(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 894 925 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
03.02.1999 Bulletin 1999/05

(51) Int. Cl.[6]: **E05B 65/32**, E05B 65/20

(21) Application number: **98114296.1**

(22) Date of filing: **30.07.1998**

(84) Designated Contracting States:
AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU MC NL PT SE
Designated Extension States:
AL LT LV MK RO SI

(30) Priority: **31.07.1997 IT TO970690**

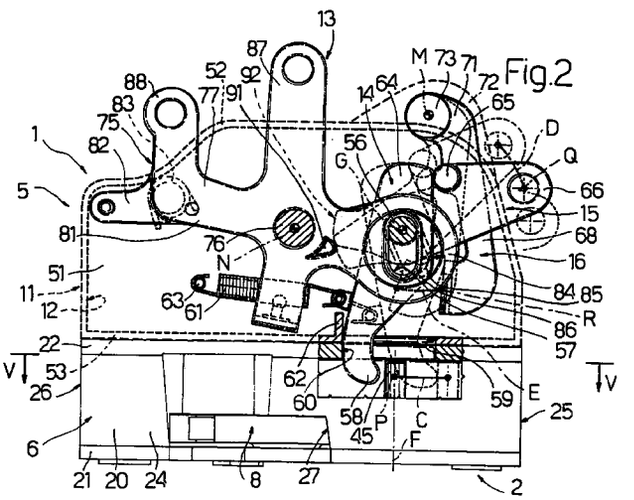
(71) Applicant: **ATOMA ROLTRA S.p.A.**
86077 Pozzilli (IS) (IT)

(72) Inventor:
Ottino, Franco Giovanni
56017 San Giuliano Terme (IT)

(74) Representative:
Cerbaro, Elena et al
STUDIO TORTA S.r.l.,
Via Viotti, 9
10121 Torino (IT)

(54) Lock for a motor vehicle door

(57) Lock (1) for a motor vehicle door comprising a closure mechanism (8) arranged to couple with a striker (4) and provided with a fork (9) and a stop (10) arranged to couple with the fork (9) itself to lock it in a releasable manner in a complete closure position on the striker, and an actuation mechanism (13) arranged to cooperate with the closure mechanism (8) according to an operational point (P) of the stop (10) to displace in unidirectional manner the operating point (P) itself along an opening stroke (C) and define the decoupling of the stop (10) from the fork (9); the actuating mechanism (13) is provided with an internal control lever (15) and an external control lever (16) having relative operational points (Q, R), which can connect with relevant handles, internal and external respectively, of the door and moving along a first and respectively a second control stroke (D, E) to displace the operating point (P) of the stop (10) along the opening stroke (C); the first and second control stroke (D, E) have respective lengths comprised between 80% and 120% of the length of the opening stroke (C).



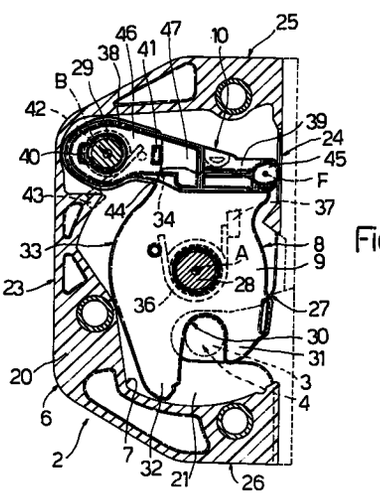


Fig.5

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Description

[0001] The present invention relates to a lock for a motor vehicle door.

[0002] As it is known, locks for motor vehicles generally comprise a closure mechanism arranged to couple with the striker and provided with a fork moveable between a complete opening operational position and an operational closure position on the said striker, and a stop arranged to couple with the fork to lock in a releasable manner the fork in the complete operating closure position. Such locks comprise among others, an actuating mechanism arranged to operate with the closure mechanism in relation with an operating point of the stop to displace in unidirectional manner the operating point itself along an opening stroke and to determine the decoupling of the stop from the fork and the opening of the lock; the operating mechanism comprises essentially an internal control lever and external control lever having relative operating points which can connect with relative handles, respectively internal and external, on the door and moving along a first and respectively a second control stroke to displace the operating point of the stop along the opening stroke.

[0003] For safety reasons, and in particular to prevent the opening of the motor vehicle doors in the event of incident, the fork and the stop are made of structurally very resistant materials, and have respective reciprocal coupling surfaces of such dimensions as to require a relatively high release load for their disengagement with an hook stroke of relatively short length.

[0004] In addition, for ergonomic reasons and in particular in order to require low intensity manual forces of the internal and external handles on each door, the control stroke of the operating points of the internal and external control levers have a relatively extended length of stroke and form a design requirement established by the motor car manufacturers.

[0005] In consequence, in the known locks, the demultiplication of the length of strokes of the various levers according to the order of operation during the opening stage of the lock (of the internal and external control levers up to the stop and the fork), which for the purpose of the principle of energy conservation comply with a multiplication of the intensity of the loads reacting on the levers. Such demultiplication of stroke length is generally distributed partly among the operating mechanism and partly among the closure mechanism, ensuring suitable dimensions for the arms of the various levers.

[0006] As observed experimentally by the applicant, the distribution of the demultiplication throughout the length of stroke among the closure and the operating mechanisms, defines a low lock yield, in that the levers successively actuated during the course of the opening operation, are subjected to progressively arising and relatively high loads, which determine the wear loads which are also relatively high.

[0007] Also, such a constraints system imposed by the closure and operating mechanisms requires the use of structurally resistant levers, which necessarily determine a relatively high overall weight for such locks.

[0008] The purpose of the present invention is to achieve a lock for a motor vehicle door, which will allow in a simple and economical manner to obviate the disadvantages connected with the known locks specified above.

[0009] The said purpose is achieved with this invention, in that it is relative to a motor vehicle door lock comprising:

- a closure mechanism arranged to couple with a striker and provided with a fork moving between an operating opening position and at least a complete closure operating position on the said striker, and a stop arranged to couple with the said fork to lock the fork in a releasable manner in the said complete closure operating position; and
- an operating mechanism arranged to cooperate with the said closure mechanism in conjunction with an operating point of the said stop to displace in unidirectional manner the operating point itself along an opening stroke and to determine the decoupling of the said stop from the said fork and the opening of the said lock, the said operating mechanism comprising an internal control lever and an external control lever having relative operating points connectable with relative handles, respectively inside and outside on the door and moving along a first and respectively a second control stroke to displace the operating point from the said stop along the said opening stroke,

characterized by the fact that the said first and second control strokes have respective length comprised between 80% and 120% of the length of the said opening stroke.

