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(54) Safety lock for car bonnets or doors

(57) The present invention relates to a safety lock for car bonnets or doors, in which the ratchet pawl (7) of the hook disc (1) designed to engage a projection (4) undergoes the interference of a lever (10), which holds the ratchet pawl (7) away from the hook disc (1) until the hook disc has completed its opening stroke.

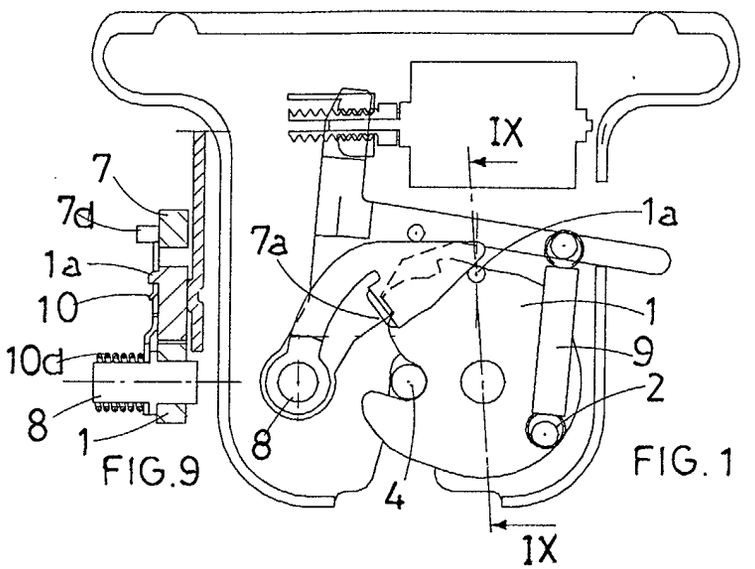

FIG.9 FIG.1

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Description

[0001] The present patent application for industrial invention relates to an improved lock for car bonnets or doors.

[0002] The lock of the invention is of the type provided with double stop tooth, capable of guaranteeing the stable, although partial, closing also in the case of a light force that is not sufficient to bring the bonnet at the end of the stroke overcoming the resistance to flattening offered by the seal gaskets against which the bonnet is closed.

[0003] This type of locks is based on a mechanism that functions as a ratchet pawl, it being composed of a rotating hook disk, whose edge is provided with two stop teeth designed to co-operate with an oscillating ratchet pawl subject to the action of a spring that pushes it constantly against the edge of the disk.

[0004] The hook disk is subject to the action of a return spring that tends to rotate it in a direction that corresponds to the release of the coupling tooth from the projection of the lock.

[0005] When the lock is closed, the ratchet pawl engages with one of the two stop teeth, thus preventing the rotation of the disk and the opening of the lock.

[0006] Therefore, the lock can only be opened with the key or button that allow to disengage the ratchet pawl from the stop teeth, thus making the hook disk trip at the end of the opening stroke, under the action of the return spring.

[0007] As mentioned in the premise, the presence of a pair of stop teeth instead of a single tooth is required to guarantee the stable, although partial closing of the lock when the closing force is not sufficient to elastically flatten the seal gaskets against which the bonnet is closed.

[0008] In the latter case, although it cannot complete the rotation to the end of its stroke, the disk is able to engage the projection.

[0009] In the presence of a single stop tooth, the ratchet pawl could act as stop for the disk only when the disk is pushed at the end of its stroke as a result of a strong closing force on the bonnet.

[0010] Vice versa, the presence of the second stop tooth allows to stop the disk as soon as the disk has made a small rotation that allows the hook tooth to engage with the projection of the lock.

[0011] While it gives higher efficacy and reliability to the lock, it must be said that the second stop tooth generates an inconvenience when opening the lock and that the solution of this inconvenience results in a complicated construction of the lock.

[0012] As a matter of fact, it appears evident that, when opening the lock, a short impulse is not sufficient to disengage the ratchet pawl of the first stop tooth, since the ratchet pawl successively would engage on the second stop tooth, thus objecting to the rotation of the disk to the end of its stroke under the action of the return spring.

[0013] The problem has been solved by introducing a safety lever that intervenes during opening to interfere with the ratchet pawl, thus preventing it from engaging with the second stop tooth once the first stop tooth has been released.

[0014] More precisely, in the locks of known type, the safety lever basically acts as holding element that engages and holds the ratchet pawl only when the ratchet pawl reaches the farthest backward position with respect to the disk, which is provided with a special appendix capable of releasing the safety lever of the ratchet pawl as soon as the rotation of the disk starts when closing the lock.

