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(54) Locking system for a door of a motor vehicle

(57) Locking system (1) for a door (2) of a motor vehicle, provided with a lock (10), which in turn includes a supporting frame (11) and an opening and closing unit (12) fixed to the supporting frame (11), a guide element (40) for a movable window (41) of the door (2), and means (42) of direct connection between the supporting frame (11) of the lock (10) and the guide element (40) to form a pre-assembled functional unit.

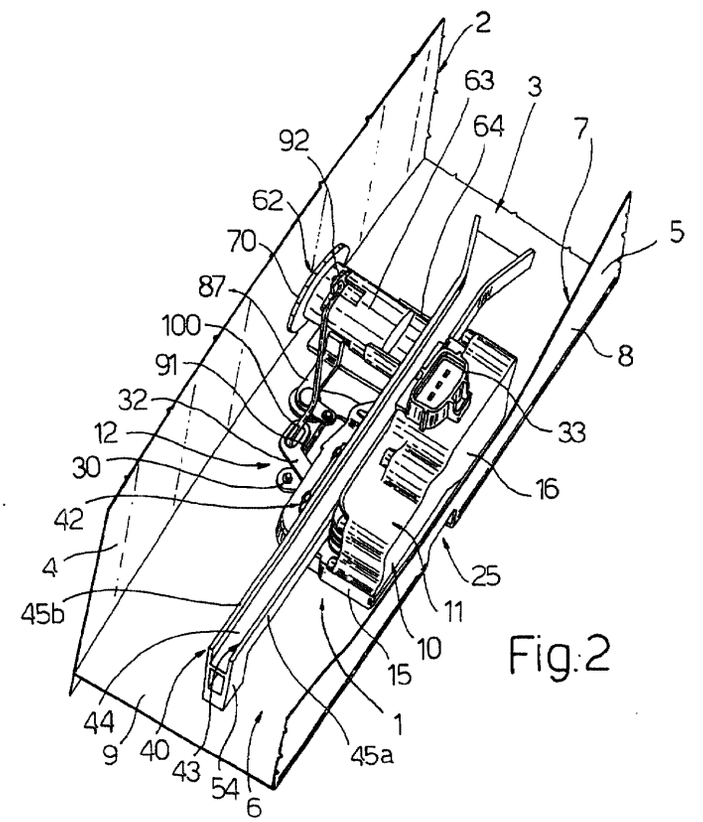

Fig.2

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Description

[0001] The present invention relates to a locking system for a door of a motor vehicle.

[0002] As is known, a door of a motor vehicle generally comprises an upper frame portion which forms an aperture which is closed by a movable window when the window is raised, and a lower box-shaped portion formed by an outer panel and an inner panel which between them form a compartment which normally houses the window, when lowered, and various components fixed to the panels, such as a lock, a window winder device, a pair of guide elements for the window, and a key unit connected for operation to the lock.

[0003] The aforesaid components are conveniently inserted into the compartment of the door through one or more apertures made in the inner panel, are assembled together in various ways, and are fixed to the panels.

[0004] These operations are relatively lengthy and complicated, and therefore require a long period of immobility of the doors on the assembly line, with relatively high associated costs.

[0005] The object of the present invention is to provide a locking system for a door of a motor vehicle which enables the door assembly operations to be simplified and speeded up in a simple and economical way.

[0006] The aforesaid object is achieved by the present invention, in that it relates to a locking system for a door of a motor vehicle, comprising a lock which in turn includes a supporting frame and an opening and closing unit fixed to the said supporting frame, characterized in that it additionally comprises at least one guide element for a movable window of the said door, and means of direct connection between the said supporting frame of the said lock and the said guide element to form a pre-assembled functional unit.

[0007] To enable the present invention to be understood more clearly, a preferred embodiment is described below, purely by way of example and without restriction, with reference to the attached drawings, in which:

Figure 1 shows in a front view a locking system according to the present invention at the time of fixing inside a compartment of a door of a motor vehicle;

Figure 2 is a perspective view, with parts removed for clarity, of the locking system of Figure 1 fixed inside the door of the motor vehicle;

Figure 3 is a perspective view, on an enlarged scale and with parts removed for clarity, of the locking system of Figure 1;

Figure 4 is a view from above, on an enlarged scale, of a detail of shows, in partial section and on a reduced scale, a detail of the locking system of Figure 1;

Figure 5 is a section through the line V-V of Figure 4;

Figure 6 is an external side view of a portion of the door of Figures 1 and 2;

Figure 7 is a perspective view, on an enlarged scale, of a key unit of the locking system of Figures 1-3 at the time of fixing to the door of the motor vehicle;

Figure 8 is a cross section of the key unit of Figure 7 after fixing to the corresponding door of the motor vehicle; and

Figure 9 is an axial section through the key unit of Figure 8.

[0008] With reference to Figures 1-3, the number 1 indicates as a whole a locking system for a door 2 of a motor vehicle.

[0009] The door 2 comprises, in a known way, a lower box-shaped portion 3, defined by an outer panel 4 and an inner panel 5 forming between them a compartment 6 in which the system 1 can be housed. For this purpose, the inner panel 5 has an aperture 7 (only a portion of the corresponding lateral edge of which is visible in Figure 2) for the introduction of this system.

[0010] The inner panel 5 has an essentially C-shaped horizontal section and comprises a main portion 8, which is essentially flat, and opposing end portions, only one of which is visible in Figures 1 and 2 where it is indicated by 9, projecting orthogonally from corresponding vertical side edges of the main portion 8 and joined along corresponding terminal side angles to the outer panel 4.

