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(54) DOOR LOCK

(71) We, REGIE NATIONALE DES USINES RENAULT, a company incorporated according to the laws of the Republic of France, of 92109 Boulogne-Billancourt, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:

The present invention relates generally to a door lock such as for a motor vehicle door, and more specifically to an internal lock plate assembly, for example for the side door of a motor vehicle.

Previously proposed motor vehicle door locks generally comprise a plate assembly having a support plate on which there are mounted a plurality of levers which are caused to perform movements, of a greater or lesser degree of complexity, by means of other internal or external actuating levers which are independent of the plate assembly. In this kind of lock, the various levers on the support plate separately perform some of the following functions:

- opening of the door by external actuation,
- opening of the door by internal actuation,
- moving the plate assembly between an inoperative position in which it prevents the door from being opened, and an operative position, in which it can permit door opening, by external actuation.
- moving the plate assembly between its inoperative and operative positions, by internal actuations,
- automatically moving the plate assembly into its operative position, by closing the door as by slamming or banging.

According to the present invention, there is provided a lock plate assembly for a door, including a support, a main lever which is mounted for pivotal movement on the support, the main lever being pivotable by one

or the other of both an external bolt member and an internal actuation lever, when the assembly is in operative association therewith, in a first direction, in which the plate assembly when mounted on a door, is rendered inoperative, to prevent the door from being opened or in a second direction, which is opposite to the first direction and in which the plate assembly, when mounted on the door, is rendered operative, to permit the door to be opened, the main lever also being pivotable in its second direction by closing of the door when the assembly is mounted on the door.

The invention also provides a lock plate assembly for a motor vehicle door, comprising a support, a main lever mounted on the support for pivotal movement between when the assembly is in operative association with a motor vehicle door, a first neutral position in which it can permit the door to be opened upon further actuation of the assembly, a second position in which it prevents said further actuation of the assembly for opening the door, and a third position for opening the door, a locking member operable from outside the door, when the assembly is in operative association with the door, for displacing the main lever between its respective positions, and an internal actuation member operable from inside the door, when the assembly is in operative association with the door, for displacing the main lever between its respective positions, the main lever also being displaceable from its second to its first position, when the assembly is in operative association with the door and the door is closed with the main lever in its second position.

A lock plate assembly according to the present invention will now be described by way of example with reference to the accompanying drawings, in which :

Figure 1 is an elevational view of the plate

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assembly, showing a main lever thereof in a neutral position,

*Figure 2* shows an internal actuation lever, as viewed from line II-II in *Figure 1*,

5 *Figure 3* shows different positions of a projection of an external blocking bolt member, as viewed from line III-III in *Figure 1*,

10 *Figure 4* shows the action of opening the door by an external actuation lever, with the main lever remaining in its neutral position,

15 *Figure 5* shows the action of opening the door by the internal actuation lever, with the main lever having pivoted in a clockwise direction,

*Figure 6* shows the plate assembly in an inoperative condition in which the door cannot be opened, the main lever having pivoted in an anti-clockwise direction,

20 *Figure 7* shows the main lever in an intermediate position between a position in which the assembly is rendered inoperative to prevent the door from being opened, and its neutral position, following the banging of the door for closure thereof, for automatically moving the plate assembly into an operative condition in which the door can be subsequently reopened.

30 Referring to *Figure 1*, a lockplate assembly 1 comprises a support 2 on which a main lever 4 of irregular shape is mounted for pivotal movement about an axis 3. The main lever 4 comprises: an opening 5 which is extended, in its lower part in *Figure 1*, by a slot or groove 6; a projection 7 which extends horizontally in the *Figure 1* position and which is arranged to be engaged by an internal actuation lever 8 for actuation of the lever 4; and a portion 9 which extends normal to the main body portion of the lever 4, being disposed vertically in the *Figure 1* position, and which is disposed substantially opposite to the projection 7. The portion 9 is apertured to receive a finger or projection portion 10 of an external lock-arresting or blocking bolt member. This bolt member, of conventional design, is mounted on the door and is formed by a rotary barrel actuated by a key. The projection portion 10 of the bolt member is returned to a neutral position under the action of a return spring (not shown) which is incorporated in the barrel. Thus, rotation of the portion 10 downwardly in *Figure 3* corresponds to opening of the door, while rotation of the finger upwardly in *Figure 3* corresponds to the inoperative condition of the plate assembly in which the door cannot be opened.