[0010] For a better understanding of the present invention a preferred form of construction is described below, exclusively as a non-restrictive example and with reference to the appended drawings, wherein:

- Fig. 1 is an exploded perspective view of a modular type lock for a motor vehicle constructed according to the present invention;
- Fig. 2 is a lateral view, in part section and on an enlarged scale, of the lock in figure 1 in a first operating configuration and with parts removed for greater clarity;
- Fig. 3 is a lateral view, in part section and on an enlarged scale, of the lock in figure 1 in a second operating configuration and with parts removed for greater clarity;
- Fig. 4 is a plan view from the top in part section of the lock in figure 2, with parts removed for greater clarity;
- Fig. 5 is a section along line V-V in figure 2, with

parts removed for greater clarity; and

- Fig. 6 is a perspective view on an enlarged scale, of an operating mechanism of the lock in figure 1, with parts removed for greater clarity.

[0011] With reference to figures 1 to 4 the assembly indicated by reference 1 is a lock for a motor vehicle door (not illustrated).

[0012] The lock 1 is of the modular type and comprises essentially a closure module 2 and an operating module 5, allowing assembly to form an integrated unit.

[0013] The closure module 2 is designed for securing to the aforesaid door and to cooperate with a cylindrical portion 3 of a fixed striker 4 integral with an upright (not shown) of the door and diagrammatically represented by the dotted line in figure 5.

[0014] With reference to figures 1 to 5, the closure module 2 comprises essentially a housing 6 arranged to be secured to the door and internally defining an aperture 7, and a closure mechanism 8 housed within the aperture 7 and comprising in turn, a fork 9, moving between an operating opening position and a complete closure operating position (Fig. 5) on the portion 3 of striker 4, and a stop 10 arranged to spring couple with the fork 9 to lock it in a releasable manner respectively in the complete closure position and in a part closure position, or "first notch" (not illustrated), in an intermediate position between the opening and complete closure positions.

[0015] The actuation module 5 essentially comprises a casing 11 coupled with casing 6 and internally defining an aperture 12, and an actuating mechanism 13 housed within the aperture 12 and having a transmission lever 14 arranged to cooperate with the closure mechanism 8 in accordance with an operating point P of the stop 10 to displace in unidirectional manner the operating point P itself along the opening stroke C and determine the decoupling of the stop 10 from the fork 9 and the opening of the lock 1; the actuating mechanism 13 comprises in addition, an internal control lever 15 and an external control lever 16 cooperating with lever 14 and presenting respective actuation points Q, R connectable to various handles (not illustrated), respectively internal and external, on the door and moving along a first and respectively a second control stroke D, E to displace the operating point P of the stop 10 along the opening stroke C.

[0016] According to the invention the respective lengths of control strokes D, E are comprised between 80% and 120% of the length of the opening stroke C; the control strokes D, E will preferably be of a length equal to the length of stroke of aperture C.

[0017] With particular reference to figures 1 and 5, the casing 6 of the closure module 2 is of prismatic form and has a reduced thickness in relation to other dimensions. The casing 6 has a sandwich-type structure and is made up of an intermediate shell 20 made of plastic material and a pair of metal base plates 21, 22 of polygonal form, mounted on opposing parts upon the shell 20 and thereby demarcating the aperture 7. The shell 20 has a pair of flat longitudinal sides 23, 24 parallel with each other and extending in service in a vertical direction, and a pair of sides 25, 26 having a broken line profile, connecting together the sides 23 and 24; more particularly, in service the side 25 is located above side 26.

[0018] The casing 6 also has a lateral aperture 27 arranged to admit the ingress of portion 3 of the striker 4 into the aperture 7, recessed more particularly in side 24 of the shell 20 and in the plate 21.

[0019] The fork 9 and the stop 10 are hinged about respective fixed pins 28, 29 integrally carried between the plates 21, 22 inside the aperture 7 and having respective axes A, B parallel with each other and orthogonal in relation to the plates 21, 22.

[0020] The fork 9 consists of a moulded metal plate coated with plastic material and essentially parallel with plates 21, 22 and hinged to correspond with an intermediate portion about the pin 28 and house a peripheral seat 30 in position C suitable to receive the portion 3 of the striker 4 and laterally demarcated by a pair of teeth 31, 32. The fork 9 also has along one of its peripheral edges 33 and on the part away from the seat 30 a pair of shoulders 34, 35 arranged to provide spring cooperation with the stop 10, as will be explained in detail below.

[0021] The fork 9 can pivot about axis A between the opening position (not illustrated) in which the seat 30 is turned towards the aperture 27 of the casing 6 and thus allow the release of portion 3 of the striker 4 from the closure mechanism 2 and the complete closure position (Fig. 5), in which portion 3 of the striker 4 is locked into the seat 30 and the tooth 31 intercepts in a known manner the aperture 27 preventing it from escaping; the fork 9 is also pushed in a known manner towards the opening position by a spring 36 wound about the pin 28 and secured to the fork 9 and to a portion 37 of the casing 6, as indicated in dotted lines in Fig. 5.

[0022] The stop 30 comprises a metal engaging component 38, hinged about the pin 29 and arranged to cooperate in snap-like manner with the shoulders 34, 35 of the fork 9, and an actuating arm 39 made of plastic material, cooperating with the transmission lever 14 to correspond with actuating point P, this also hinged about pin 29 and coupled at an angle to the engaging component 38 by means of a pair of keying components 40, 41. The stop 10 is also pushed towards the fork 9 by a spring 42 wound around the pin 29 and secured to the stop 10 itself and to a portion 43 of the casing 6, as indicated in the dotted line figure 5.

[0023] In particular the engaging component 38 consists of a plate essentially coplanar with the fork 9 and has an L-shaped end edge 44 arranged to couple in a snap-like manner with the shoulders 34, 35 to lock the fork 9 in a releasable manner respectively in the complete closure and in the part closure positions.

[0024] The actuating arm 39 is of elongated shape in

a direction transverse to axis B of pin 29 and to the sides 23, 24 of the shell 20, and displaced in superimposition on the engaging component 38 to extend over the full width of the casing 6 between the sides 23, 24. More particularly, the actuating arm 39 has in the direction of maximum extension, a length essentially equal to twice the length of the engaging component 38 in the same direction; the actuating arm 39 is hinged about the pin 29 to correspond with an end adjacent to the side 23 and carries a projection corresponding with an opposing end adjacent to side 24, a projection 45 having an axis F parallel with axes A, B arranged to cooperate with transmission lever 14 and defining, with the tracing of the axis F on a plane orthogonal with axis F itself, the said operating point P.