[0011] The system 1 comprises a lock 10 formed essentially by a casing 11, located inside the compartment 6 of the door 2 and fixed to the end portion 9 of the inner panel 5, and an opening and closing unit 12, housed for the most part inside the casing 11 and capable of interacting with a stop (not illustrated) which is integral with an upright (also not illustrated) of the door 2.

[0012] The casing 11 is essentially L-shaped in a side view, and is formed by two prismatic bodies 15, 16 whose thickness is small with respect to their other dimensions and which are fixed at their edges to each other in an assembled position.

[0013] In particular, the body 15 consists of a hollow shell having an essentially flat rectangular base wall 17, from the outer perimeter of which a lateral projecting edge 18 extends.

[0014] The body 16 is delimited by a pair of end walls 19, 20 of approximately rectangular shape, parallel to each other and connected perimetrically along three sides by a C-shaped lateral edge 21, in such a way that an open portion is left (not visible in the attached figures) for communication with the body 15. The body 16 is also provided with an integral plate element 22 projecting orthogonally from one side of the wall 19 delimiting the open portion of the body 16 and forming, in the assembly position, a cover for the body 15.

[0015] More precisely, in the assembly position the body 16 is fixed to the open portion of the body 15 and covers the body 15 by means of the plate element 22 on the side opposite the wall 17; additionally, the wall

20 of the body 16 is located in the same plane as a corresponding portion of the lateral edge 18 of the body 15.

[0016] The casing 11 is fixed inside the compartment 6 of the door 2 by means of a plurality of screws 23, numbering three in the case in question, connecting the wall 17 of the body 15 to the end portion 9 of the inner panel 5, in such a way that the wall 20 of the body 16 is positioned adjacent and parallel to the main portion 8 of the inner panel 5.

[0017] The casing 11 also has a lateral aperture 24 for the introduction of the stop formed in the body 15 and located corresponding to an angled aperture 25 formed in the lower portion 3 of the door 2 in the corner area formed between the end portion 9 and the main portion 8 of the inner panel 5. More precisely, the aperture 24 of the body 15 extends partially in the wall 17 and partially in a corresponding portion of the lateral edge 18.

[0018] The unit 12 comprises, in a known way which is not described in detail, a closing mechanism (not illustrated) capable of interacting with the stop to close the lock 10, and a first and a second opening lever 30, 31 connected for operation to the closing mechanism and operable from the outside and from the inside of the motor vehicle respectively to open the lock 10. The unit 12 also comprises a security lever 32 which is selectively movable between a first and a second operating configuration, for the enabling and prevention, respectively, of the opening of the lock 10 from the outside, and an electrically operated door lock actuator (which is known and is not illustrated), connected for operation to the security lever 32.

[0019] The closing mechanism, the opening lever 30 and the security lever 32 are housed inside the body 15, and have end portions 30a, 32a projecting from the body, while the opening lever 31 and the door lock actuator are carried by the body 16.

[0020] In particular, the opening lever 30 and the security lever 32 are pivoted on the body 15 about respective axes orthogonal to the wall 17.

[0021] The door lock actuator is housed inside the body 16 and is provided with an electrical connector 33, whose insulated enclosure is formed in one piece with the body 16. The essentially L-shaped opening lever 31 is pivoted externally on the wall 20 of the body 16 (Figure 1) about an axis orthogonal to the wall 20, and is connected by means of an operating link 34 to an inner handle 35, of a known type, capable of opening the lock 10 from the inside and mounted movably on a finishing element 36 fixed, in use, to the inner panel 5 of the door 2.

[0022] According to an important aspect of the present invention, the system 1 also comprises a guide element 40 for a movable window 41 of the door 2, and means 42 of snap-fitting the plate element 22 of the casing 11 of the lock 10 to the guide element 40 to form a pre-assembled functional unit.

[0023] With particular reference to Figures 1-5, the guide element 40 is in the shape of an elongated box with a C-shaped cross section and forms a seat 43 for engaging a lateral edge of the window 41.

[0024] More precisely, the guide element 40 has a flat base wall 44 with an elongate rectangular profile, from whose longitudinal edges lateral walls 45a, 45b, which face each other, project orthogonally.

[0025] The guide element 40 is fixed to the casing 11 in an operating position (Figures 1-5, 7) in which it is located with its base wall 44 in contact with the plate element 22 and extends predominantly in a direction A parallel to the wall 19 and to the plate element 22. In particular, in the aforesaid operating position, the terminal portions 46, 47 of the guide element 40 project from opposite sides of the body 15 and of the plate element 22. The lateral walls 45a, 45b, of which the wall 45a is located adjacent to the wall 19 of the body 16, extend for the most part parallel to each other and to the wall 19, and diverge at a free end of the terminal portion 47, forming a receiving section for the insertion of the window 41.

[0026] The connection means 42 (Figures 4 and 5) comprise a pair of plates 48 of flat elongate rectangular shape, projecting externally in an intermediate position from the corresponding lateral walls 45a, 45b of the guide element 40 essentially on the extension of the base wall 44, and two pairs of retaining teeth 49 projecting from the plate element 22, each pair interacting with a corresponding plate 48.

[0027] More precisely, the teeth 49 of each pair are located in alignment with each other in a direction parallel to the direction A, and face the corresponding teeth 49 of the other pair.

[0028] With particular reference to Figure 5, each tooth 49 essentially has a profile in the form of an inverted L and comprises a base portion 50 extending from the plate element 22 and a retaining portion 51, projecting from one side of the base portion 50 and delimited towards the plate element 22 by a side piece 52 parallel to and facing the plate element 22, and on the other side by an oblique side piece 53 converging towards the side piece 52.