60 By a pivotal movement in a first direction, namely an anticlockwise direction in the drawings, about its axis 3, the main lever 4 can be moved from its neutral position as shown in *Figure 1*, to a blocking position as shown in *figure 6*; it is loaded by a spring means having two stable positions. In the

illustrated embodiment, the spring means is a spring blade 11 which presses against the support 2 a ball 12 which is of smaller diameter than a bore in the lever 4, the bore thus serving to house the ball in the lever. 70 The diameter of the ball is greater than two further bores or recesses in the support 2, which are disposed on the same circular arc 12a drawn around the axis 3 of the main lever 4 whereby the co-operation of the ball and such further bores defines the two stable positions of the lever 4. 75

The support 2 also supports a lever 13 for external actuation, the lever 13 being supported, adjacent one end, for pivotal movement about a second axis 14. The lever 13 has a boss or projection 15 for engaging a cam finger or projection 16 which is fixed directly on or forms part of the bolt (not shown) of the lock. The cam projection 16 projects through the opening 5 in the main lever 4. The projection 16 is pivotal about the axis 14, as indicated in broken lines in *Figure 1*. The other end of the lever 13 provides a portion 17 which extends normal to the main body of the lever 13 and on which an actuating button (not shown) is fixed. This direct external actuating assembly (lever 13 and related components) may be identical to that which is disclosed in French Patent No. 2 355 150 of the present applicants, and has the advantage in particular of being recessed entirely within the door joint or contour, without projecting beyond the outside panel of the door, thereby to improve safety conditions in the event of the vehicle overturning. 80 85 90 95 100

As shown in *Figure 2*, the projection 7 of the lever 4 engages into a groove 18 in the lever 8 for internal actuation. The lever 8 is disposed perpendicularly relative to the projection 7, and provides for pivotal operation of the main lever in either direction, from the interior of the vehicle. For this purpose, the lever 8 is mounted for pivotal movement about an axis 19 by the action of an actuating rod (not shown) which is engaged in an opening 20 in the vertical limb of the lever 8. As will be seen hereinafter, this internal actuating means (lever 8) provides, from the interior of the motor vehicle, both for opening the vehicle door and for displacing the plate assembly between an inoperative condition in which it prevents the door from being opened, and an operative condition in which it can permit the door to be opened. 105 110 115 120

*Figure 3* shows that the portion 9 of the main lever 4 can assume different positions as shown in broken lines. These positions correspond to pivotal movement of the main lever in one direction or the other, under the action of the projection portion 10 of the bolt member as described above, as actuated by its barrel and key. 125 130

The mode of operation of the above-described assembly will now be described, with reference to Figures 4 to 7.

5 In Figure 4, the external actuation lever 13 is moved from its lower rest position as shown in broken lines to its upper position in solid lines, producing pivotal movement of the cam projection 16 about the common pivot axis 14. This position corresponds to that for opening of the door by the external actuation lever 13, the lock bolt thus being liberated from its catch position. The lever 13 returns automatically to its rest position (Figure 1) when it is released, by the action of a return spring (not shown), for example a torsion spring which is wound around the axis 14 of the lever. It will be noted that, in the movement described above with reference to Figure 4, the main lever 4 remains in its neutral position of Figure 1, and that in this case the lever 4 serves only as an upper abutment in respect of the movement of the cam projection 16.

25 In Figure 5, the main lever 4 is pivoted from its neutral position in a clockwise direction, under the action of the lever 8; the centre line of the vertical limb of the lever 8 then occupies the position shown at 21 in Figure 2. During this pivotal movement of the main lever 4, the cam projection 16 co-operates with a first rectilinear inclined surface portion or ramp surface 22 of the opening 5; this co-operation between the ramp surface 22 and the projection 16 urges the projection 16 upwardly in Figure 5, to the position to provide for opening the door. At the end of its upward movement, the cam projection 16 is received in upper left-hand corner of the opening 5 in the main lever 4 which then cannot pivot any further in the clockwise direction. This is an unstable position of the main lever which tends to return to its neutral position in Figure 1, under the effect of the spring arrangement 11, 12.

45 In Figure 6, the plate assembly is shown in a blocked or inoperative condition in which it prevents the door from being opened and in which the groove or slot 6 in the main lever 4 captures an abutment 23 on the external actuation lever 13 which is thus held in its rest position as shown in Figure 6. To arrive at this stable position, the main lever 4 has pivoted in an anticlockwise direction from its neutral position of Figure 1, either by operation of the internal actuation lever 8 when the lever 8 is moved into a position in which its centre line is at position 24 in Figure 2, or by operation of the projection 10 which moves to press against the upper edge 25 of the portion 9 of the main lever (this position of the projection 10 is shown in broken lines in Figure 6). By virtue of the pivotal movement of the main lever 4, the cam projection 16 is received

between the boss 15 of the lever 13 and a second rectilinear inclined surface portion or ramp surface 26 of the opening 5 of the main lever, such portion 26 being disposed substantially opposite to the first portion 22.

70 The plate assembly 1 can be placed in an operative condition in which it can permit the door to be opened, for which purpose the main lever 4 is pivoted in the clockwise direction from its neutral or blocking position as shown in Figure 6, in three different ways, namely: 1) by operation of the internal actuating lever 8 in the same direction as for opening (Figure 5); 2) by displacing the projection 10 against the lower edge 27 of the portion 9 of the main lever (Figure 6), the projection 10 subsequently returning to its stable or rest position shown in solid lines in Figure 1; or 3) automatically by banging the door shut, as will now be described with reference to Figure 7.