[0015] The major inconvenience of the safety levers used in locks of known type is represented by the fact that they only work when the opening force is sufficient to bring the ratchet pawl to the farthest backward position with respect to the disk. As a matter of fact, these safety levers are not able to engage and hold the ratchet pawl before the ratchet pawl has reached the farthest backward position with respect to the disk.

[0016] This means that, if the opening lever is not actuated with sufficient strength to bring the ratchet pawl at the end of its stroke, the lock is opened partially due to the accidental engagement between the ratchet pawl and the second tooth of the hook disk, which cannot complete its opening travel under the action of the return spring.

[0017] In similar circumstances it is necessary to repeat the opening operation with more force in such a way that the second stop tooth is released and the ratchet pawl is brought to the end of its backward travel, where it is engaged and blocked by the safety lever.

[0018] The purpose of the present invention is to solve the inconvenience by realising an improved version of the aforementioned type of car locks, in which the safety lever interferes with the ratchet pawl for the length of time that is necessary for the hook disk to complete its opening travel.

[0019] In other words, when opening the improved lock of the invention, the safety lever holds the ratchet pawl away from the hook disk until the second stop tooth has reached such a position that it can no longer be intercepted and engaged by the ratchet pawl when the ratchet pawl is free to get close to the edge of the hook disk.

[0020] For major clarity the description of the lock of the invention continues with reference to the enclosed drawings, which are intended for purposes of illustration and not in a limiting sense, whereby:

- Figures 1, 2 and 3 show the three sequential steps of the opening operation of the lock of the invention, seen according to a coaxial direction to the axis of the pivoting pin of the disk with hooked tooth;
- Figures 4, 5 and 6 shows the three sequential steps of the closing operation of the lock of the invention,

see according to coaxial direction to the axis of the pivoting pin of the disk with hooked tooth;
- Figure 7 shows the safety lever separately from the other components of the internal mechanism of the lock;
- Figure 8 shows the ratchet pawl separately from the other components of the internal mechanism of the lock;
- Figure 9 is the cross-section of Fig. 1 with plane IX-IX;
- Figure 10 is the cross-section of Fig. 5 with plane X-X.

[0021] With reference to the aforementioned figures, the lock of the invention comprises a disk (1) that rotates around a pivoting pin (2) and is peripherally equipped with a hook tooth (3) designed to engage the projection (4) when the car bonnet is closed.

[0022] The external edge of the hook disk (1) features a first stop tooth (5) and a second stop tooth (6) designed to co-operate with a ratchet pawl (7) composed by a rocker level pivoted at one end on a fixed pin (8) of the lock.

[0023] As shown in Fig. 8, the lever has a special forked profile with the following components:

- a tooth (7a) able to engage with the stop teeth (5 and 6);
- a first section (7b) on which the opening force is applied;
- a second section (7c) used to fix the return spring (9) that constantly pushes the ratchet pawl (7) against the external edge of the hook disk (1).

[0024] The lock of the invention also comprises a safety level designed to interfere with the ratchet pawl during opening, in order to prevent it from engaging with the second stop tooth (6), once the first stop (tooth) has been released.

[0025] The lock of the invention is characterised both by the profile of the safety lever and by the mechanism used to move the safety lever, which must be inactive when closing the lock and must be activated when opening the lock to remove the ratchet pawl (7) from the hook disk (1) until the hook disk (1) has reached the end of its opening stroke, which corresponds to the complete disengagement of the hook tooth (3) from the projection (4).

[0026] As shown in Fig. 7, the safety lever (10) has a pivoting hole (10a) at one end, while the other end finishes with a wedge-shaped head-cam (10b) that protrudes from one side only.

[0027] The lever (10) is pivoted on the pin (8) in such a way that the head-cam (10b) faces the hook disk (1).

[0028] It must be noted that the two opposite sides of the head-cam (10b) are in contact with two tappets (1a and 7d), which are located and protrude from the hook disk (1) and the ratchet pawl (7), respectively.

[0029] More precisely, the external side (L1) of the head-cam (10b) interferes with the tappet (7d) on the second section (7c) of the ratchet pawl (7), while the internal side (L2) of the head-cam (10b) interferes with the tappet (1a) on the edge of the hook disk (1).

[0030] As shown in figures 1, 2 and 3, which refer to three sequential steps of the opening operation, when an opening force (FA) is applied on the first section (7b) of the ratchet pawl (7), the ratchet pawl (7) is dragged into counter-clockwise rotation around the pin (8), thus disengaging the tooth (7a) from the first stop tooth (5) of the hook disk (1). Being unconstrained, the hook disk (1) can start a counter-clockwise rotation around its pin (2) under the action of the return spring (9), which is fixed to the second section (7c) of the ratchet pawl (7) on one side and is eccentrically engaged to the hook disk (1) on the other side.