[0025] The actuating arm 39 also has a first portion 46 hinged about the pin 29 and placed in superimposition and in contact with the engaging component 38, and a second portion 47 projecting longitudinally in relation to the engaging component 38, carrying the projection 45 and located in a staggered position in relation to the fork 9 in a direction parallel with axes A, B so as to avoid interfering with the rotation of the fork 9.

[0026] According to a preferred characteristic of the lock 1, in each of the part and complete closure positions of the fork 9, the distance between the relative rest points 34, 35 and the axis B of pin 29 of the stop 10 is essentially equal to twice the length of the arm of the thrust force applied by transmission lever 14 to the projection 45 in relation to axis B itself, or of the distance between axes B and F.

[0027] According to another preferred characteristic of the lock 1, the distance between each rest point 34, 35 and the axis A of the pin 28 is essentially equal to twice the length of the arm of the reaction force of portion 3 of the striker 4 upon the fork 9 in relation to axis A.

[0028] According to a further preferred characteristic of the lock 1, in service, the stop 10 is placed above the fork 9 and extends in a position adjacent to the side 25 of the shell 20, in such a way that, in the event of failure of the spring 42, the stop 10 is nevertheless maintained engaged with the fork 9 by the force of gravity; in addition, the fork in the part and complete closure positions has a displaced centre of gravity in relation to axis A of pin 28 in such a way that the action of the force of gravity tends to move the fork 9 itself towards its opening position.

[0029] With reference to figures 1 to 4, the casing 11 of the actuation module 5 has an essentially prismatic structure and similarly to the casing 6, is of a reduced thickness in relation to the other dimensions. The casing 11 advantageously made of plastic material, is a defined by two base walls 50, 51, essentially parallel with each other and a side wall 52 consisting essentially of a flat longitudinal side 53, of two flat transverse sides 54a, 54b extending in orthogonal manner from the respective opposing ends of the side 53, and from a moulded side 55 facing away from side 53 and connected to the opposing ends of sides 54a, 54b.

[0030] When the lock 1 is assembled, the casing 11 is knife-edge placed on the casing 6 with its side 53 in contact with the plate 22, and extending in proximity of and along the whole length of the side 23 of the shell 20.

[0031] With reference to figures 2, 3, 4 and 6 the transmission lever 14 has an extended shape and is essentially flat, conveniently made of plastic material, essentially placed parallel with the walls 50, 51 and extending transversely to the side 53 of the case 11 and the plate 22.

[0032] The lever 14 has an intermediate longitudinal passing slot 57, closed on the inside of one edge 86 in relief in relation to the face of the lever 14 turned towards the wall 50. The slot 57 is engaged by a fixed pin 56, integrally carried between the walls 50 and 51 and having an axis G orthogonal to the walls 53, 51 and to axes A, B.

[0033] Lever 14 also has an engaging end portion 58, when the lock 1 is assembled, respective passing apertures 59, 50 coaxial with each other, of which a first (59) is formed in the side 53 of the casing 11, whereas the other (60) is formed in the plate 22 of the casing 6 and faces the projection 45 of the stop 10; the portion 58 of lever 14 is arranged to cooperate by thrust with the projection 45, and thus the actuating point P, to move it along the opening stroke C.

[0034] Lever 14 moves parallel to reference plane π orthogonal to axis G, parallel with axes A, B and defined by the walls 50 of casing 11; more precisely, the lever 14 is arranged to rotate about axis G between the limits imposed by the dimensions of the apertures 59, 60 imposed by portion 58, and is arranged to move longitudinally in a transverse direction to axis G, between the limits imposed by the dimensions of the slot 57, from an advanced position in which it is arranged with portion 58 projecting from the casing 11 inside casing 6 and in line with the projection 45 and a withdrawn position in which portion 58 does not project inside the casing 6 and is thus out of line with the projection 45.

[0035] The lever 14 is held by traction spring 61 in a rest position (Figs. 2 and 3), which presents its portion 58 located to bear against a stop component 62 integral with casing 11 and extending transversely to the side 53 towards the inside of the casing 11 as from a side edge of the aperture 59; in particular the spring 61 has an axis transverse to the sides 54a,54b of the casing 11 and to the direction of extension of the lever 14 and is secured at one end to a pin 63 and carried to project from the wall 50 and to an end opposing the lever 14 in close proximity to portion 58.

[0036] Finally lever 14 has a projecting end 64 from its opposing end to portion 58 and arranged to cooperate with the internal and external control levers 15, 16 respectively, as is explained in detail below; more specifically, the end 64 projects from one face of the lever 14 turned towards the wall 51.

[0037] The internal control lever 15, suitably made of

plastic material, is essentially flat, hinged about pin 56, located essentially parallel with the walls 50,51 and lever 14 and extends transversely to lever 14.

[0038] Lever 15 has an end portion 66 projecting externally from the casing 11 through a relative passing aperture 67 (Fig. 4), recessed in the side 54a, and arranged to be secured to a tie-rod (known and not illustrated) connected with the internal door handle; in particular the portion 66 is hinged from the said tie-rod about an axis parallel with axes A, B, G, of which the trace on the position plane of lever 15 defines the aforesaid actuating point Q.

[0039] The lever 15 is retained by a conventional type spring not illustrated in a rest position, illustrated in Fig. 2 (continuous line), in which the portion 66 cooperates with one end of the aperture 67 turned towards the closure module 2.

[0040] The lever 15 will pivot about the pin 56 in parallel with the reference plane π and presents along the peripheral edge, a projection 65 arranged to cooperate by thrust with the end 64 to rotate the lever 14 about the pin 56.

[0041] The external control lever 16 is advantageously made of stamping and clipping sheet metal and comprises a main flat body 68 extending parallel with levers 14 and 15, on the edge opposing lever 15 as compared to lever 14 (Fig. 6), and in a transverse direction the side 53 of the casing 11.

[0042] The lever 16 is hinged from the casing 11, in conformity with an end 71 of the component 68, by way of a pin 73 carried in a projection 72 of the casing 11 opposite the side 53; the pin 73 has an axis M orthogonal with the walls 50, 51 and thereby the reference plane π.

[0043] Lever 16 comprises in addition an essentially flat arm 69, extending in orthogonal manner from one end of the body 68 opposing the end 71, projecting externally from the casing 11 through a passing aperture 70 (Fig. 1) of wall 51 and arranged to be secured to a tie-rod (known and not illustrated) connected with the external handle of the door; in particular the arm 69 is hinged from the said tie-rod about an orthogonal axis to the sides 54a, 54b of the casing 11, of which the track on the positioning plane of the arm 69 defines the aforesaid actuating point R.