[0029] In use, the side pieces 52 of the teeth 49, together with the corresponding base portions 50 and the plate element 22, form retaining seats for the corresponding plates 48 of the guide element 40.

[0030] With reference to Figures 1-3, the guide element 40 also has a first and a second appendage 54, 55 projecting from terminal portions 46, 47 respectively of the base wall 44.

[0031] In particular, the appendage 54 consists of an essentially parallelepipedal block, one face of which is formed by a corresponding end portion of the base wall 44. The appendage 54 also has a threaded through hole (not visible in the attached figures) having an axis orthogonal to the base wall 44 of the guide element 40 and capable of being engaged, when in use, by a screw 56 connecting the appendage 54 to the end portion 9 of the inner panel 5.

[0032] The appendage 55 is essentially L-shaped and comprises a first arm 57 extending orthogonally from the base wall 44 and a second arm 58 in the form of a plate projecting orthogonally from one end of the arm 57 opposite the base wall 44 and lying, when in use, on the end portion 9 of the inner panel 5.

[0033] Finally, the guide element 40 has an essentially U-shaped half-shell element 60 with a profile in the form of an arc of a circle, which projects from the lateral wall 45 in the same direction as, and in a position facing, the arm 58 of the appendage 55, and is convex towards the arm 58.

[0034] Advantageously, the half-shell element 60 forms a retaining seat for a key unit 62 forming part of the system 1 and connected for operation to the lock 10.

[0035] With reference to Figures 7-9, the key unit 62 comprises a casing 63 in the form of a cylindrical cup fitted in engagement within the half-shell element 60 with one of its axes B orthogonal to the wall 19 of the body 16 of the casing 11, and an externally cylindrical key block 64 which is housed coaxially within the casing 63 in such a way that it can move with respect to the latter, is connected for operation to the opening and security levers 30, 32 to cause their operation, and projects partially from the casing 63 with an end portion which, when in use, engages in a through hole (not visible in the attached figures) formed in the outer panel 4 of the door 2.

[0036] The casing 63 comprises a discoid end wall 66 and a cylindrical lateral wall 67 projecting from a perimetric edge of the end wall 66. In particular, the casing 63, when in use, is housed completely within the compartment 6 of the door 2, is partially engaged, in the proximity of the end wall 66, within the half-shell element 60, and carries, at its opposite end, an annular flange 70 which, when in use, can be placed in a position where it bears against the outer panel 4 of the door 2.

[0037] The casing 63 is provided with an integral fixing element 71 of essentially parallelepipedal shape, extending radially outwards from the lateral wall 67 and capable of being connected rigidly to the end portion 9 of the inner panel 5 by means of a screw 72. In particular, the fixing element 71 extends from the casing 63 until its end face comes into contact with the arm 58 of the appendage 55 of the guide element 40, on which it rests, and has a threaded hole 73 having its axis orthogonal to the direction A and to the axis B and capable of being engaged by the screw 72.

[0038] More precisely, the screw 72 engages in a through hole 74, having the axis B, made in the end portion 9 of the inner panel 5 of the door 2, and a through slot 75 formed in the arm 58 of the appendage 55 of the guide element 40, providing a degree of play of the screw 72 in the direction parallel to the axis B, and having the function of enabling the axial position of the key unit 62 to be adjusted with respect to the guide element 40 and to the door 2.

[0039] With particular reference to Figures 8 and 9, the key block 64 comprises a push-in element 76 in the form of a cylindrical cup, engaging the casing 63 in an axially movable way and in an angularly fixed position, and connected for operation to the opening lever 30, and a key cylinder 77 engaging in an axially fixed position the push-in element 76, forming a seat 78 for engaging an operating key (not illustrated) and connected for operation to the security lever 32.

[0040] The key cylinder 77 is connected angularly to the push-in element 76 in a selectively releasable way, and can be released angularly from the push-in element 76 as a result of the interaction with the operating key. For this purpose, the key cylinder 77 carries a plurality of engagement elements 79 (which are known and are only partially illustrated in Figure 8), which are normally pushed by corresponding springs (not illustrated) into a position of connection (Figure 8) to a radial groove 80 of the push-in element 76, thus making the key cylinder 77 and the push-in element 76 angularly integral with each other, and are selectively releasable from the groove 80 by the effect of the interaction with the outer profile of the operating key.

[0041] The push-in element 76 is axially loaded by a cylindrical coil spring 81 housed inside the casing 63 and interposed between the end wall 66 and an end wall of the push-in element 76. The axial extraction of the push-in element 76 from the casing 63 is prevented by means of a cylindrical pin 82 projecting radially inward from the lateral wall 67 of the casing 63 and engaging in a slot 83 formed in a lateral wall of the push-in element 76 and elongated in a direction parallel to the axis B. In the absence of external actuation, the push-in element 76 is pushed by the spring 81 into a protruding rest position (Figure 9) in which it projects partially from the casing 63, engaging in the corresponding hole of the outer panel 4 of the door 2, and is retained within the casing 63 by the contact between the pin 82 and an end of the slot 83 adjacent to the spring 81.

[0042] The push-in element 76 also has an outer radial projection 84, which engages slidably in an elongate slot 85 formed in the lateral wall 67 of the casing 63 and extending in a direction parallel to the axis B, and is capable of interacting with, and imparting a force to, a lever mechanism 86 for operating the opening lever 30.

[0043] In particular, the lever mechanism 86 (Figure 3) comprises a lever 87 having an intermediate portion 88 pivoted on an appendage of the body 15, and two arms 89, 90 extending radially from the intermediate portion 88; one of these arms (89) is connected by a link 91 to the end portion 30a of the opening lever 30, while the other arm (90) is L-shaped and is moved by the pressure of the projection 84.