Further to the counter-clockwise rotation of the hook disk (1), as shown in figure 9, the tappet (1a) interferes with the internal side (L2) of the head-cam (10b), thus removing the safety lever (10) until the tappet (1a) engages against the head side (L3) of the head-cam (10b), after sliding along the internal side (L2).

[0031] The removal of the lever (10) causes the simultaneous removal of the ratchet pawl (7) due to the interference between the external side (L1) of the head-cam (10b) and the tappet (7d).

[0032] As it can be seen in figure 3, when the tappet (1a) has completed its travel along the internal side (L2), the hook disk (1) has concluded its opening travel. For this reason the second stop tooth (6) remains in such a position that it can no longer be engaged by the tooth (7a) of the ratchet pawl (7), which can get close to the edge of the hook disk (1) only when the interference between the tappet (1a) and the internal side (L2) ends.

[0033] This means that, after applying an opening force sufficient to disengage the ratchet pawl (7) from the first stop tooth (5), regardless of the intensity and duration of the opening impulse, the ratchet pawl (7)is kept away from the hook disk (1) until the hook disk (1) reaches the end of its opening stroke.

[0034] As shown in figures 4, 5 and 6, which refer to three sequential steps of the closing operation, when a closing force (FC) is applied on the hook disk (1), the hook disk (1) is dragged into clockwise rotation around the pin (2), overcoming the antagonist force of the return spring (9); during the clockwise rotation of the hook disk (1), the stop teeth (5) and (6)are engaged by the tooth (7a) of the ratchet pawl (7), which is no longer subject to the thrust of the lever (10), which is temporarily inactive, due to the fact that in its return stroke the tappet (1a)does not slide along the internal side (L2) of the head-cam (10b), passing under the head-cam (10b), which is raised when the tappet (1a) passes by, as shown in figures 5 and 10.

[0035] The rising of the head-cam (10b) makes the lever (10) rise completely with respect to the pin (8), on which a return spring (10d) is inserted to keep the lever

(10) down.

[0036] The head side (L3) of the head-cam (10b) has a chamfered edge (10c) that favours the sliding of the tappet (1a) under the head-cam (10b), with simultaneous complete rising of the lever (10) that, due to the action of the spring (10d), returns to its natural lowered position, as soon as the tappet (1a) faces the internal side (L2), as shown in fig. 6.

[0037] In the enclosed figures number (11) is used to indicate the actuator designed to excite the opening force (FA) on the section (7b) of the ratchet pawl (7); in this specific case, the actuator consists in an electric motor that drags into rotation a screw (11a) coupled with a nut screw (11b) applied on the ratchet pawl (7).

Claims

1. Improved lock for car bonnets or doors, of the type comprising:

   - a disk (1) that rotates around a pivoting pin (2) and is peripherally equipped with a hook tooth (3) designed to engage a projection (4) when the car bonnet is closed;
   - a ratchet pawl (7) consisting in a rocker lever pivoted on a fixed pin (8) of the lock at one end and provided with a hook tooth (7a) designed to engage with a first (5) and a second (6) stop tooth on the external edge of the hook disk (1);
   - a return spring (9) that drags the hook disk (1) to the end of the opening stroke;
   - a safety lever (10) designed to interfere with the ratchet pawl (7) when the lock is opened to prevent the ratchet pawl (7) from engaging with the second stop tooth (6), once the first stop tooth (5) has been released;

   characterised by the fact that

   - the safety lever (10) ends with a wedge-shaped head-cam (10b) bordered by an external side (L1) facing the ratchet pawl (7), an internal side (L2) facing the hook disk (1) and a head side (L3) with chamfered edge (10c);
   - the two opposite sides (L1 and L2) of the head-cam (10b)are in contact with two tappets (7d and 1a) that are positioned and protrude on the hook disk (1)and the ratchet pawl (7), respectively;
   - the safety lever (10) can rise, although it is subject to the action of the return spring (10d).

2. Lock according to the preceding claim, **characterised by** the fact that the lever (10) is pivoted on the same pin (8) of the ratchet pawl (7), where the return spring (10d) of the lever (10) is inserted.

3. Lock according to claim 1, **characterised by** the fact that the ratchet pawl (7) consists in a lever with special forked profile with the following components:

   - a tooth (7a) able to engage with the stop teeth (5 and 6);
   - a first section (7b) on which the opening force is applied;
   - a second section (7c) used to fix the return spring of the lever.