[0044] The lever 16 presents in addition along a peripheral edge of the body 68, a rounded projection 74 arranged to cooperate by thrust with the end 64 of lever 14 to rotate it about axis G.

[0045] Lever 16 can pivot about axis M parallel with the reference plane π, and is normally maintained by a known type of spring not illustrated here and in a rest position, illustrated in Fig. 2 (continuous line), in which it cooperates with the side wall 52 of the casing 11.

[0046] The actuating mechanism 5 also comprises a safety lever 75, which hinges about a fixed pin rigidly held between the walls 50, 51 of the casing 11 and having an axis N orthogonal with the walls 50, 51 and thereby with reference plane π. The lever 75 will pivot about axis N in parallel with the reference plane p and is positioned by the opposing part of lever 14 as related to lever 15.

[0047] Lever 75 is made from clipping sheet metal and comprises a main body 77 essentially flat and hinged in an intermediate position, about the pin 76 and located parallel with walls 50, 51 on levers 14, 15 and the body 67 of lever 16.

[0048] Lever 75 comprises in addition an end arm 78 extending from the body 77 in orthogonal way as an overhang, to project from casing 11 through a passing aperture 79 recessed in wall 51, with a spherical node 80 end arranged to connect in service to a lever system (not shown) which can be controlled with a key from outside the motor vehicle.

[0049] In particular, the body 77 comprises a portion 81 extending in the transverse direction to the walls 54a, 54b of the casing 11 and having an end stretch 82 adjacent to the wall 54b and secured to a bistable spring 83 of known type anchored to the wall 50, and an opposing end stretch 84 complete with passing hole 85 engaging with a clearance from the edge 86 in relief from the lever 14.

[0050] From one side of portion 81, turned to the side 53 of casing 11, the arm 78 is extended, whereas from the opposing end extending in coplanar manner with portion 81, two arms 87, 88 of differing length, externally projecting from the casing 11 through respective apertures 89, 90 recessed in the side 55 of casing 11, and serving to connect to the safety connection knob respectively in the case in which the lock 1 is fitted on a front door of the motor vehicle or in the case where the lock 1 is mounted on a rear door of the motor vehicle.

[0051] The spring 83 is arranged to make stable two of the positions of the lever 75, respectively for enabling (Fig. 2, continuous line, and Fig. 3, dotted line) and for inhibition (Fig. 3, continuous line) of the opening of the lock 1.

[0052] In the enabling position or disconnected safety position, the lever 75 is slightly rotated in clockwise direction in Figs. 2 and 3, the end stretch 84 being slightly inclined towards the side 53 of the casing 11 and maintains as a result of the engagement with the edge 86 of the hole 85, the lever 14 in the correct advanced position; the angular stoppage of lever 75 is determined by contact with the edge 86, in turn bearing against the pin 56 which occupies an end portion of the slot 57.

[0053] In the inhibiting or connected safety position, the lever 75 is slightly rotated in anti-clockwise direction in Figs. 2 and 3, the end stretch 84 is slightly inclined towards the side 55 of the casing 11 and as a result of the engagement of the edge 86 into the hole 85, the lever 14 is retained in the withdrawn position; the angular immobilisation of lever 75 is also determined in this case by the contact with the edge 86, in turn bearing against the pin 56 which takes up an end position opposed to the button hole 57.

[0054] Finally, the lever 75 has a tooth 91 projecting out of the body 77 in the proximity of pin 76 and arranged to cooperate with the cam-end portion 92 of lever 15 opposing portion 66. In particular, in the enabling position of lever 75 and during the rotation of lever 15 at the pin 56, the portion 92 is arranged to cooperate with friction against the tooth 91 along the outer profile of the latter; vice versa, in the inhibition position of lever 75 and during the rotation of the lever 15, the portion 92 is arranged to intercept the tooth 91 and to exercise upon it a thrust action to rotate the lever 75 into the enabling position.

[0055] The operation of the lock 1 is described on the basis of the configuration in Fig. 2 (continuous line), in which the lock 1 is closed (portion 3 of the striker 4 is locked in the seat 30 of the fork 9, of which the rotation is prevented by the stop 10) and the safety is disconnected.

[0056] The opening of the lock 1 from the outside of the vehicle is achieved by means of the external control lever 16, together with the external handle of the door, as shown in Fig. 2. Clockwise rotation of lever 16 about axis M defines a thrust action of the projection 74 against the appendix 64 of lever 14 which is then rotated in anti-clockwise direction about pin 56; during the rotation of the lever 14 the portion 58 cooperates by spring action with the projection 45 of the actuating arm 39 of the stop 10, moving it along the opening stroke C and thus determining the rotation of the stop 10 about axis B in anti-clockwise direction as in Fig. 5. That rotation defines the disconnection of the retaining component 38 from the shoulder 4 of the fork 9, which is thus free to rotate towards the opening position following the thrust of the spring 36, releasing portion 3 from the striker 4.

[0057] Closure of the lock 1, from the outside or the inside of the motor vehicle, occurs by simple slamming of the door; in that way there is an impact of portion 3 of the striker 4 upon tooth 32 of the fork 9, which rotates about axis A against the thrust of the spring 36; the locking of the stop 10 on the fork 9 may occur, as previously seen, either in the part closure position or in the complete closure position, according to the load applied to the door. In particular, the complete closure position is achieved in the event of the load applied to the door providing a thrust upon the fork 9 sufficient for the shoulder 34 to be coupled with the end section 44 of the engaging component 38 of the stop 10, whereas the part closure position is achieved in the event of the load imposed is insufficient to cause coupling of the shoulder 34 and the engaging component 38 but sufficient to ensure snap-coupling of the shoulder 35 with the end section 44.

[0058] The safety can be connected from the outside by means of a key, or from the inside by means of a knob. In the first case the key reacts upon the ball joint 80 of the safety lever 75 and defines a rotation of the said lever about axis N in clockwise direction as in Fig. 3, from the enabling position (dotted line) to the inhibiting position (continuous line). The said rotation moves the lever 14 from the advanced position to the withdrawn position, making it run along the stop components 62; that movement misaligns the portion 58 of lever 14 in relation to the projection 45; consequently by acting on the outer control lever 16, a free movement of lever 14 occurs so that it cannot cooperate with the stop 10.

[0059] Connection of the safety from the inside is obtained by reacting on the knob on arm 87 in the case of the forward door, or on the arm 88 in the case of the rear door; in both cases there is a movement of the lever 75 identical with that seen in the case of the connection of the safety by means of a key.