[0044] The push-in element 76 (Figure 7-9) is movable axially against the action of the spring 81 from the protruding rest position to a retracted position in which it moves the opening lever 30 by means of the lever mechanism 86.

[0045] The key cylinder 77 also has an external radial

projection 92, which is engaged slidably in a first circumferential slot 93 formed in the lateral wall of the push-in element 76, and an essentially T-shaped second slot 94, formed in the lateral wall 67 of the casing 63 and having a first portion 95 in the form of an arc of a circle, superimposed on the slot 93 in the protruding rest position of the push-in element 76, and a second rectilinear portion 96 parallel to the axis B.

[0046] The projection 92 is connected by a link 100 to the end portion 32a of the security lever 32, in such a way that a rotation of the key cylinder 77, by means of the key, with respect to the push-in element 76 about the axis B corresponds to an operation of the security lever 32.

[0047] The operation of the system 1 in respect of its operating components, in other words the lock 10 and the key unit 62, is known and therefore will not be described.

[0048] The assembly of the system 1 and its fixing inside the compartment 6 of the door 2 are carried out in the following way.

[0049] First of all, the guide element 40 is placed with its base wall 44 facing the plate element 22 of the previously assembled casing 11, is moved in a direction orthogonal to the plate element 22, until the lateral plates 48 are snap-fitted to the corresponding teeth 49. Alternatively, the aforesaid connection could be made by sliding the guide element 40 along the plate element 22 until the plates 48 are brought into engagement between the retaining portions 51 of the corresponding teeth 49 and the plate element 22.

[0050] The key unit 62 is then snap-fitted into the half-shell element 60. In particular, the casing 63 of the key unit 62 engages the half-shell element 60 with a portion of its lateral wall 67 lying between the end wall 66 and the area from which the fixing element 71 extends. At this stage, the axial positioning of the key unit 62 with respect to the lock 10 and to the guide element 40 is completed, care being taken to locate the projection 84 of the push-in element 76 on the opposite side of the arm 90 of the lever 87 from the half-shell element 60, the fixing element 71 being brought into contact with the arm 58 of the appendage 55 in such a way as to position the hole 73 and the slot 75 next to each other.

[0051] The support of the key unit 62 during the mounting of the system 1 in the compartment 6 of the door 2 is therefore provided by the half-shell element 60 and by the arm 58 of the appendage 55 of the guide element 40.

[0052] Because of the presence of the slot 75, small axial movements to adjust the position of the key unit 62 with respect to the guide element 40 and to the door 2 can still be carried out at the stage of fixing the system 1 to the door 2.

[0053] At this point, the projection 92 of the key cylinder 77 is connected to the end portion 32a of the security lever 32, and an arm of the opening lever 31 is connected to the handle 35 by means of the link 34.

[0054] The system 1 assembled in this way is then inserted into the compartment 6 of the door 2 and fixed by the screws 23, 56 and 72 to the end portion 9 of the inner panel 5. At this stage, the flange 70 of the casing 63 of the key unit 62 is brought into contact with the outer panel 4 of the door 2 and the key block 64 is fitted through the corresponding hole in the outer panel 4.

[0055] An examination of the characteristics of the system 1 made according to the present invention will clearly reveal the advantages which it provides.

[0056] In particular, the guide element 40, the key unit 62 and the handle 35 are supported directly or indirectly by the casing 11 of the lock 10, which can be fixed to the door 2 in a very simple and rapid way. In other words, the lock 10 forms the reference point for the positioning of the various members forming part of the system 1. The operations of pre-assembling the system 1 and fixing it to the door 2 by means of the screws 23, 56 and 72 are therefore simplified.

[0057] Furthermore, the system 1 has a very low weight and very small dimensions, which facilitate its movement during assembly, while simultaneously making it possible for the dimensions of the aperture 7, made in the inner panel 5 of the door 2 to allow the system 1 to be inserted and fixed, to be kept unchanged from those used in the conventional solutions described previously.

[0058] Finally, the casing 63 of the key unit 62 is rigidly connected, when in use, to the end portion 9 of the door 2 and to the arm 58 by means of the fixing element 71 and its screw 72. This provides a significant obstacle to the forcing of the lock 10 by the rigid rotation of the key unit 62 about itself, a problem frequently encountered in doors of known types, in which the key unit is fixed to the outer panel of the door by a simple prismatic connection.

[0059] Finally, it is clear that modifications and variations can be made to the system 1 without departure from the scope of protection of the present invention.

Claims

1. Locking system (1) for a door (2) of a motor vehicle, comprising a lock (10), which in turn includes a supporting frame (11) and an opening and closing unit (12) fixed to the said supporting frame (11), characterized in that it also comprises at least one guide element (40) for a movable window (41) of the said door (2), and means (42) of direct connection between the said supporting frame (11) of the said lock (10) and the said guide element (40) to form a preassembled functional unit.

2. System according to Claim 1, characterized in that the said connection means (42) comprise first engagement means (48) carried by the said guide element (40) and second engagement means (49)

carried by a fixing wall (22) of the said supporting frame (11) and connectable to the said first engagement means (48).

3. System according to Claim 2, characterized in that the said first engagement means comprise a pair of plates (48) projecting from opposing lateral parts of the said guide element (40), and in that the said second engagement means comprise at least one pair of teeth (49) projecting from the said fixing wall (22) of the said supporting frame (11) and forming, with the fixing wall (22), retaining seats for the corresponding said plates (48).

4. System according to Claim 3, characterized in that each of the said teeth (49) essentially has a profile in the form of an inverted L, and comprises a base portion (50), extending from the said fixing wall (22) of the said supporting frame (11), and a retaining portion (51), projecting from one side of the said base portion (50).

