



(51) International Patent Classification:
E05B 77/06 (2014.01)

(21) International Application Number:
PCT/IB2019/060271

(22) International Filing Date:
28 November 2019 (28.11.2019)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
16/218,680 13 December 2018 (13.12.2018) US

(71) Applicant: **KIEKERT AG** [DE/DE]; Hoeseler Platz 2,
42579 Heiligenhaus (DE).

(72) Inventors: **PETTENGILL, Robert**; 33836 James Ct.,
Farmington, MI 48335 (US). **BORLODAN, Stelian**; 8890

Twin Lakes Dr., White Lake, MI 48386 (US). **BRICKNER, Robert**; 3590 Gardner Ave, Berkley, MI 48072 (US).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

(54) Title: MOTOR VEHICLE LOCK, IN PARTICULAR A MOTOR VEHICLE DOOR LOCK

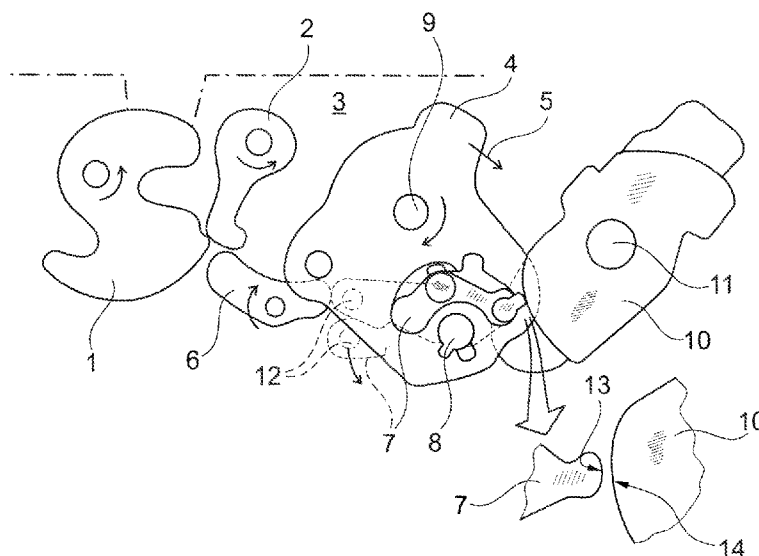


Fig. 1

(57) Abstract: The object of the invention is a motor vehicle lock, in particular a motor vehicle door lock. It is provided with a locking mechanism (1, 2) essentially made of a rotary latch (1) and a pawl (2). An actuating lever mechanism (4, 5, 6, 7) is further provided for the locking mechanism (1, 2) having at least one coupling lever (7) rotatable about an axis (8) and having a mass inertia element (10) rotatable about an additional axis (11) spaced apart from the axis (8) of the coupling lever (7) in order to guide the coupling lever (7), at least in the event of an accident. The coupling lever (7) in its "engaged" position connects the actuating lever mechanism (4, 5, 6, 7) mechanically with the locking mechanism (1, 2) and in its "disengaged" position ensures that the actuating lever mechanism (4, 5, 6, 7) is locked and/or separated from the locking mechanism (1, 2). According to the invention, the mass inertia element (10) has a guide contour (14) for the coupling lever (7) that interacts with a contact contour (13) of the coupling lever (7) in such a manner



TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

— *with international search report (Art. 21(3))*

that the guide contour (14) and/or contact contour (13) is configured so that a force exerted upon it runs essentially tangentially to the diameter (d) of the associated axis (8 or 11).

Description

Motor vehicle lock, in particular a motor vehicle door lock

5 The invention relates to a motor vehicle lock, in particular a motor vehicle door lock having a locking mechanism essentially made up of a rotary latch and a pawl, further having an actuating lever mechanism for the locking mechanism with at least one coupling lever rotatable about an axis and having a mass inertia element rotatable about an additional axis that is spaced apart from the axis of
10 the coupling lever in order to guide the coupling lever, at least in the event of an accident, the coupling lever in its "engaged" position mechanically connecting the actuating lever mechanism to the locking mechanism and in its "disengaged" position locking and/or mechanically separating the actuating lever mechanism from the locking mechanism.

15

The vehicle locks described above are generally vehicle door locks, meaning, for example, vehicle side door locks, vehicle hatchback locks or vehicle hood locks. In principle, however, seat locks and the like also fall under the term motor vehicle lock.