[0060] Opening from the inside is achieved by way of the internal handle, acting on internal control lever 15 and ensuring a rotation about the pin 56 in anti-clockwise direction as in Figs. 2 and 3.

[0061] If the safety is connected (Fig. 3, continuous line), during the first portion of the angular movement of lever 15 about axis G, the cam portion 92 of the lever 15 itself cooperates by thrust with tooth 91 on lever 75 until the said lever 75 is brought into the enabling position; the initial and final positions of lever 15 in that operating phase are illustrated in Fig. 3 respectively in a continuous and in a dotted line. From that point onwards the projection 65 of lever 15 cooperates with the appendix 64 of lever 14 thus determining as already previously seen similarly with reference to opening from the outside, the shifting of the prominence 45 along the opening stroke C and the disconnection of the engaging component 38 of stop 10 from the fork 9.

[0062] Opening occurs in a similar way when the safety is not connected (Fig.2); in that case, there is a first free rotation stretch for lever 15 until the projection 65 makes contact with appendix 64 of lever 14.

[0063] From an examination of the characteristics of the lock 1 constructed according to the present invention the advantages which may be obtained become obvious.

[0064] In particular, it is clear that by achieving the demultiplication of the length of stroke of the levers, and thereby the multiplication of the intensity of the forces reacting on the levers, exclusively in the closure mechanism 8, it is possible to obtain a reduction in the loads reacting on the levers of the actuating mechanism 13, which may thus be made of plastic material (transmission lever 14 and internal control lever 15) or of very thin sheet metal (external control lever 16 and safety lever 75). In addition, the concentration of the loads on the closure mechanism 8 no longer require any structural modification thereof, since, as explained previously, the fork 9 and the stop 10 are normally designed for safety reasons to resist relatively high loads.

[0065] A reduction in overall weight of the lock 1 is thus achieved, and according to experimental results, a reduction in the wear loads reacting on the levers of the actuating mechanism 13, with consequent improvement

in performance of the lock 1 itself.

[0066] The location in service of the stop 10 above the fork 9 allows further advantages to be obtained. Above all, in the case of fracture of the spring 42, the stop 10 is nevertheless maintained in engagement with fork 9 by the force of gravity thereby preventing the opening of the lock 1. In addition such provisions facilitate the downward flow of accidentally penetrating water inside the casing 6; this thus prevents the retention of water in close proximity with the stop 10, which in the event of frost, particularly in Northern countries, could cause the lock 10 to seize while connected with the fork 9 and prevent opening of the lock.

[0067] Finally it is clear that the lock 1 allows modifications and variations without going outside the protective scope of the present invention.

[0068] In particular, the lock 1 could be fitted to the upright of the door 2 and could cooperate with a striker which is integral with the door itself.

Claims

1. Lock (1) for a motor vehicle door comprising:

   - a closure mechanism (8) arranged to couple with a striker (4) and having a fork (9) moving between operating positions to open and at least to close completely on the said striker (4), and a stop (10) arranged to couple with the said fork (9) to lock in releasable manner the said fork (9) in complete closure operative position; and
   - an actuation mechanism (13) arranged to cooperate with the said closure mechanism (8) to correspond with an actuation point (P) of the said stop (10) to displace in unidirectional manner the operating point (P) along an opening stroke (C) and to define the disengagement of the said stop (10) from the said fork (9) and opening of the said lock (1), the said actuation mechanism (13) comprising an internal control lever (15) and an external control lever (16) offering relative actuation points (Q,R) connectable to relative door handles, internal and external respectively, and moving along a first and respectively a second control stroke (D, E) to move the actuatinq point (P) of the said stop (10) along the said opening stroke (C),

   characterised by the fact that the said first and second control stroke (D, E) are of respective lengths comprised between 80% and 120% of the length of the opening stroke (C).

2. Lock according to claim 1, characterised by the fact that the said first and second control strokes (D, E) have lengths essentially equal to the length of the said opening stroke (C).

3. Lock according to claims 1 or 2, characterised by the fact that in service the said stop (10) is located above the said fork (9).

4. Lock according to any one of the preceding claims, characterised by the fact that in service the said fork (9) and the said stop (10) are hinged respectively about a first and a second axis (A, B) parallel with each other, and that the said actuation mechanism (13) comprises a transmission lever (14) arranged to cooperate with the said stop (10) in accordance with the said actuation point (P), operated by the said internal and external control levers (15, 16) secured to a pin (56) having a third axis (G) transversely to the said first and second axis (A, B) and moving parallel with a reference plane (π) parallel with the said first and second axes (A, B) and orthogonal to the third axis (G).

5. Lock according to claim 4, characterised by the fact that the said closure and actuation mechanisms (8, 13) are respectively housed in a first and a second envelope (6, 11) coupled together, and with the envelopes (6, 11) define respectively a closure module (2) and an actuation module (5) for the said lock (1), the said first and a second envelope (6, 11) providing a first and second intercommunicating opening (60, 59) respectively to allow the said transmission lever (14) to cooperate with the said stop (10) according to the said actuation point (P).

6. Lock according to claims 4 or 5, characterised by the fact that the said stop (10) comprises an engaging component (38), hinged about the second said axis (B) and arranged to snap-couple with a peripheral edge (33) of the said fork (9), an actuation arm (39) hinged about the said second axis (B) and having a projection (45) arranged to cooperate with an end portion (58) of the said transmission lever (14) and defining the said actuation point (P), and angular coupling means (40, 41) between the said engaging component (38) and the said actuation arm (39).

7. Lock according to claim 6, characterised by the fact that the said transmission lever (14) is of elongated shape and engages with its own said end portion (58), the said first and second aperture (60, 59) of the said first and second envelopes (6, 11), and in that the said projection (45) of the said stop (10) is arranged inside the said first envelope (6) and appears at the said first aperture (60), the said transmission lever (14) pivoting about the said third axis (G) and being arranged to move longitudinally in a transverse direction to the said third axis (G) between an advanced position in which it projects from the said second envelope (11) inside the said first envelope (6) and is in line with the first projec-

tion (45) of the said stop (10), and a withdrawn position, in which it does not project from the said second envelope (11) and is out of line with the said projection 45).

8. Lock according to claims 6 or 7, characterised by the fact that the said actuation arm (39) is arranged superimposed above the engaging component (38) and has a portion (47 projecting in relation to the engaging component (38) and is arranged out of line with the said fork (9) in a direction parallel with the said first and second axes (A, B) in such a way as to avoid interfering with the rotation of the said fork (9).