4. Lock according to claims 1 and 3, **characterised by** the fact that the return spring (9) is fixed to the hook disk (1) and to the second section (7c) of the ratchet pawl (7).

5. Lock according to claims 1 and 3, **characterised by** the fact that the tappet (7d) is positioned on the second section (7c) of the ratchet pawl (7), while the tappet (1 a) is positioned along the edge of the hook disk (1).

6. Lock according to claim 1, **characterised by** the fact that the ratchet pawl (7) features a nut screw (11b) in which a screw (11a) is engaged and dragged into rotation by an electric motor (11) actuated by the electric opening command of the lock.

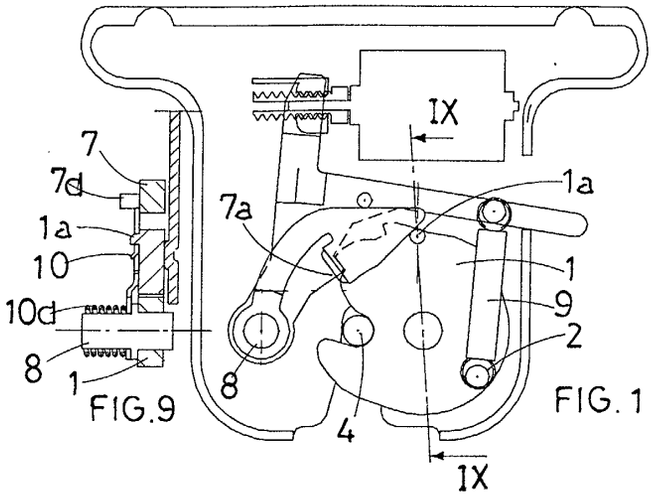

FIG.9

FIG.1

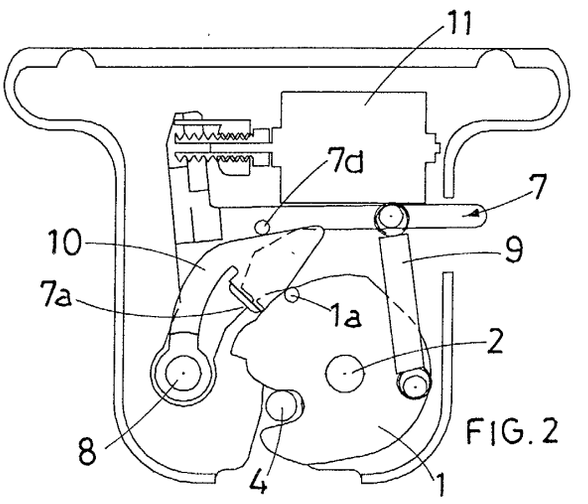

FIG.2

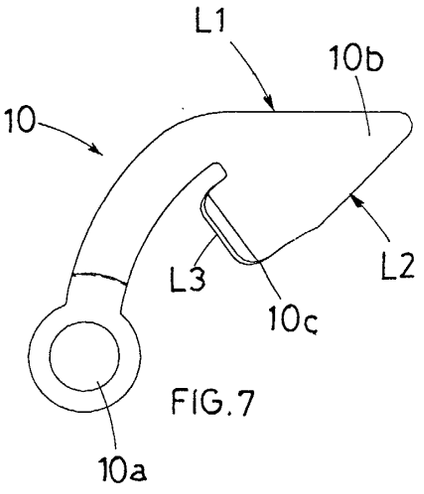

FIG.7