20

With vehicle locks and specifically vehicle door locks, there is the basic danger that in the event of a crash—meaning in the event of an accident and the increased deceleration forces associated with it that affect the vehicle lock—the actuating lever mechanism is inadvertently deflected and the associated locking
25 mechanism is opened along with a vehicle door equipped with it. As a result of this, safety measures such as a side airbag or a side impact protection provided in or on the vehicle door could no longer produce any effect for the vehicle occupants. For this reason, one uses so-called mass inertia elements of the prior art that remain at rest in the event of a crash or are only minimally deflected.
30 Using the relevant mass inertia element, the actuating lever mechanism can be mechanically interrupted and/or locked. In both cases, an outer door handle

deflected, for example, in the event of a crash does not ensure that the locking mechanism is inadvertently opened.

In the prior art according to WO 2015/090286 A1, a locking device for a motor
5 vehicle is described that is equipped with a coupling element and a release
actuating lever for the lock mechanism. If the release actuating lever is actuated
starting at an initial position, the coupling element connects the release actuating
lever using the release lever to open the lock mechanism. If, however, the release
actuating lever is excessively accelerated, the coupling element does not ensure
10 that the release actuating lever is connected to the release lever to open the door.
This means that in the “disengaged” position of the coupling element or coupling
lever, the actuating lever mechanism is interrupted in the event of a crash.

In the generic prior art according to DE 10 2016 112 182 A1, a release lever and
15 a coupling lever are realized as components of the actuating lever mechanism.
The release lever can be connected to an actuating lever via the coupling lever.
In addition, the coupling lever is guided by a control lever. The control lever, for
its part, is moved by a control contour of a mass inertia element.

20 Prior art has fundamentally proven itself. However, in practice, problems of the
sort can arise that the coupling lever in the event of a crash does not properly
interact with the mass inertia element in order to leave the “engaged” position
and transition into the “disengaged” position. This is essentially attributable to two
phenomena. First, in practice, the coupling lever and the mass inertia element
25 are often equipped with a journal and a stop or an arcuate contour that interact
with each other in the event of a crash. As a result of this, there is often only one
minimal mechanical contact or a contact surface between the coupling lever on
the one hand and the mass inertia element on the other is of small dimensions.
Because of manufacturing tolerances, functional impairments can occur at this
30 point via a mutual “hooking.”

Moreover, it should also be noted that such a crash event must be flawlessly
managed basically during the entire life of the auto. If one considers that

automobiles today often have a lifetime of 10 and up to 15 years, then contamination in the contact region and/or corrosion between the coupling lever and the mass inertia element are conceivable and can also lead to functional impairments. The invention will remedy this situation in its entirety.

5

The invention is based on the technical problem of further developing a motor vehicle lock of this type, and in particular a motor vehicle door lock, in such a way that a flawless interaction is observed between the coupling lever and the mass inertia element, in particular in the event of a crash, and the coupling lever is transferred securely into its disengaged position.

To solve this technical problem, a generic motor vehicle lock and in particular a motor vehicle door lock in the context of the invention is characterized in that the mass inertia element has a guide contour for the coupling lever that interacts with a contact contour of the coupling lever in such a manner that the guide contour and/or the contact contour is configured so that a force exerted upon it runs essentially tangentially to the diameter of the associated axis.

According to the invention, the guide contour on the mass inertia element and/or the contact contour on the coupling lever thus undergoes a specific design and optimization. It must then be ensured here that the guide contour and/or contact contour in question is designed so that a force exerted upon it runs essentially tangentially to the diameter of the associated axis. For example, the coupling lever acts on the guide contour on the mass inertia element. So that the coupling lever is properly transferred from its "engaged" position into the "disengaged" position in the event of a crash in particular, the guide contour on the mass inertia element provides a form and design of this sort so that the force exerted by the coupling lever on the guide contour in question runs essentially tangentially in comparison to the diameter of the associated axis of the mass inertia element.

30

Because the mass inertia element in the event of a crash remains at rest or essentially at rest, the force exerted by the coupling lever deflected on the mass inertia element in the event of a crash is converted into a torque acting upon the

coupling lever. This torque as a whole causes the coupling lever to be transferred from its previous position, meaning the “engaged” position assumed in normal operation, into the “disengaged” position in the event of a crash.