9. Lock according to claim 8, characterised by the fact that the said actuation arm (39) is arranged over the full width of the said first envelope (6) between a first and a second end-side (23, 24) of the said first envelope, the said actuation arm (39) being hinged about the said second axis (B) corresponding with its end adjacent to the said first side (23) of the said first envelope (6) and carries the said projection (45) to overhang corresponding with its opposing end adjacent to the said second side (24) of the first envelope (6).

10. Lock according to claim 9, characterised by the fact that the said first and second apertures (60, 59) of the said first and second envelopes (6,11) are arranged in the proximity of the said second side (24) of the said second envelope (11).

11. Lock according to one or other of claims 6 to 10, characterised by the fact that the said actuation arm (39) has in the direction of its maximum extension, a length essentially equal to twice the length of the said engaging component (38) in the selfsame direction.

12. Lock according to one or other of claims 6 to 11, characterised by the fact that the said peripheral edge (33) of the said fork (9) has a first and a second shoulder (34,35), and that the said engaging component (38) of the said stop (10) is pushed by elastic means (42) to snap-couple with the said first and second shoulder (34,35) to lock in releasable manner the said fork (9) respectively in the complete closure position and in a part closure position interposed between the said opening position and the said complete closure position, in each of the said part and complete closure positions of the fork (9), the distance between the relative said shoulder (34,35) and the said second axis (B) is essentially equal to twice the length of the arm of the push force applied to the said transmission lever (14) at the said projection in relation to the second axis (B).

13. Lock according to claim 12, characterised by the fact that the distance between each said shoulder (34, 35) and the said first axis (A) is essentially equal to twice the length of the arm of the reaction force of the said striker (4) upon the said fork (9) as related to the said first axis (A).

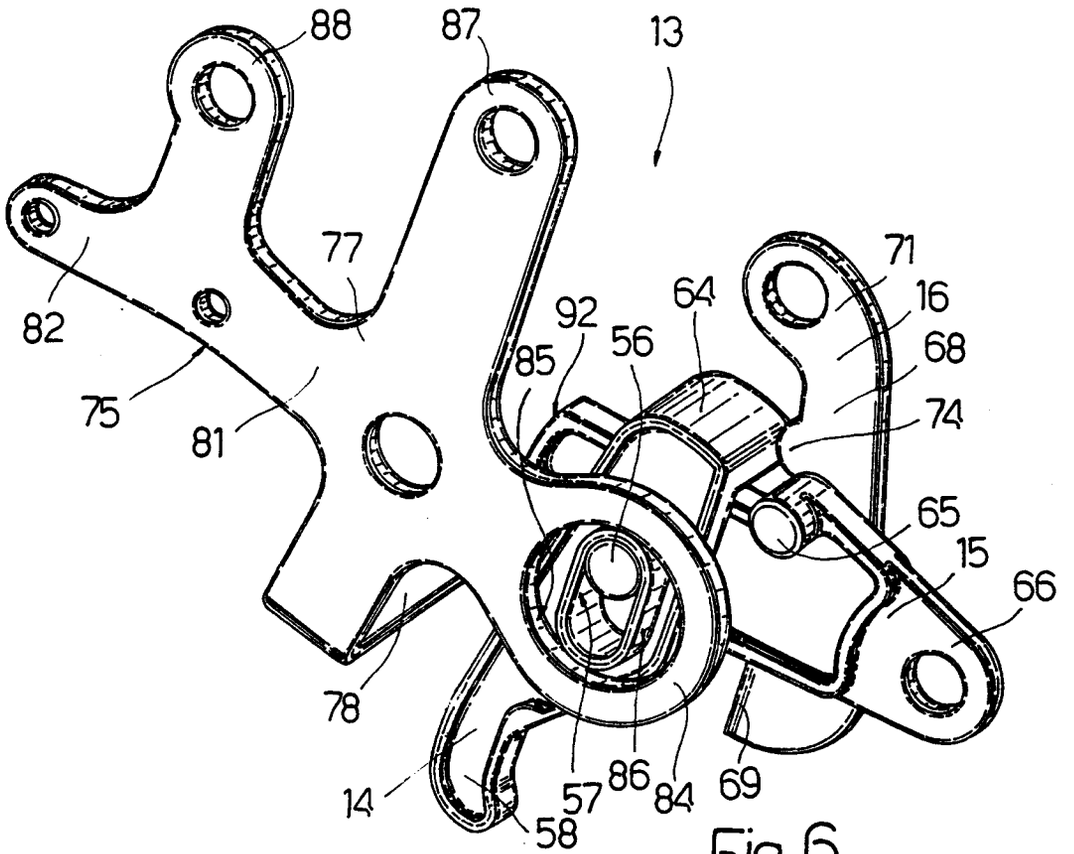
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Fig.6

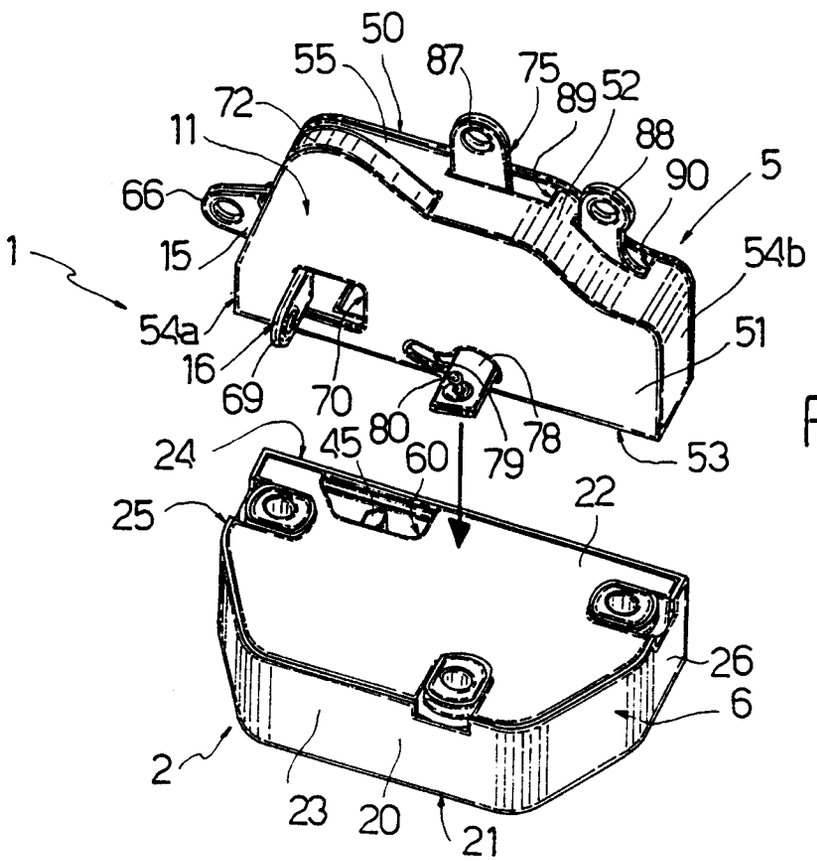
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Fig.1