75 Figure 7 shows the main lever 4 in an intermediate position. The door has just been closed, and the cam projection 16 which is engaged by the lock bolt, under the effect of entry of the catch of the lock, has been raised to the maximum extent, starting from its position shown in Figure 6. Because of this, and by its action against the ramp surface 26 of the main lever, the cam projection 16 begins a pivotal movement of the lever 4 in the clockwise direction, thus moving the plate assembly towards a condition in which it can permit the door to be opened. Complete pivotal movement of the lever 4 to its neutral position (Figure 1) is effected by virtue of the above-mentioned spring 11, 12 and the inertia of the main lever 4.

80 It will be seen that in the above-described assembly, all the functions listed hereinbefore are performed by a single lever 4, thus providing a substantial simplification in structure and a saving in production costs. The single main lever removes at a stroke the plurality of pivots and the frictional forces involved with the multiple levers of the previously proposed locks, thereby improving the operation of the lock.

85 Various modifications can be made in the above-described embodiment without thereby departing from the scope of the invention as defined by the appended claims. For example, the design of the main lever 4 can be modified in order to perform partly or completely the various functions set out in the preamble of the present application, to comply with the different operating and safety regulations in various countries.

#### WHAT WE CLAIM IS:-

1. A lock plate assembly for a door, including a support, a main lever which is mounted for pivotal movement on the support, the main lever being pivotable by one

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- or the other of both an external bolt member and an internal actuation lever, when the assembly is in operative association therewith, in a first direction in which the plate assembly, when mounted on a door, is rendered inoperative, to prevent the door from being opened, or in a second direction, which is opposite to the first direction and in which the plate assembly when mounted on the door is rendered operative, to permit the door to be opened, the main lever also being pivotable in its second direction by closing of the door when the assembly is mounted on the door.
2. An assembly according to claim 1 including an external actuation lever, wherein the main lever has an opening extended by a slot or groove, and the slot or groove being so positioned that upon pivotal movement of the main lever in its first direction said slot or groove captures an abutment on the external actuation lever when said external actuation lever is in a rest condition.
3. An assembly according to claim 2, wherein the external actuating lever is mounted on the support for pivotal movement relative thereto, and has a projection operable, for the purpose of opening the door when the assembly is mounted on the door and when the main lever is in a neutral position, to entrain a cam projection which projects through said opening in the main lever and which is connectible directly to a lock bolt.
4. An assembly according to claim 3, wherein the contour of the opening in the main lever provides a first ramp surface to entrain the cam projection in the direction of opening of the door when the main lever is pivoted in its second direction with the assembly mounted on the door.
5. An assembly according to claim 4, wherein the contour of the opening in the main lever provides a second ramp surface which is substantially opposite to said first ramp surface and which is arranged to be entrained by the cam projection when the assembly is mounted on the door and the door is closed, thereby to cause said main lever to pivot in its second direction and to free said external actuation lever.
6. An assembly according to any one of the preceding claims, wherein the main lever has a projection of which one end engages into a groove in the internal actuation lever when the assembly is in operative association with the internal actuation lever, actuation of the last-mentioned lever causing pivotal movements of the main lever selectively in either of its first and second directions.
7. An assembly according to claim 6, wherein the main lever also has an apertured perpendicularly extending portion which is disposed substantially opposite to said projection, the upper and lower edges of the aperture in the portion providing contact abutments for a projection of said external bolt member, when the assembly is in operative association with the external bolt member, whereby actuation of said external bolt member causes the main lever to pivot selectively in said first or second direction.
8. An assembly according to any one of the preceding claims, including a spring arrangement for holding the main lever selectively in either neutral position or its position in which the plate assembly is rendered inoperative as aforesaid.
9. An assembly according to claim 2 or any claim appendant thereto, including a spring urging the external actuation lever towards its said rest position.
10. A lock plate assembly for a door, substantially as hereinbefore described with reference to the accompanying drawings.
11. A lock plate assembly for a motor vehicle door, comprising a support, a main lever mounted on the support for pivotal movement between, when the assembly is in operative association with a motor vehicle door, a first neutral position in which it can permit the door to be opened upon further actuation of the assembly, a second position in which it prevents said further actuation of the assembly for opening the door, and a third position for opening the door, a locking member operable from outside the door, when the assembly is in operative association with the door, for displacing the main lever between its respective positions, and an internal actuation member operable from inside the door, when the assembly is in operative association with the door, for displacing the main lever between its respective positions, the main lever also being displaceable from its second to its first position, when the assembly is in operative association with the door and the door is closed with the main lever in its second position.
12. In a motor vehicle, an assembly according to any one of the preceding claims.

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