- 5 The force relationships remain essentially equal in this process because the guide contour on the mass inertia element is designed so that the force exerted upon it by the coupling lever in each case runs tangentially to the diameter of the axis of the mass inertia element. As the mass inertia element remains at rest in the event of a crash, this leads overall to the desired pivoting movement of the
- 10 coupling lever because the mass inertia element exerts a corresponding counterforce on the coupling lever. Via the essentially tangential orientation of the forces exerted upon the guide contour on the part of the coupling lever, there is at this point a smooth desired movement of the coupling lever, even if a contact contour between the guide contour on the mass inertia element and the contact
- 15 contour of the coupling lever is contaminated, as applicable, or has corrosion, etc. This means that the functionality is improved, and additionally and in particular over the long term.

Normally, it is thus the approach that the guide contour as well as the contact

20 contour is designed so that each force exerted upon the other runs essentially tangentially to the respective diameter of the associated axis. This means that, at this point, the design as a whole is made so that the guide contour on the mass inertia element as well as the contact contour of the coupling lever ensure that the respective forces exerted upon them run tangentially to the diameter of the

25 associated axis

This specifically means that not only the coupling lever exerts forces upon the guide contour on the mass inertia element as described in the event of a crash. Instead, the guide contour on the mass inertia element, on its part, also transfers

30 to the coupling lever counterforces that at this point act on the contact contour of the coupling lever designed according to the invention. These counterforces again and according to the invention run tangentially to the diameter of the associated axis, in the present case the axis of the coupling lever. As a result of

this, according to the invention, there is a rolling motion between the guide contour on the mass inertia element, on the one hand, and the contact contour on the coupling lever, on the other, with formation of a significantly large contact surface. This rolling motion is characterized in that here the respective forces
5 acting upon the guide contour or contact contour run tangentially to the associated diameter of the axis or axis of rotation. In this manner, corresponding proper torques are transferred without additionally produced forces so that a hooking, non-circular motion and, as a result of this, any functional disruptions are prevented by design. Even possible impairments of the guide contour with
10 respect to the contact contour by contamination, possible corrosion, etc. do not adversely affect this basic design over the long term. The essential advantages can be seen here.

According to an advantageous embodiment, the diameter of the axis of the mass
15 inertia element and/or the diameter of the axis of the coupling lever can be selected as a function of the respective desired resistance to rotational movements. This means that the larger the diameter of the axis that is chosen, the smaller also is the respective resistance with respect to rotational movements. In other words, a large diameter of the axis corresponds to the fact that small
20 resistance must first be overcome in order to be even able to initiate a rotational movement created by the applied force, and vice versa. In this context, specifying the diameter longitudinally as part of a radius of inertia has proven effective.

In a known way, the radius of inertia indicates the distance from the associated
25 axis or axis of rotation in that the punctiform mass of the element in question (the mass inertia element or of the coupling lever) must be applied in order to obtain the associated moment of inertia of the element in question. Naturally, the mass inertia element has a moment of inertia many times greater than the coupling lever, so that in the event of a crash, the mass inertia element essentially remains
30 at rest and can also remain at rest while, in contrast, the coupling lever is pivoted and therefore is transferred from its previously assumed "engaged" position into the "disengaged" position.

In the context of the exemplary embodiment, the diameter of the mass inertia element and/or of the coupling lever can be designed, for example, so that it is between 10 % and 80 % of the length of the radius of inertia and in particular between 20 % and 60 % of the length of the radius of inertia. This clearly applies
5 only as an example and is in no way to be understood as limiting.

According to an advantageous embodiment, the guide contour and/or the contact contour are designed as involutes. Such an involute arises in a known way by “unwinding,” so to speak, of respective tangents to the diameter of the associated
10 axis. As a result of this, the associated guide contour of the mass inertia element that is configured as an involute appears in an unwinding of the tangents from the diameter of the mass inertia element. The coupling lever can be made and operated in the same way. In this case, the contact contour of the coupling lever designed as an involute is produced by the individual tangents at the diameter of
15 the axis of the coupling lever being unwound.

Specifically, and especially advantageously, the relevant involute is designed as an involute of a circle. In this case, one begins with a circle as the involute, i.e. that the unwinding of the tangents in question occurs in each case starting from
20 a circle. The invention here takes into account that the relevant diameter of the associated axis of the mass inertia element, on the one hand, and of the coupling lever, on the other, correspond to a circular surface, which is generally the case. In the case of an involute of a circle, the length of each individual tangent to the diameter of the associated axis for the unwinding of the involute increases by the
25 amount of the arc length between adjacent tangents. In other words, the involute of a circle describes a spiral having a constant pitch. It is produced conceptually as a track of a thread-like element that is unwound with tension from the circumference of the associated axis, meaning the axis of the mass inertia element and/or the axis of the coupling lever. In each case, this specific design
30 as a whole causes the contact contour on the coupling lever to similarly roll over the guide contour of the mass inertia element at least in the event of a crash, as is known from involute teeth in gears.