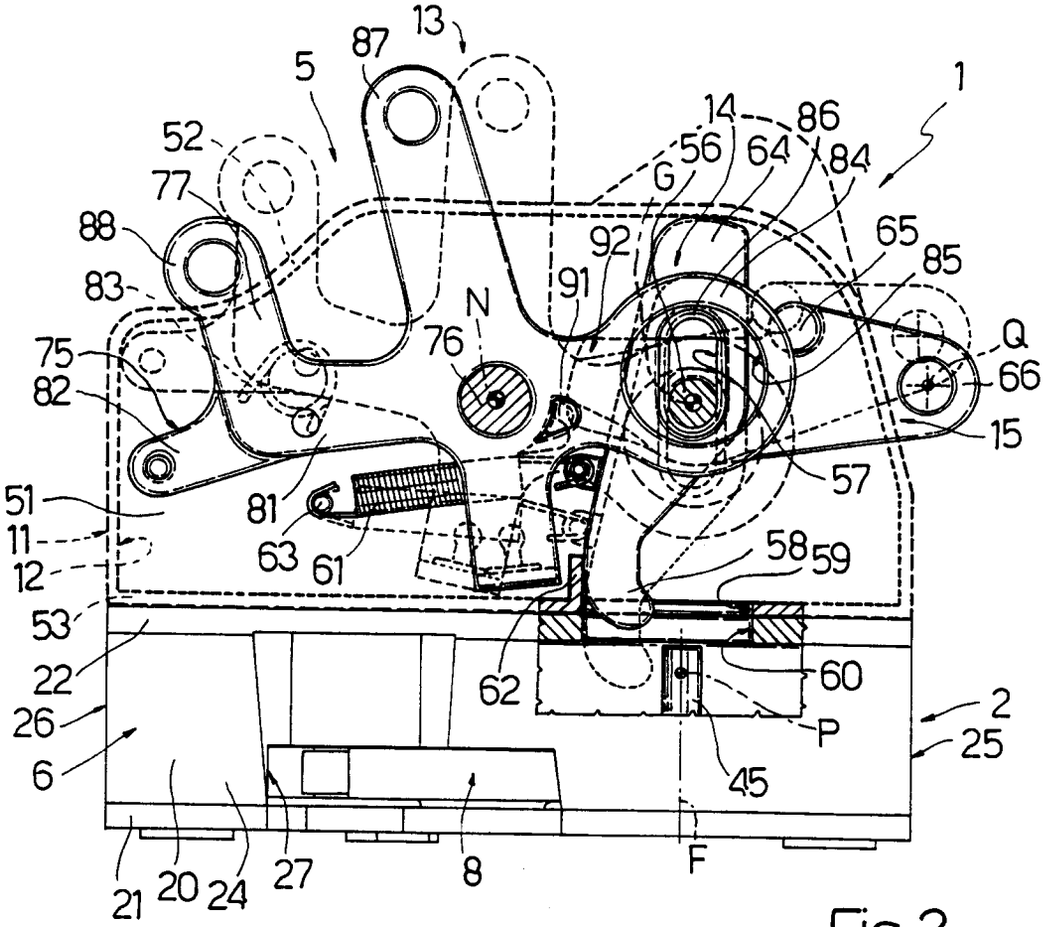
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Fig.3