5. System according to Claim 4, characterized in that the said retaining portion (51) of each of the said teeth (49) is delimited towards the said fixing wall (22) by a first side piece (52) parallel to and facing the fixing wall (22), and on the other side by an oblique second side piece (53) converging towards the said first side piece (52).

6. System according to any one of Claims 3 to 5, characterized in that the said guide element (40) has an elongated box shape with a C-shaped cross section, and comprises a base wall (44) and a pair of longitudinal lateral walls (45a, 45b) facing each other, the said plates (48) projecting from the corresponding said lateral walls (45a, 45b) essentially in the plane of the said base wall (44).

7. System according to any one of the preceding claims, characterized in that the said guide element (40) comprises a first external appendage (54) which can be rigidly connected, when in use, to the said door (2).

8. System according to any one of the preceding claims, characterized in that it comprises a key unit (62) connected for operation to the said lock (10), and means (60) of supporting the said key unit (62), carried by the said guide element (40).

9. System according to Claim 8, characterized in that the said key unit (62) comprises an external cylindrical casing (63) and a key block (64) housed movably inside the said casing (63) and connected for operation to the said opening and closing unit (12) of the said lock (10), the said support means comprising a half-shell element (60) projecting laterally from the said guide element (40) and forming a retaining seat for the said casing (63) of the said key unit (62).

10. System according to Claim 9, characterized in that the said casing (63) of the said key unit (62) comprises a fixing element (71) which can be rigidly connected to the said door (2).

11. System according to Claim 10, characterized in that the said fixing element (71) extends radially from the said casing (63) of the said key unit (62) and has a threaded hole (73) which can be engaged by a screw (72) for connection to the said door (2).

12. System according to Claim 11, characterized in that the said guide element (40) comprises a second external appendage (55) having a plate portion (58) which can be interposed, when in use, between the said fixing element (71) and the said door (2), and which is provided with a through slot (75) which can be engaged, when in use, by the said screw (72) for connection to the door (2) and which provides, with respect to the screw (72), a degree of play in a direction parallel to the axis (B) of the said key unit (62).

13. System according to any one of the preceding claims, characterized in that it comprises at least one opening handle (35) connected to the said opening and closing unit (12) of the said lock (12) by means of a link (34) and capable of being fixed, when in use, to an inner panel (5) of the said door (2).

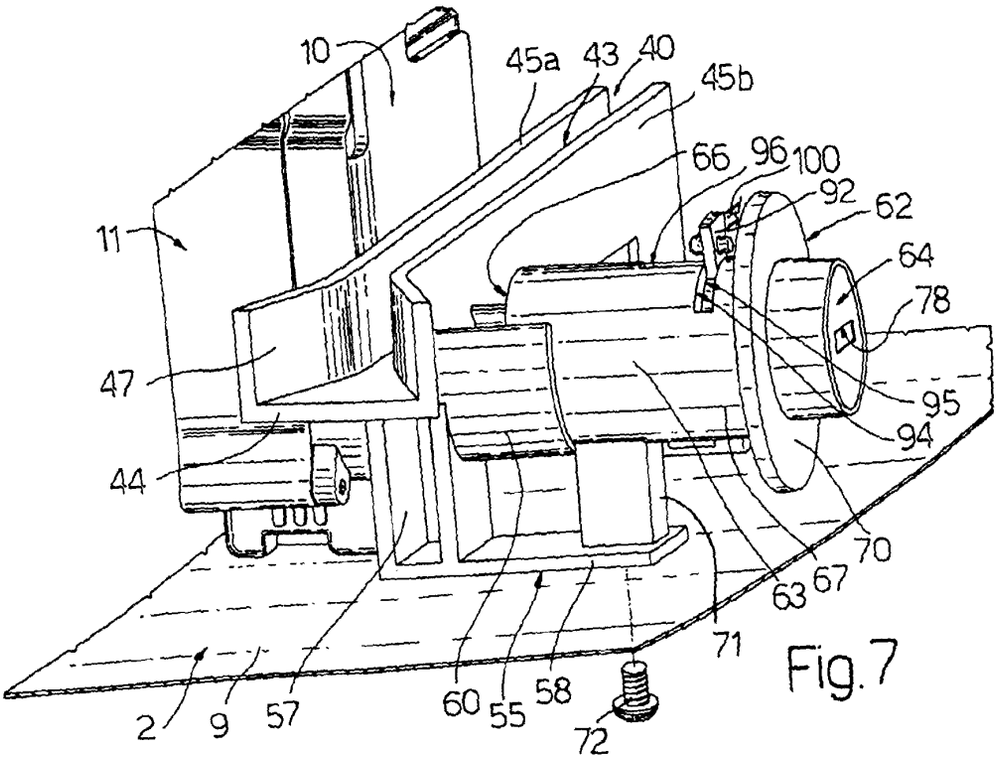
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Fig.7

