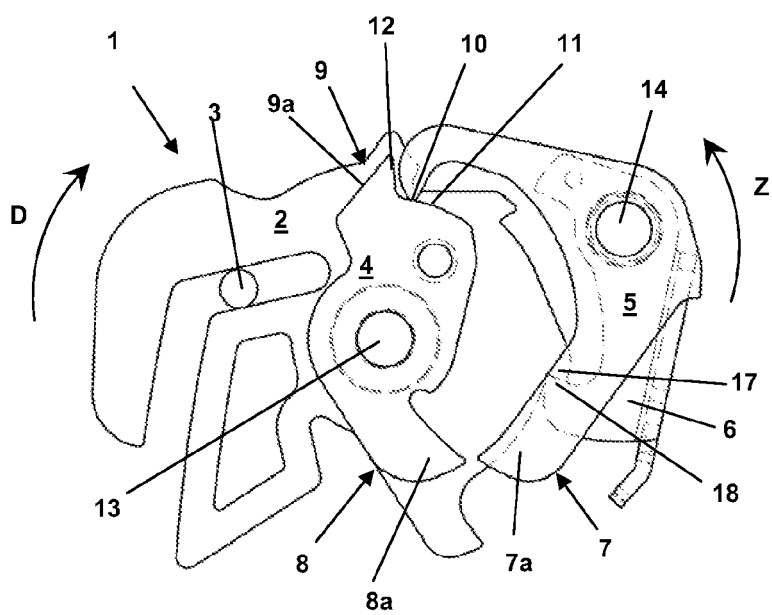


Fig 7

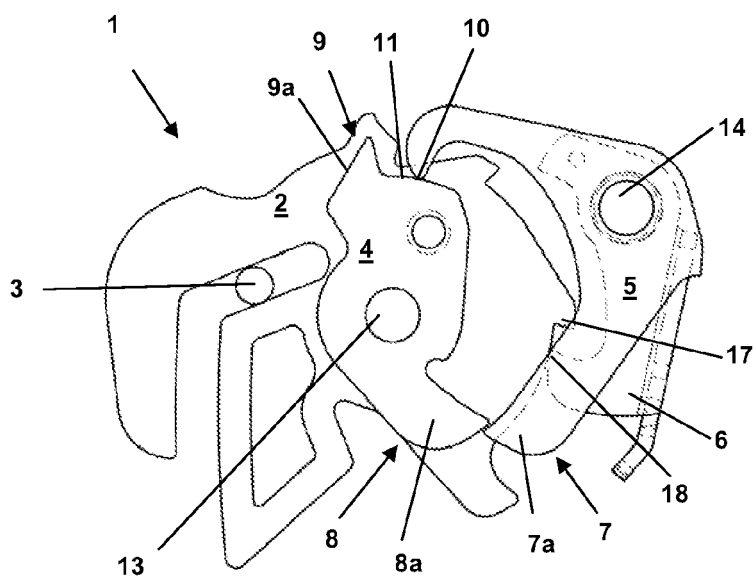


Fig 8

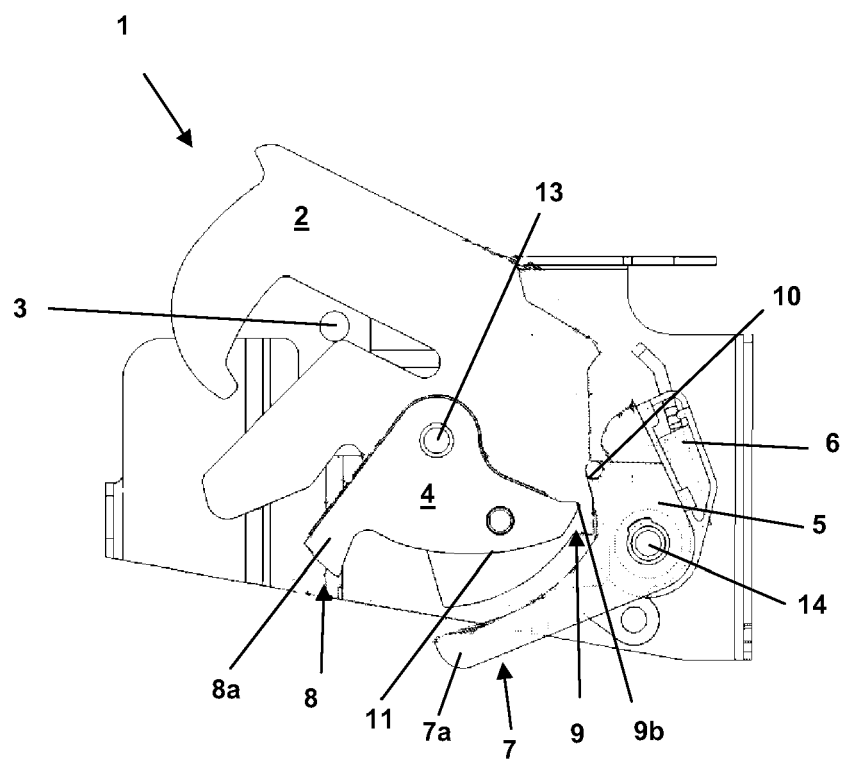


Fig 9