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(54) **Mechanical actuation unit of lock for a door of a motor vehicle, and lock provided with said mechanical actuation unit**

(57) A mechanical actuation unit (1) of a lock (2) for a door of a motor vehicle is provided with an opening mechanism (33) controlled to release an internal mechanism (62), which is designed to be connected to the inside handle of the door and is rotatable starting from a position at rest along an opening travel path against the elastic action of a return spring (71), to control the opening mechanism (33) and open the door; the me-

chanical actuation unit (1) is also provided with a principal inhibiting device (73), which can be activated selectively to make opening of the door from the outside ineffective; the return spring (71) of the internal control lever (62) has a first and a second stop portion (98), which are designed respectively to deactivate the principal inhibiting device (73) following rotation of the inside control lever (62) and to obstruct activation of the principal inhibiting device (73) when the door is open.

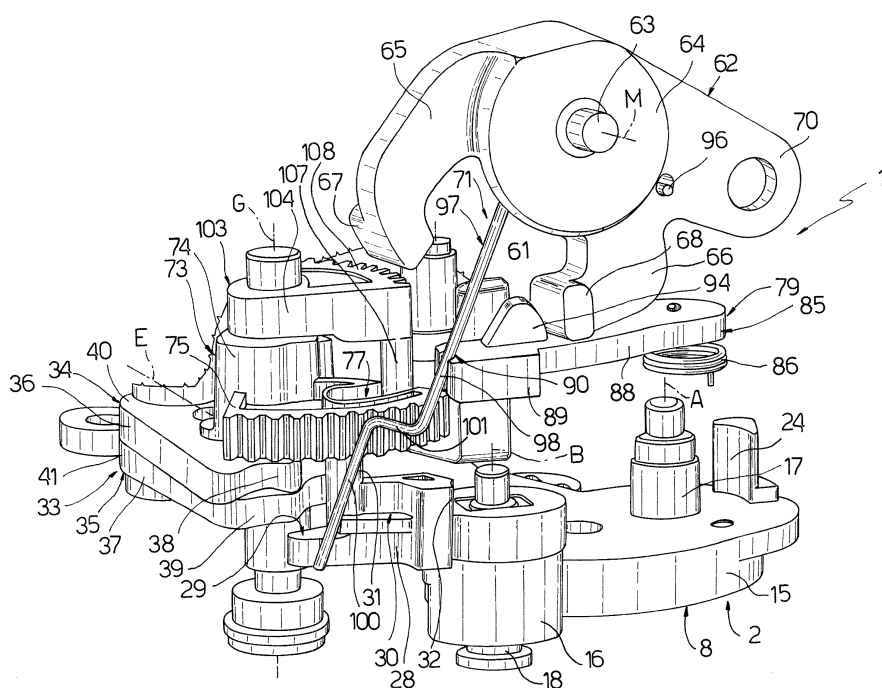


Fig.1

Description

[0001] The present invention relates to a mechanical actuation unit of a lock for a door of a motor vehicle.

[0002] As is known, in motor vehicles locks are mounted, generally, inside a relative door in a position suitable to interact with a lock striker, which is integral with a fixed upright delimiting the door compartment to be closed with said door. In particular, the locks comprise a closing mechanism designed to couple in a releasable way with the lock striker to determine closing of the door, and a mechanical actuation unit actuated by an inside handle and by an outside handle of the door to cause release of the closing mechanism from the lock striker respectively from inside the passenger compartment and from outside the vehicle.

[0003] The mechanical actuation unit comprises a principal inhibiting device, which can be selectively activated from outside the motor vehicle by a key or remote control, or from inside the passenger compartment by means of a knob or by means of the inside handle, to make actuation ineffective on the outside handle to inhibit opening of the door from the outside, thereby producing an external safety function.

[0004] To control engagement and disengagement of the external safety function from inside the passenger compartment, the mechanical actuation unit has an internal control lever, which is shaped in such a way as to interact with a relay element of the principal inhibiting device to activate and deactivate said principal inhibiting device by rotating respectively in opposite directions.