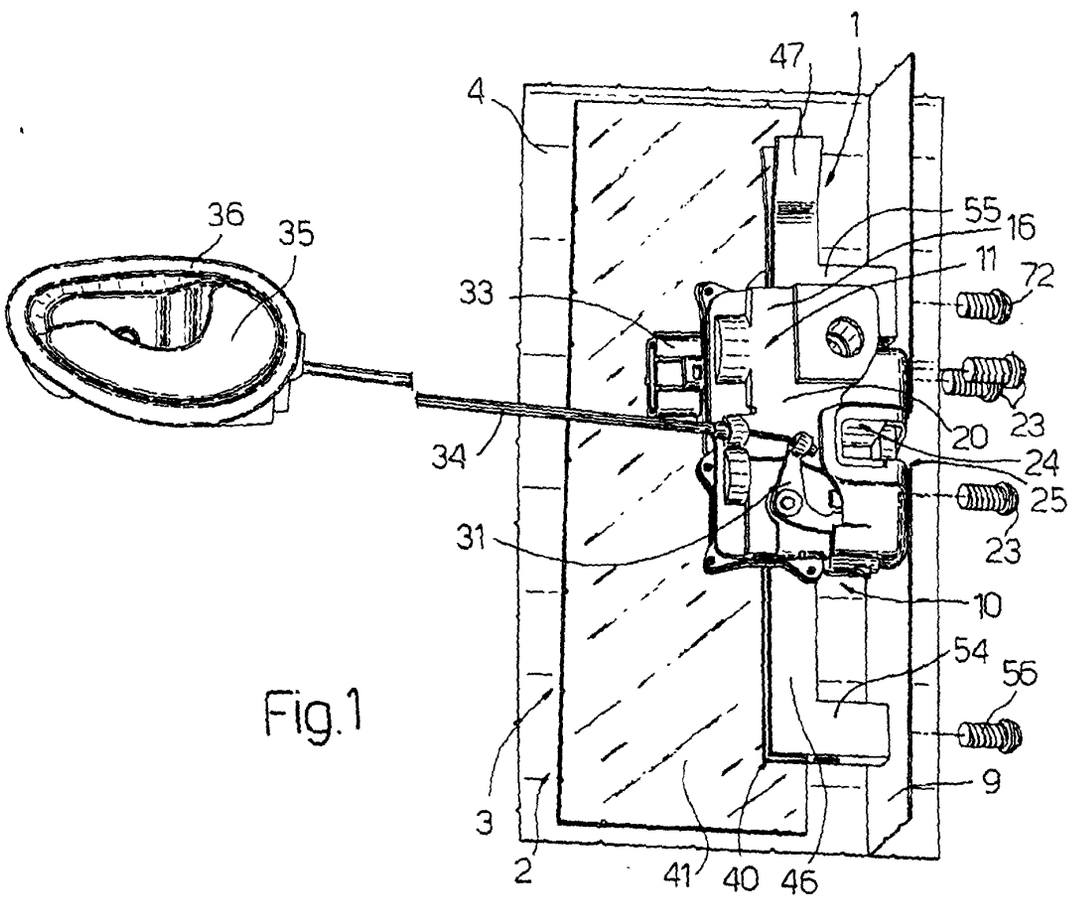
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Fig.1

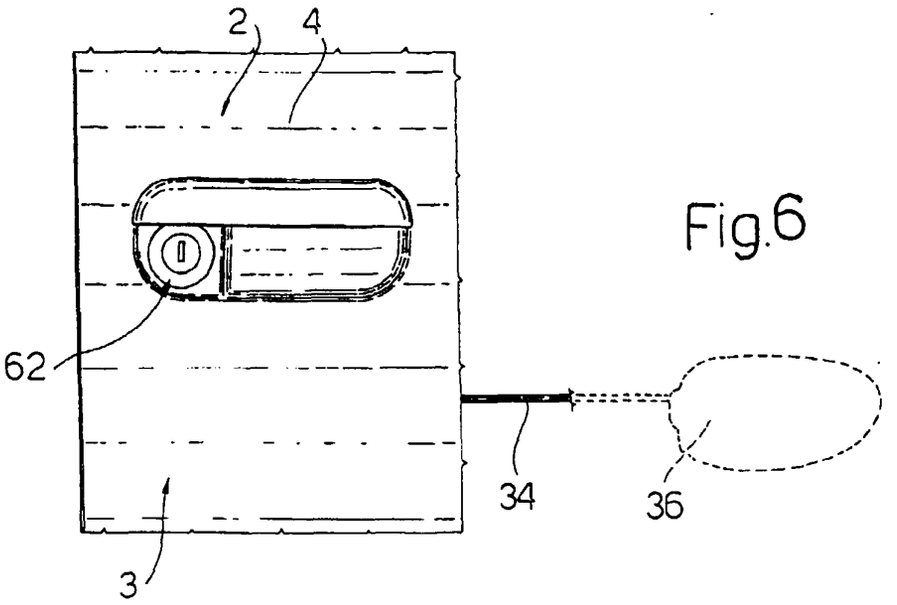
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Fig.6