Such involute gear teeth are basically also known and in connection with vehicle door locks, as US 2018/0038137 A1 documents with the explanatory notes in section [0084] there. In any case, a crash event and with it the interaction between the mass inertia element and the coupling lever according to the invention is not described in this context. In any case, involutes and specifically involutes of a circle are known in principle, but not for the design of a guide contour in a mass inertia element and/or the associated contact contour of the coupling lever. This leads altogether to the previously described, functionally reliable and smooth operation and to the coupling lever being thereby transferred from the normal "engaged" position assumed in normal operation into the "disengaged" position, at least in the event of a crash. As a result of this, the actuating lever mechanism is mechanically separated from the locking mechanism so that even the displacement of the associated outer door handle or interior door handle as a result of the acting deceleration forces cannot result in an inadvertent opening of the locking mechanism.

In the same way, such an inadvertent opening of the locking mechanism is prevented if the coupling lever locks the actuating lever mechanism in its "disengaged" position. Also in this case, a possible deflection of the door outer handle or door inner handle caused by the deceleration forces being exerted cannot be transferred to the locking mechanism. In all cases considered, this remains locked so that the associated vehicle door cannot be opened in any case.

In general, the actuating lever mechanism has, in addition to the previously mentioned coupling lever, at least one actuating lever and, as needed, a release lever. The actuating lever generally acts on the release lever that, in turn, in the closed position of the locking mechanism lifts a pawl that is engaged with the rotary latch from the rotary latch. The actuating lever mechanism is then mechanically connected to the locking mechanism, and the coupling lever in normal operation is in its "engaged" position. In the event of a crash and in the "disengaged" position of the coupling lever, the actuating lever mechanism is mechanically interrupted or locked so that the release lever cannot lift the pawl from the rotary latch.

In detail, it has proven effective if the coupling lever is rotatably mounted on the actuating lever. The actuating lever can thus in turn be mounted in a lock case or lock housing. The same applies to a locking mechanism comprising a rotary latch
 5 and a pawl. The essential advantages can be seen here.

The invention is explained in detail below in reference to a drawing representing only one exemplary embodiment; shown are:

10 Fig. 1 the vehicle lock according to the invention in a top view,

Fig. 2 the mass inertia element in a detail view and

Fig. 3 the coupling lever in an individual view.

15

A motor vehicle lock is shown in the figures. The motor vehicle lock is not limited to a vehicle door lock that is equipped with a locking mechanism 1, 2 essentially comprising a rotary latch 1 and a pawl 2. Rotary latch 1 and pawl 2 are mounted in an indicated lock case 3 or a lock housing. In addition, an actuating lever
 20 mechanism 4, 5, 6, 7 is realized for locking mechanism 1, 2. Actuating lever mechanism 4, 5, 6, 7 provides at least one coupling lever 7 that can be rotated about axis 8 for locking mechanism 1, 2.

In detail, actuating mechanism 4, 5, 6, 7 first comprises an actuating lever or
 25 outer actuating lever 4, a door outer handle 5 indicated by only one arrow, a release lever 6 and finally coupling lever 7. Release lever 6 is rotatably mounted in lock case 3. The same applies for the actuating lever or outer actuating lever 4, which, while defining an axis 9, is also mounted in lock case 3. By contrast, coupling lever 7 is mounted on actuating lever or outer actuating lever 4, namely
 30 rotatably about its axis 8.

A mass inertia element 10 also belongs to the basic design. The mass inertia element is mounted about an additional axis 11 that, compared to axis 8 of coupling lever 7, is arranged at a distance in the interior of the motor vehicle door

lock. Mass inertia element 10 with its axis 11 is further illustrated in detail in fig. 2. Fig. 3 shows coupling lever 7 with its axis 8 in an individual view.

In fig. 1, locking mechanism 1, 2 is shown in the closed state. In addition, the
5 normal operation is shown as a solid line, in contrast to which the dashed position of coupling lever 7 corresponds to the crash case. In normal operation, an impact of the door handle in the direction of the arrow 5 ensures that actuating lever or outer actuating lever 4 is pivoted about its axis 9 in the clockwise manner indicated here. Coupling lever 7 rotatably mounted on actuating lever 4 now
10 provides a journal 12 that runs against release lever 6 during the described pivoting movement of actuating lever 4 in normal operation and in the clockwise direction during an opening procedure of locking mechanism 1, 2.