[0005] In some solutions, moreover, the mechanical actuation unit also comprises an auxiliary inhibiting device, which can be activated selectively to make actuation of the inside handle ineffective and thus inhibit opening of the door from the inside. Actuation of the auxiliary inhibiting device also prevents deactivation of the principal inhibiting device, thus producing an internal safety function (commonly indicated with the name "dead lock") in addition to the external safety function, for the purpose of preventing fraudulent opening of the lock by tools inserted into the passenger compartment from the outside, for example between the window and the body of the door, when the vehicle is left unattended.

[0006] The mechanical actuation units of known types described hereinbefore are somewhat complicated to produce and to mount and are relatively bulky, due to the particular shape and constructional characteristics required by the internal control lever and the aforesaid return element to cooperate with each other to activate and deactivate the principal inhibiting device when this is controlled from inside the passenger compartment.

[0007] Moreover, in locks provided with the "dead lock" function, the elements of the inhibiting devices are subject to unavoidable breakages if the internal control lever is forced to deactivate the principal inhibiting device when the latter is blocked by the auxiliary inhibiting device.

[0008] The object of the present invention is to produce a mechanical actuation unit of a lock for a door of a motor vehicle, which enables the aforesaid problems to be solved in a simple and inexpensive way and, preferably, enables activation of the principal inhibiting device to be prevented when the door is open.

[0009] According to the present invention, a mechanical actuation unit of a lock for a door of a motor vehicle is produced, said lock comprising a closing mechanism designed to couple in a releasable way with a lock striker to determine closing of said door; said mechanical actuation unit comprising:

- an opening mechanism controlled to cause release of said closing mechanism from said lock striker following manual actuation by a user on an external movable element or on an internal movable element associated with said door respectively on the outside and on the inside of said motor vehicle;
- an internal control lever designed to be connected to said internal movable element and rotatable starting from a position at rest along an opening travel path against the elastic action of a return spring, to control said opening mechanism and open said door;
- a principal inhibiting device that can be activated selectively to make actuation ineffective on said external movable element and inhibit opening of said door from the outside; and
- deactivation means of said principal inhibiting device that can be controlled from inside said motor vehicle to enable opening of said door from the outside;

characterized in that said return spring comprises a first stop portion constituting part of said deactivation means.

The present invention also relates to a lock for a door of a motor vehicle.

[0010] According to the present invention a lock is produced for a door of a motor vehicle, defined in claim 13.

[0011] The invention shall now be described with reference to the attached drawings, which show a non-limiting embodiment, wherein:

Figures 1 and 2 are different partial perspective views of a preferred embodiment of the mechanical actuation unit of a lock for a door of a motor vehicle, produced according to the present invention and shown in an operating condition wherein the door is closed and an external safety function is engaged;

Figure 3 shows a closing mechanism of the lock in Figure 1 in an operating condition wherein the door is closed;

Figure 4 is analogous to Figure 2 and shows, with parts removed for clarity, the mechanical actuation

unit in an operating condition wherein the door is open; and

Figure 5 is analogous to Figure 2 and shows, with parts removed for clarity, the mechanical actuation unit in an operating condition wherein the door is closed and an internal safety function is engaged.

[0012] In Figures 1 and 2, number 1 indicates as a whole a mechanical actuation unit of a lock 2 (shown partially) for a door (not shown) of a motor vehicle (not shown). The lock 2 is part of a centralized locking system of the doors of a motor vehicle, the operation of which is managed in a known way, not shown, by the electrical system of said motor vehicle, and is designed to interact in a known way with a lock striker 3 (the trace of which is shown with a dashed line in Figure 3) integral with an upright (not shown) of the door compartment to be closed with the door.

[0013] With reference to figure 3, the lock 2 comprises a supporting body 4 (partially shown) designed to be fixed rigidly to the door of the motor vehicle and defining two compartments 5, 6, which are separated from each other by a wall 7 of the body 4 and are closed by respective metallic plates (not shown) essentially parallel with the wall 7.

[0014] The compartment 5 houses a closing mechanism 8 of a per se known type, which constitutes part of the lock 2 and is designed to couple in a releasable way with the lock striker 3 to determine closing of the door.

[0015] The body 4 defines an internal sliding groove 11 to guide the lock striker 3 along an essentially rectilinear direction 12 inside the compartment 5 towards the mechanism 8 starting from an opening 13 produced on a side wall 14 of said body 4. The opening 13 defines the extension of a slot (not shown) produced on the metallic closing plate of the compartment 5 along the direction 12 at the level of the groove 11, and is disposed, in use, at the level of an angular opening (not shown) produced in the body of the door to allow entry of the lock striker 3 in the compartment 5.