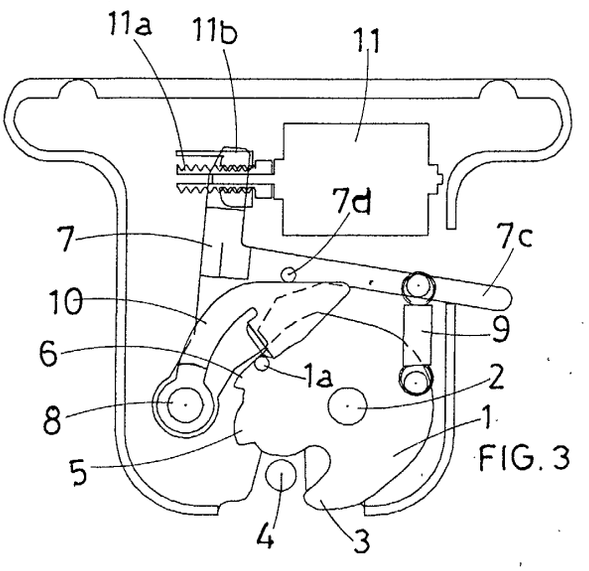

FIG.3

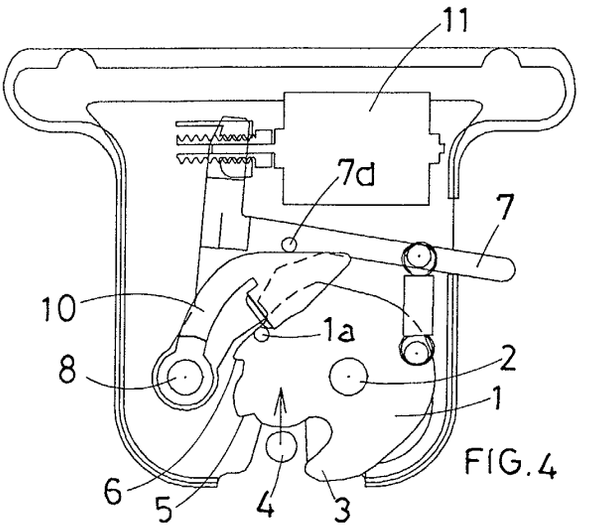

FIG. 4

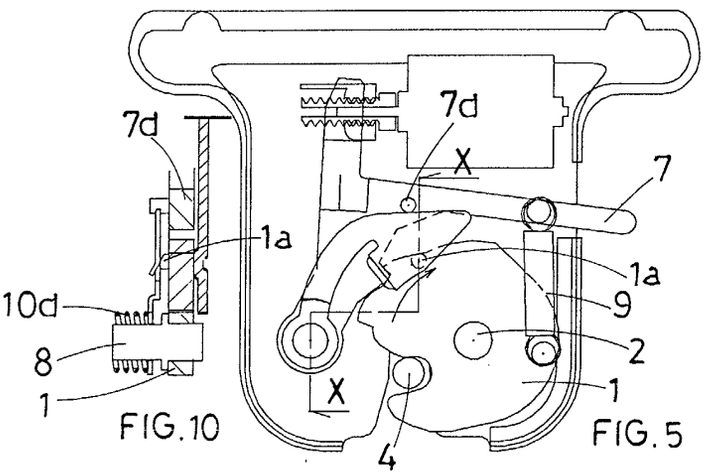

FIG. 10

FIG. 5

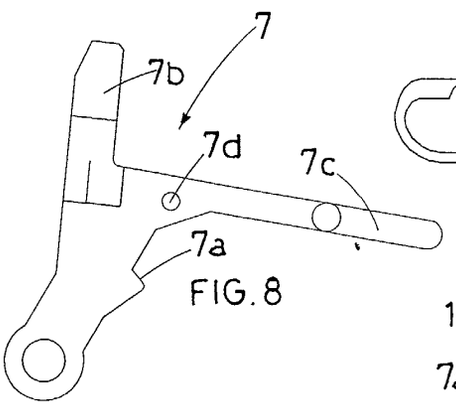

FIG. 8

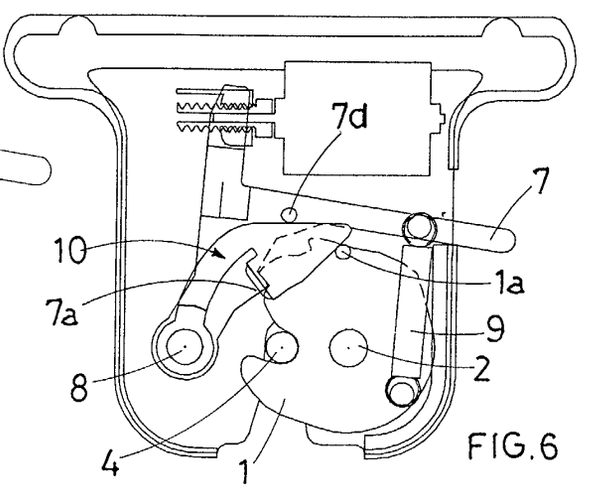

FIG. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 02 42 5460

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
A	DE 199 30 339 A (WITTE-VELBERT GMBH & CO KG) 4 January 2001 (2001-01-04) * the whole document *	1	E05B65/32 E05B65/19
A	EP 0 153 231 A (ACIERS ET OUTILLAGE PEUGOT) 28 August 1985 (1985-08-28) * page 13, paragraph 2 - page 14, paragraph 2 *	1	
A	US 3 998 482 A (NOZAKI ET AL.) 21 December 1976 (1976-12-21) * the whole document *	1	
			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	14 January 2003	Westin, K

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