As a result of this opening movement, release lever 6 mounted in lock case 3
15 also pivots in the clockwise direction indicated in fig. 1 and ensures that the pawl 2 engaged into rotary latch 1 in the locked state shown in fig. 1 is lifted from its engagement with rotary latch 1. This is because the clockwise rotation of release lever 6 causes pawl 2 to be pivoted in the clockwise direction and lifted from its engagement with rotary latch 1. As a result of this, rotary latch 1 can swing up in
20 the counter-clockwise direction supported by a spring and release a previously hooked and merely hinted at locking bolt. The associated motor vehicle door can be opened.

In the event of a crash, however, the crash event corresponds in such a way that
25 deceleration forces acting on coupling lever 7 ensure that coupling lever 7 executes a pivoting motion in the counter-clockwise direction about its axis 8 relative to actuating lever 4 as indicated by a dashed line in fig. 1. The pivoting motion of coupling lever 7 is thus undertaken regardless of a possible additional pivoting motion of actuating lever 4 caused by exerted decelerating forces. This
30 is because coupling lever 7 is equipped, for this purpose and in detail, with a contact contour 13 that interacts with an associated guide contour 14 on mass inertia element 10. The interaction between the two contours 13, 14 thus takes place at least in the event of a crash and regardless of whether or not actuating lever 4 also executes a clockwise movement about its axis 9 that is initiated by
35 the exerted deceleration forces and a deflection of door outer handle 5.

Contact contour 13 of coupling lever 7 as well as guide contour 14 on mass inertia element 10 as well as their respective designs are illustrated in detail in figures 2

and 3. This creates, overall and at least in the event of a crash, a contact contour of significant size between contact contour 13 of coupling lever 7 and guide contour 14 of mass inertia element 10, thereby ensuring a flawless mode of operation and in detail guaranteeing that, at least in the crash event described here, coupling lever 7 is transferred by the interaction between coupling lever 7 and mass inertia element 10 from its "engaged" position, represented as a solid line, into the "disengaged" position, rendered as a dashed line and corresponding to a counter-clockwise movement of coupling lever 7 about its axis 8.

10 In the "engaged" position of coupling lever 7, as illustrated as a solid line in fig. 1, an actuation of actuating lever 4 in the indicated clockwise direction about axis 9 renders journal 12 of coupling lever 7 able to act on release lever 6 as described, so that locking mechanism 1, 2 is opened as a final effect. If, however, coupling lever 7 in the event of a crash is, transferred by its interaction with mass inertia
15 element 10 into its "disengaged" position indicated as a dashed line in fig. 1, then journal 12 is separated from release lever 6. A possible impact of actuating lever 4 in the clockwise direction, and thus in the opened state, is consequently not (no longer) transferred to locking mechanism 1, 2. Locking mechanism 1, 2 consequently remains in the closed state illustrated in fig. 1. An associated motor
20 vehicle door is not inadvertently opened.

According to the invention, guide contour 14 of mass inertia element 10 and also contact contour 13 of coupling lever 7 are designed in such a way that relevant forces exerted upon mass inertia element 10 or coupling lever 7 run essentially
25 tangentially to relevant diameter d of associated axis 8 or 11. According to the exemplary embodiment and the illustration following in figures 2 and 3, guide contour 14 as well as contact contour 13 are designed so that relevant forces of mass inertia element 10 or coupling lever 7 exerted upon each other run essentially tangentially to the relevant diameter of associated axis 8 or 11.
30 According to the exemplary embodiment, contact contour 13 as well as guide contour 14 are each involutes of a circle.

For example, looking at mass inertia element 10 in fig. 2, it can be recognized that diameter d of axis of rotation 11 of mass inertia element 10 as a whole
35 describes a circle as an involute. If coupling lever 7 now exerts a force upon guide contour 14 on mass inertia element 10 in the event of a crash, the relevant force in each case runs essentially tangentially as compared to diameter d of associated axis 11 in question, as the individual tangents indicated in fig 2 make

clear. Guide contour 14 of mass inertia element 10 or the involute of a circle realized at this position is now formed and designed so that each individual tangent is unwound at diameter d of axis 11 from diameter d. Because this is also an involute of a circle, the length of the respective tangents thus similarly
 5 increases by the amount of the arcuate length between adjacent tangent as if a thread wound onto axis 11 of diameter d were unwound. The tangents increasing in this manner with respect to their lengths describe the involute of a circle or guide surface 14 of mass inertia element 10.