[0016] Again with reference to Figure 2, the mechanism 8 comprises a fork 15 and a dog 16 hinged about respective cylindrical pins 17 and 18, which extend in fixed positions through the wall 7 along respective axes A, B parallel to each other and orthogonal to the direction 12. The fork 15 is constituted by a shaped metallic plate coated in plastic material, is hinged at the level of an intermediate portion thereof about the pin 17 and has a peripheral C-shaped seat 20 designed to receive the lock striker 3 and delimited laterally by a pair of teeth 21, 22.

[0017] The fork 15 is subject in a known way to the return action of a helical spring 23 (Figures 4 and 5) wound around the pin 17 and constrained, at the ends thereof, to an appendage 24 of said fork 15 and to a stop carried by the body 4 (not shown); in particular, the fork 15 is thrust by the spring 23 towards an opening position (Figure 4), wherein it is disposed laterally with its tooth

21 against a stop 25 carried by the wall 14 at the side of the opening 13 and enables engagement and disengagement of the lock striker 3 in/from its seat 20.

[0018] Under the thrust of the lock striker 3 and following slamming of the door, the fork 15 rotates about the axis A from the opening position towards a closing position (Figure 3), wherein the tooth intercepts the passage defined by the groove 11 and by the slot of the closing plate of the compartment 5, preventing the lock striker 3 from escaping from the seat 20.

[0019] The dog 16 is constituted by a shaped metallic plate coated with plastic material extending on the same plane as the fork 15 and on one side thereof. The dog 16 has a terminal projection 26, which is designed to couple against the tooth 21 of the fork 15, to block it in a releasable way in the closing position, and is thrust by a helical spring 27 to rotate about the axis B towards the fork 15.

[0020] With reference to Figures 1 and 4, the dog 16 is fixed to an actuating arm 28, preferably produced in plastic material and defined by an elongated plate, which extends radially with respect to the pin 18, is housed in the compartment 6 and rotates together with the dog 16 about the pin 18 on a plane orthogonal to the axis B. The arm 28 has a face 29 extending from the axial part opposite the dog 16 and carrying a projection 30, which protrudes parallel to the axis B and comprises two opposed terminal portions 31, 32 positioned side by side along the face 29.

[0021] When the fork 15 is blocked by the dog 16 in the closing position, the portion 31 assumes a position wherein it can receive from the unit 1 thrust forces designed to cause release of the mechanism 8 from the lock striker 3 and thus open the door.

[0022] The unit 1 is housed in the compartment 6 and is controllable by means of manually controlled movable elements associated with the door of the motor vehicle, such as the inside and outside handles (not shown), by means of a key unit (not shown) carried by the door on the outside of the motor vehicle, and/or by means of an electrical actuator unit (not shown) constituting part of the lock 2.

[0023] The unit 1 comprises an opening mechanism 33 constituted by two opening devices 34, 35, which are disposed parallel to each other, are controlled to cause release of the mechanism 8 from the lock striker 3 following manual action by a user respectively on the outside handle and on the inside handle of the door and comprises respective connecting thrust rods 36, 37 designed to interact with the projection 30, to disengage the dog 16 from the fork 15. The connecting rods 36, 37 are defined by plates lying on planes orthogonal to the axes A and B and superimposed on each other and have an elongated shape in a transverse direction to the arm 28. The connecting rods 36, 37 comprise respective ends 38, 39 facing the projection 30 and shaped in a manner complementary to the shape of the portion 31, and respective ends 40, 41, opposite the ends 38, 39

and rotating about respective hinge axes C and D movable and parallel to the axes A and B.

[0024] The connecting rods 36, 37 are movable separately from each other in the respective planes thereof starting from a reversed position, wherein the ends 40, 41 are disposed against a stop wall (not shown) laterally delimiting the compartment 6 of the body 4, towards an advanced position towards the projection 30, against the elastic action of respective helical springs 42, 43 (partially shown in Figure 4) wound around a cylindrical pin 44, which extends in a cantilever fashion from the wall 7 parallel to the pins 17, 18 and is disposed on the side of the connecting rods 36, 37 in a position spaced from said connecting rods 36, 37.