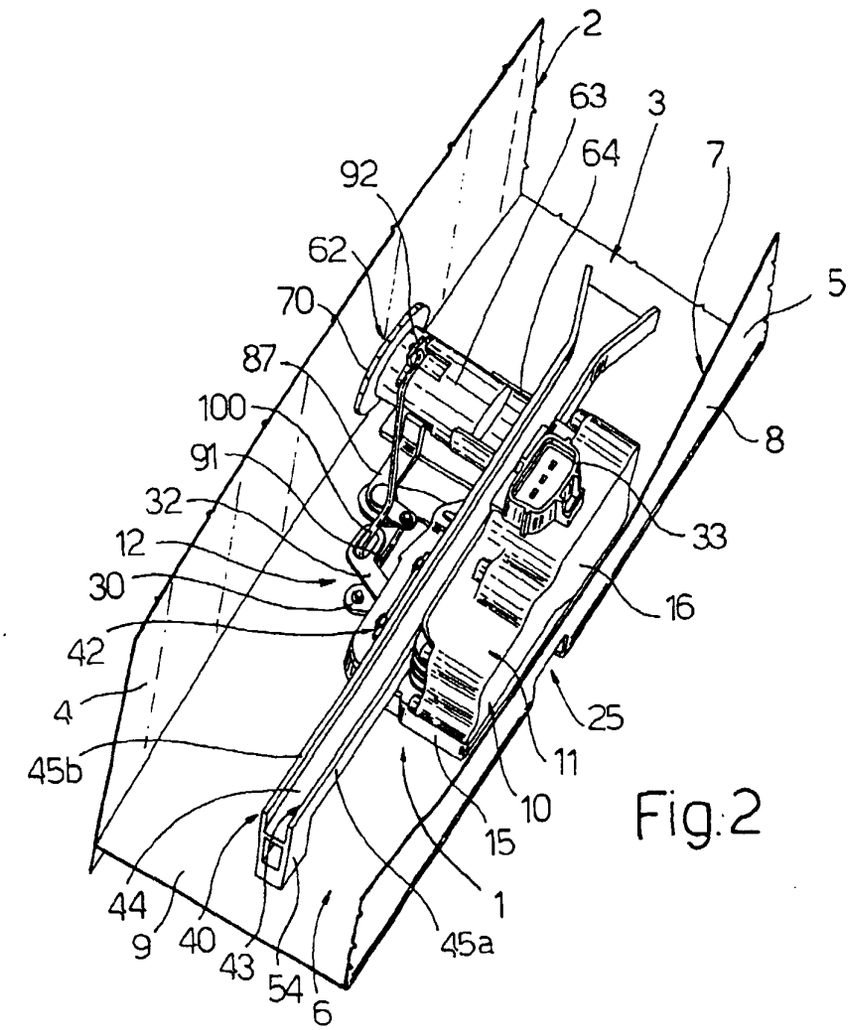
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Fig.2