10 A similar process takes place for contact contour 13 of coupling lever 7 in fig. 3. Also in this case, it is an involute of a circle, diameter d of axis 8 representing the involute. Any forces exerted by mass inertia element 10 upon coupling lever 7 again run essentially tangentially to diameter d in question of associated axis 8 of coupling lever 7, as is indicated in fig. 3. Contact contour 13 is again designed
 15 as an involute of a circle here, so that the length of each individual tangent at diameter d of axis 8 for unwinding the involute of a circle increases by the amount of the arcuate lengths between adjacent tangents, comparable to how this was previously described for guide contour 14.

20 As a result of this, in the event of a crash, it happens that contact contour 13 of coupling lever 7 designed as an involute or involute of a circle rolls over on associated guide contour 14 of mass inertia element 10 also designed as an involute or involute of a circle. The rolling movement here takes place in a manner comparable to a rolling movement in an involute gearing of a transmission. This
 25 ensures an especially smooth rotational motion of coupling lever 7 from its "engaged" position, shown in fig. 1 as a solid line, into the "disengaged" position rendered as a dashed line.

Mass inertia element 10 actually remains essentially at rest in the event of a crash
 30 so that contact contour 13 on coupling lever 7 rolls over, and also can roll over, guide contour 14 of mass inertia element 10 as described. This rolling movement between the two contours 13, 14 is one between two involutes of a circle so that the respective force exerted by coupling lever 7 on mass inertia element 10, on the one hand, and the counterforce of mass inertia element 10 on coupling lever
 35 7, on the other, extends tangentially in each case to associated diameter d of corresponding axis 8 or 11. This leads to a particularly uniform and smooth operation and to a functionally reliable assumption of the "disengaged" position of coupling lever 7, in particular in the event of a crash.

Finally, it can be recognized in figures 2 and 3 that diameter d of axis 11 of mass inertia element 10 as well as diameter d of axis 8 of coupling lever 7, as appropriate, can be selected as a function of the relevant desired resistance to rotational movements. The larger the diameter d of associated axis 8 or 11, the smaller the resistance in question with respect to rotational movements and vice versa. In addition, in figures 2 and 3, yet another relevant radius of inertia a is reproduced and pictorially represented of mass inertia element 10, on the one hand, and of coupling lever 7, on the other. Associated diameter d is now measured longitudinally as part of associated radius of inertia a . In the case of mass inertia element 10 in fig. 2, the configuration is designed in such a way that diameter d of associated axis 11 is approximately 40 % of the length of radius of inertia a . In the case of coupling lever 7 in fig. 3, diameter d of associated axis 8, however, is measured at approximately 60 % of radius of inertia a . This clearly is only applied as an example and is in no way limiting.

List of reference numbers

	1	Rotary latch
	1, 2	Locking mechanism
5	2	Pawl
	3	Lock case
	4	Actuating lever / outer actuating lever
	4, 5, 6, 7	Actuating lever mechanism
	5	Exterior door handle / direction of the arrow
10	6	Release lever
	7	Coupling lever
	8	Axis
	9	Axis
	10	Mass inertia element
15	11	Axis / Axis of rotation
	12	Journal
	13	Contact contour
	13, 14	Contours
	14	Guide contour
20	a	Radius of inertia
	d	Diameter

Claims

1. A motor vehicle lock, in particular a motor vehicle door lock having a locking mechanism (1, 2) essentially made up of a rotary latch (1) and a pawl (2),
5 further having an actuating lever mechanism (4, 5, 6, 7) for the locking mechanism (1, 2) with at least one coupling lever (7) that can be rotated about an axis (8) and having a mass inertia element (10) rotatable about an additional axis (11) that is spaced apart from the axis (8) of the coupling lever (7) in order to guide the coupling lever (7), at least in the event of an accident, the coupling
10 lever (7) in its "engaged" position mechanically connecting the actuating lever mechanism (4, 5, 6, 7) to the locking mechanism (1, 2) and in its "disengaged" position locking and/or mechanically separating the actuating lever mechanism (4, 5, 6, 7) from the locking mechanism (1, 2), characterized in that, the mass inertia element (10) has a guide contour (14) for the coupling
15 lever (7) that interacts with a contact contour (13) of the coupling lever (7) in such a manner that the guide contour (14) and/or the contact contour (13) is configured so that a force exerted upon it runs essentially tangentially to the diameter (d) of the associated axis (8 or 11).
- 20 2. The motor vehicle lock according to claim 1, characterized in that the guide contour (14) and the contact contour (13) are designed so that respective forces exerted upon each other run essentially tangentially to the diameter (d) of the associated axis (8 or 11).
- 25 3. The motor vehicle lock according to claim 1 or 2, characterized in that the diameter (d) of the axis (11) of the mass inertia element (10) and/or the diameter (d) of the axis (8) of the coupling lever (7) is selected as a function of the force resisting the rotational movements that is desired in each case.
- 30 4. The motor vehicle lock according to claim 3, characterized in that the respective diameter (d) is longitudinally configured as a part of a radius of inertia (a) of the mass inertia element (10) and/or of the coupling lever (7), for