[0025] With particular reference to figures 2, 4 and 5, the connecting rods 36, 37 delimit respective slots 45, 46, which are elongated along respective directions E and F orthogonal to the axes C and D and transverse to the arm 28 and house respective disks 47, 48, each disposed on the same plane as the relative connecting rod 36, 37. The disks 47, 48 engage the slots 45, 46 in a sliding manner to guide the relative connecting rods 36, 37 along the directions E and F between the aforesaid reversed and advanced positions and are coupled to the body 4 so as to rotate eccentric, separately from each other, about the same fixed axis G parallel to the axis B. The lateral surfaces of the disks 47, 48 define respective cams, as they exert a transverse thrust on the surfaces delimiting the relative slots 45, 46, during rotation about the axis G, to direct the advance trajectories of the connecting rods 36, 37, defined by the directions E and F, respectively about the axes C and D with respect to the position of the projection 30, as shall be better described hereunder.

[0026] With reference to Figure 2, advance of the connecting rod 36 from the reversed position towards the advanced position is controlled by an external control lever 51, which is defined by a plate essentially shaped with a circular sector, lying on a plane parallel to the plane of the connecting rod 36 and disposed in an intermediate position between said connecting rod 36 and the metallic plate closing the compartment 6.

[0027] The lever 51 comprises a terminal coupling portion, hinged about the end of the pin 44 about an axis H parallel to the axes A, B and C, and two appendages 54, 55 spaced angularly from each other about said axis H. The appendage 54 is hinged at the end 40 of the connecting rod 36 about the axis C, while the appendage 55 is connected, in use, to the outside handle of the door, in a way not shown (for example by interposing a Bowden cable transmission) and so that the lever 51, following operation of said outside handle, rotates about the axis H in a direction L of rotation against the elastic action exerted by the spring 42 on the connecting rod 36, to thrust the connecting rod 36 towards its advanced position.

[0028] According to the illustration in Figure 5, the opening device 35 comprises, moreover, a relay lever

57 facing the wall 7, produced in metallic material, L-shaped and comprising an intermediate portion 58 which is hinged to the pin 44 to enable the lever 57 to rotate about the axis H.

[0029] The lever 57 comprises, moreover, a pair of arms 59, 60, which extend in a cantilever fashion from the portion 58 and radially with respect to the axis H. The arm 59 is interposed axially between the connecting rod 37 and the wall 7 and is hinged, at its free end, to the end 41 of the connecting rod 37 about the axis D, while the arm 60 extends in a position side by side with the connecting rods 36, 37 towards the pin 18 and carries in a cantilever fashion, at the free end thereof, a tooth 61, which projects in a direction parallel to the axis H in the opposite direction to the wall 7.

[0030] Again with reference to the Figure 5, the device 35 is controlled by an internal control lever 62 comprising an intermediate portion 64, which is hinged by means of a pin 63 (Figure 1) to a metallic supporting bracket fixed to the body 4 (not shown), to allow the lever 62 to rotate about an axis M orthogonal to the axis H. The lever 62 also comprises two arms 65, 66, which extend in a cantilever fashion from the portion 64 in positions diametrically opposite each other, which together make the lever 62 essentially C-shaped and terminate with respective thrust teeth 67, 68 spaced apart from each other in a direction parallel to the axis M.

[0031] The lever 62 also comprises a radial appendage 70 extending in a cantilever fashion from the arm 66 and connected, in use, to the inside handle of the door, in a way not shown, and is rotatable, following activation of said inside handle, about the axis M in a direction N of rotation along an opening travel path starting from a position at rest (figure 2), wherein the teeth 61, 67 are facing each other and adjacent in a tangential direction with respect to the axes H and M. In particular, by rotating along said opening travel path against the elastic return action exerted by a wire spring 71, which will be better described hereunder, the tooth 67 is positioned against the tooth 61 and, subsequently, exerts a thrust action on said tooth 61 to make the lever 57 rotate about the axis H and, therefore, make the connecting rod 37 slide towards its advanced position against the elastic action of the spring 43.