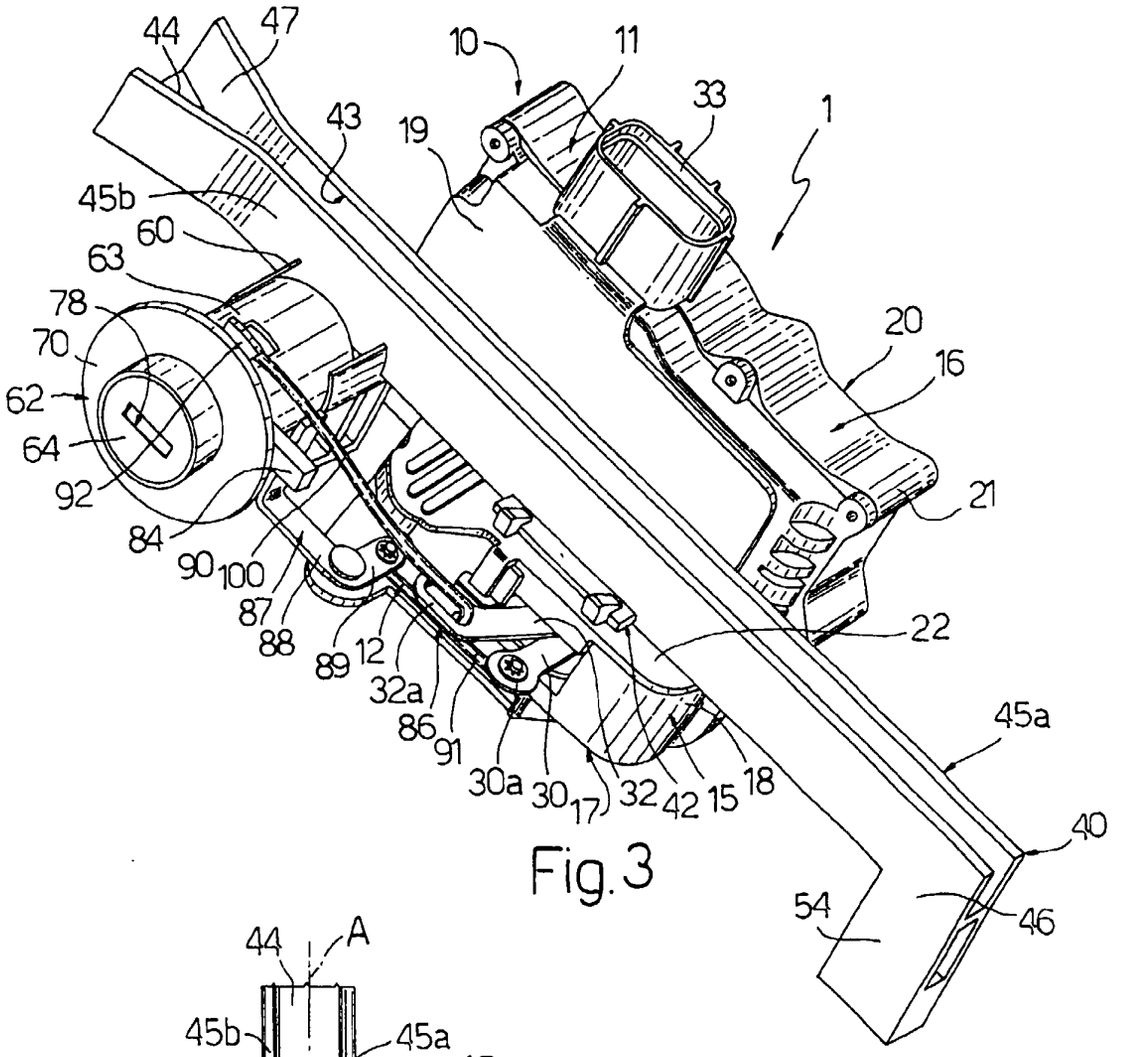

Fig.3

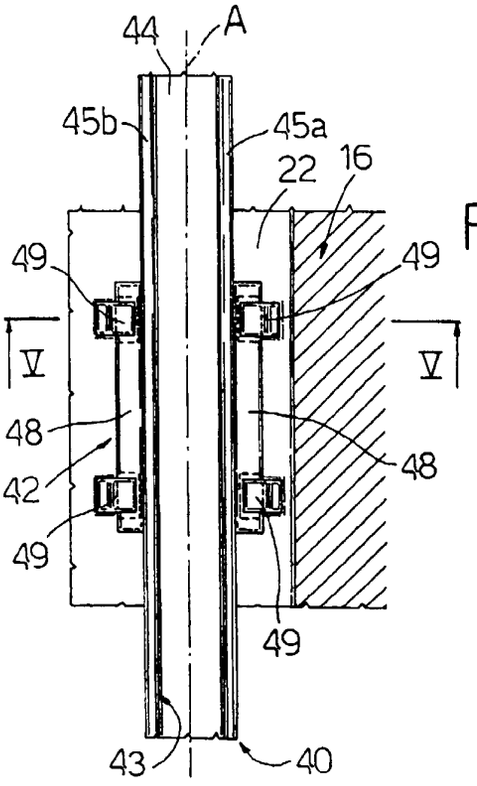

Fig.4

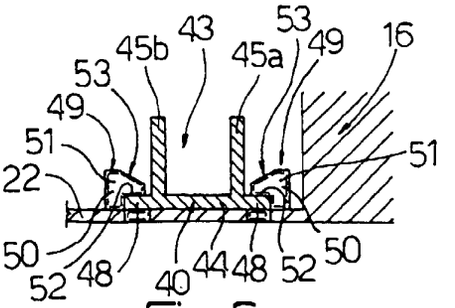

Fig.5

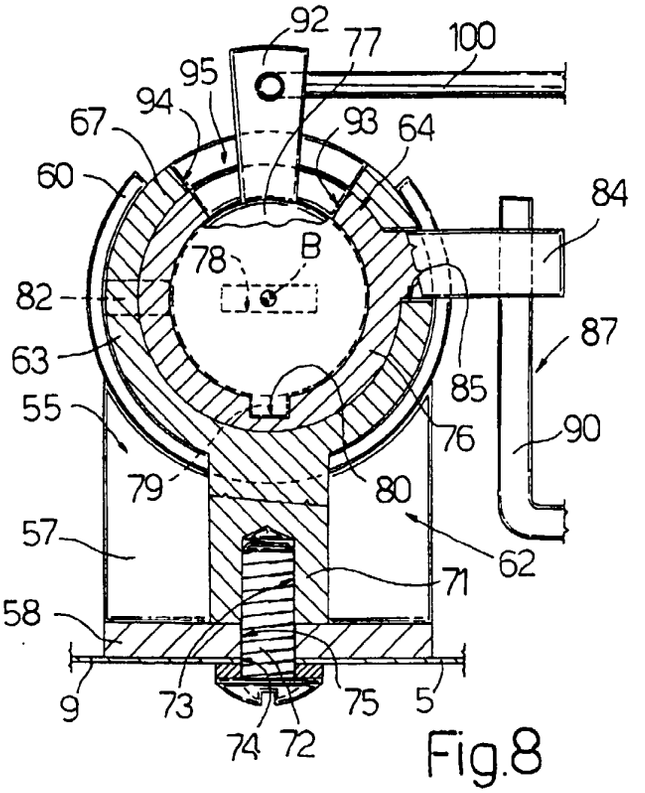
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Fig.8

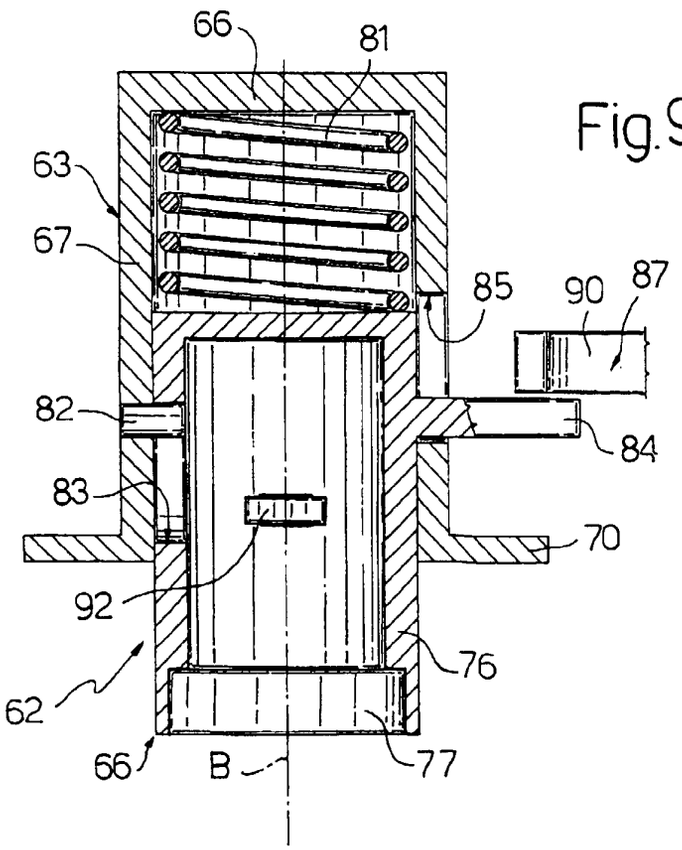
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Fig.9

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 12 8023

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Place of search	Date of completion of the search	Examiner
THE HAGUE	15 March 2001	Pieracci, A

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