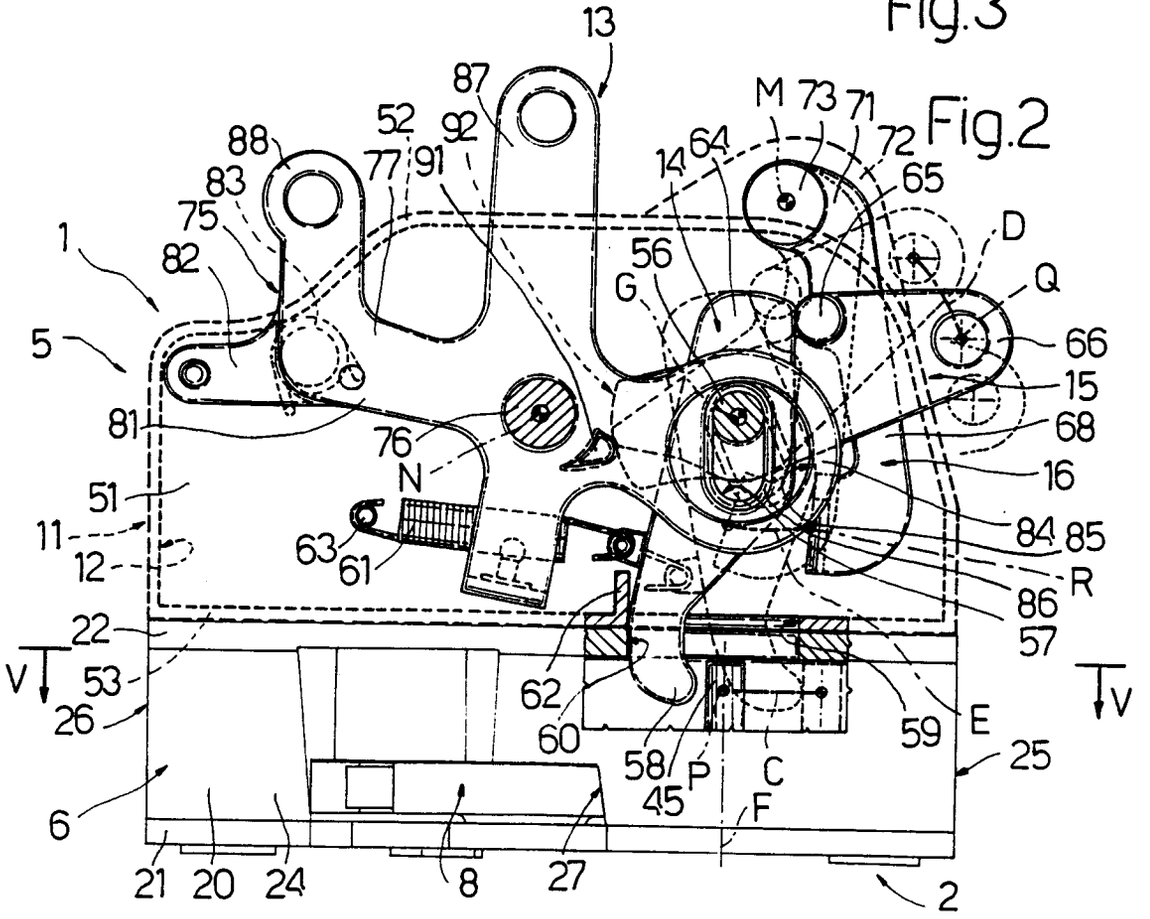
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Fig.2
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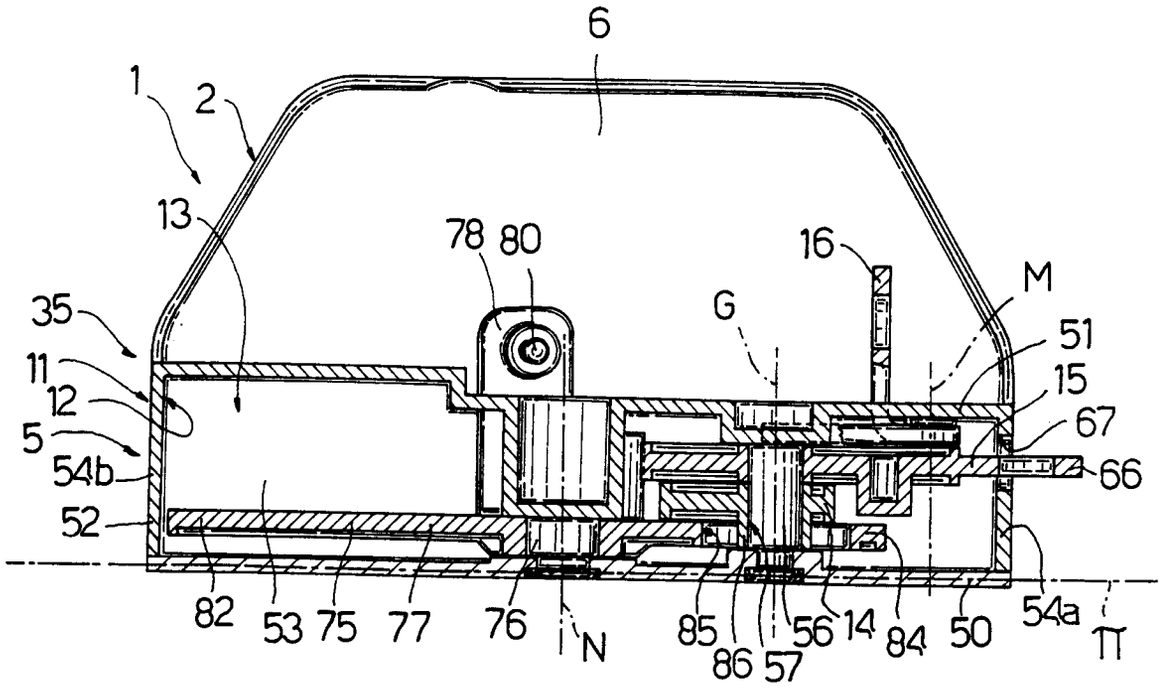
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Fig.4

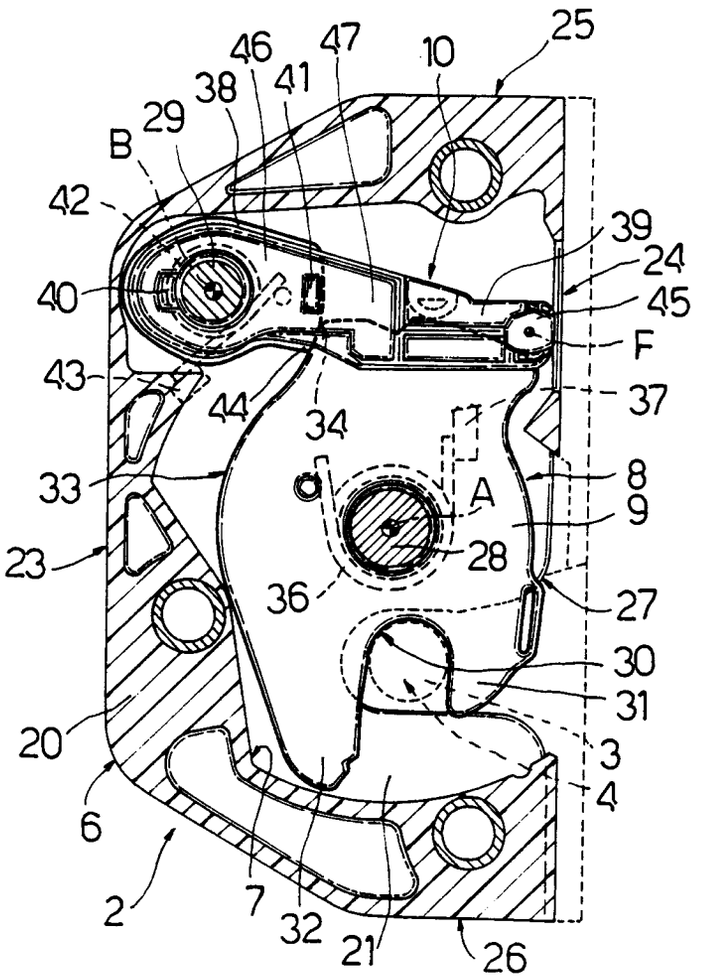
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Fig.5

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 98 11 4296

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.6)
X	US 4 904 004 A (BARTCZAK ANDRZEJ) 27 February 1990	1-4	E05B65/32 E05B65/20
Y	* column 7, line 11 - column 12, line 34; figures *	5,6,8	
X	GB 2 108 191 A (MITSUI MINING & SMELTING CO) 11 May 1983	1-3	
Y		5	
A	* page 2, line 112 - page 8, line 51; figures *	4,9,10	
Y	DE 88 12 485 U (BOMORO BOCKLENBERG & MOTTE) 17 November 1988	6,8	
A	* page 3, line 5 - page 7, line 21; figures *	1	
X	DE 36 26 441 C (BMW AG) 24 September 1987	1-3	
A	* column 2, line 29 - column 4, line 62; figures *	4	
X	DE 38 19 521 A (MOTROL SPA) 22 December 1988	1-3	TECHNICAL FIELDS SEARCHED (Int.Cl.6)
A	* column 4, line 14 - column 9, line 1; figures *		E05B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	18 November 1998	Westin, K

CATEGORY OF CITED DOCUMENTS

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