example 10 % to 80 % of the length of the radius of inertia (a) in particular 20 % to 60 % of the length of the radius of inertia (a).

5. The motor vehicle lock according to any of claims 1 to 4,
5 characterized in that, the guide contour (14) and/or the contact contour (13) in each case has an involute design.

6. The motor vehicle lock according to claim 5, characterized in that the involute is an involute of a circle.

10

7. The motor vehicle lock according to any of claims 1 to 6, characterized in that the actuating lever mechanism (4, 5, 6, 7) has, in addition to the coupling lever (7), at least one actuating lever (4) and a release lever (6) where appropriate.

15

8. The motor vehicle lock according to claim 7, characterized in that the coupling lever (7) is rotatably mounted on the actuating lever (4).

9. The motor vehicle lock according to any of claims 1 to 8,
20 characterized in that, in the event of a crash, the contact contour (13) of the coupling lever (7) rolls over the guide contour (14) of the mass inertia element (10).

10. The motor vehicle lock according to any of claims 1 to 9,
25 characterized in that the coupling lever (7) in the event of a crash rotates with respect to the mass inertia element (10), which essentially remains at rest, about its axis (8) and transitions from its "engaged" state into the "disengaged" position.

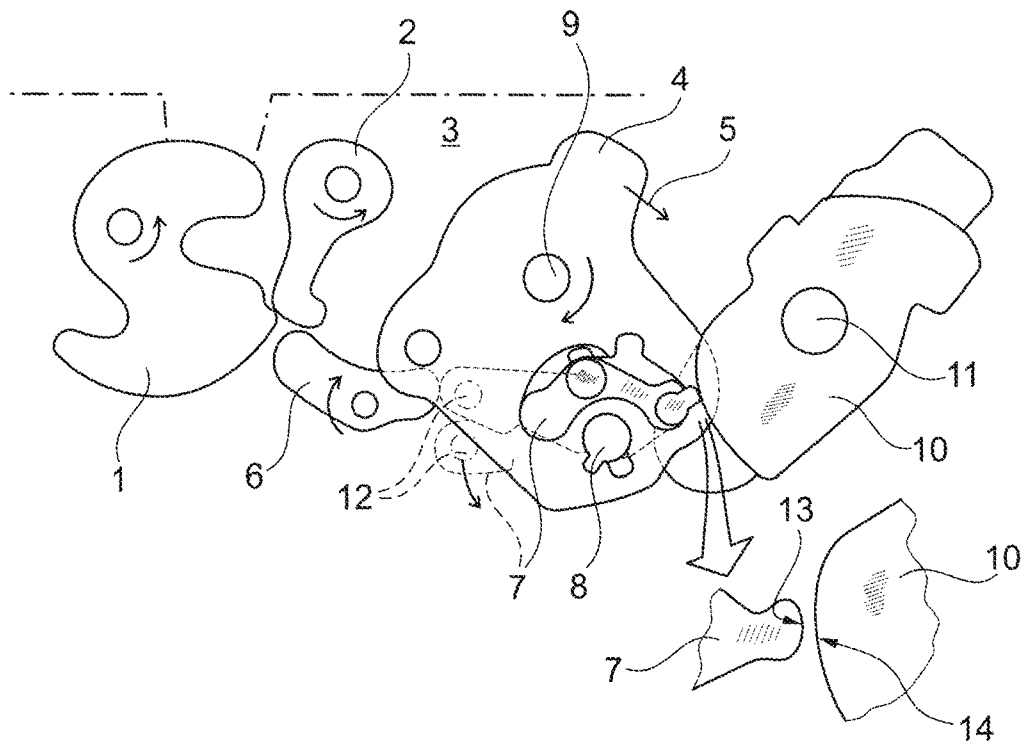


Fig. 1

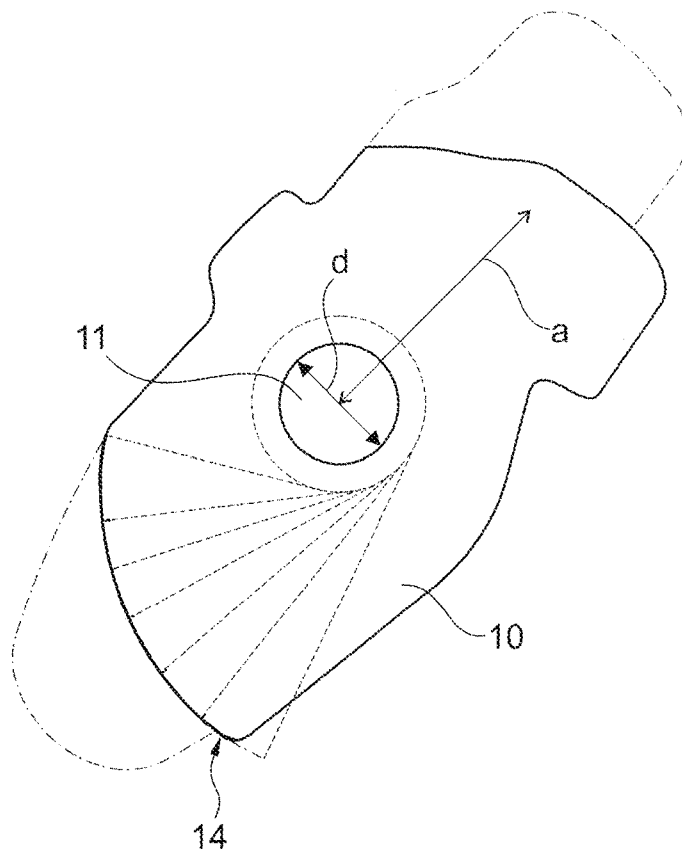


Fig. 2

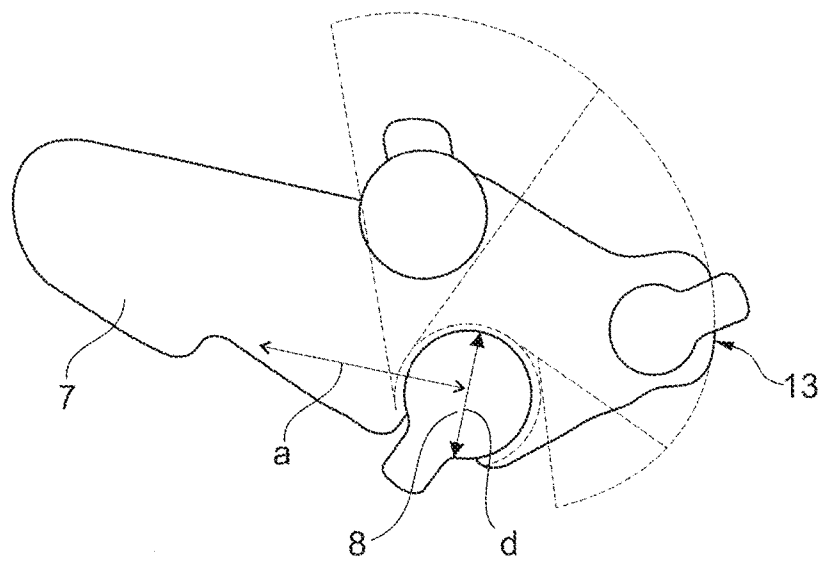


Fig. 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2019/060271

A. CLASSIFICATION OF SUBJECT MATTER
INV. E05B77/06
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
E05B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2018/044947 A1 (MANOLESCU CONSTANTIN [US] ET AL) 15 February 2018 (2018-02-15) paragraph [0024] - paragraph [0027]; figures 1-7	1-10
X	DE 10 2016 112182 A1 (KIEKERT AG [DE]) 4 January 2018 (2018-01-04) cited in the application paragraph [0049] - paragraph [0053]; figures 1-4	1-4,7-10
A	US 2018/038137 A1 (DAMBOIU CRISTIAN [US] ET AL) 8 February 2018 (2018-02-08) cited in the application paragraphs [0052], [0053], [0084]; figures 6,7	1,5,6



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

28 February 2020

Date of mailing of the international search report

06/03/2020

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040,
Fax: (+31-70) 340-3016

Authorized officer

Pérez Méndez, José F

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2019/060271

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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