[0032] According to the illustrations in Figures 1 and 2, the unit 1 also comprises a principal inhibiting device 73, which can be activated selectively to make operation of the outside handle of the door ineffective and to inhibit opening of the door from the outside, producing an external safety function of the lock 2. The device 73 comprises a disk 47 and a superimposed actuation element 74, coaxial and angularly integral with said disk 47. Under the action of the element 74, the disk 47 rotates about the axis G between a first end of travel position (not shown) wherein the connecting rod 36 is directed with the end 38 aligned with the portion 31 of the projection 30 along the direction E, and a second end of travel position (figure 1), wherein the trajectory of ad-

vance of the connecting rod 36, defined by the direction E, extends to the side of the projection 30.

[0033] Therefore, in this second end of travel position, the end 38 of the connecting rod 36 translates towards its advanced position without encountering the projection 30 and, therefore, without being able to cooperate with the dog 16, so that the external safety function is engaged, while in the aforesaid first end of travel position the end 38 of the connecting rod 36, translating towards its advanced position, is able to thrust the portion 31 to rotate the dog 16 and disengage said dog 16 from the fork 15, so that the external safety function is disengaged.

[0034] The actuation element 74 comprises two externally toothed sectors 75, 76 (Figure 2), which extend on a plane orthogonal to the axis G, are diametrically opposite each other and can be actuated to cause rotation of the element 74 about the axis G. In particular, the sector 75 meshes with a pinion actuated by an electrical actuator of the lock 2 (not shown), has a diameter greater than the diameter of the sector 76 and defines a circumferential groove 77 (Figure 1) produced on a face axially opposite with respect to the disk 47 and to the connecting rod 36. The sector 76, on the other hand, receives movement from a relay lever 79 (Figures 2 and 4) constituting part of the device 73 and defined by a shaped plate extending on the same plane as the sectors 75, 76.

[0035] With reference to Figure 4, the lever 79 comprises an intermediate portion 80, which is hinged to the pin 44, to allow rotation of the lever 79 about the axis H, is axially facing the lever 51, carries in a cantilever fashion a toothed sector 81 meshing with the sector 76 and has a peripheral seat 82 engaged with circumferential clearance by a projection 83. In particular, the projection 83 constitutes part of a control lever 84, which is hinged to the pin 44 about the axis H in an intermediate axial position between the levers 57 and 79 and is actuated in a known way, not describe in detail, by the key unit of the door, to rotate the lever 79 and engage/disengage the external safety function.

[0036] Again with reference to Figure 4, the lever 79 also comprises an arm, 85, which is C-shaped and is coupled to the body 4 by means of a helical spring 86 defining a dead positioning point, beyond which the lever 79 rotates selectively in two stable reference positions defined by respective end of travel stops (not shown) and corresponding to the first and second end of travel position of the disk 47.

[0037] The arm 85 comprises a portion 87 extending radially from the portion 80 and a subsequent circumferential portion 88, which terminates with an end 89 coupling with the internal control lever 62. The end 89 has a U-shaped seat 90 defined by a radial shoulder 91 with respect to the axis H and by two circumferential protrusions 92 with respect to said axis H, and carries in a cantilever fashion a tooth 94 on a face thereof orthogonal to the axis H and facing the lever 62.

[0038] The tooth 94 is disposed in contact with the tooth 68 in a direction tangential to the axes H and M to receive thrust from the lever 62 aimed at engaging the external safety function following a control from inside the passenger compartment, for example on the inside handle of the door. In fact, following said internal control, the lever rotates starting from its position at rest in the direction opposite the direction N towards an actuation position of the principal inhibiting device 73, that is in the opposite direction to the opening travel path described above, and causes rotation of the lever 79 in a direction P of rotation, to take the disk 47 to its aforesaid second end of travel position, simultaneously moving the tooth 67 away from the tooth 61.

[0039] The tooth 94 is forced against the tooth 68 by the spring 71, which comprises an intermediate cylindrical helical stretch (not visible in the attached figures) wound around the pin 63, and two opposed terminal branches 96, 97. The branch 96 is constrained to the arm 66, while the branch 97 comprises an intermediate rectilinear stop portion 98, which is disposed against the shoulder 91 in a direction tangential to the axes H and M, is held engaged in the seat 90 by the protrusions 92 and is designed to transfer, from the lever 62 to the lever 79, thrusts aimed at disengaging the external safety function following a control from inside the passenger compartment, for example on the inside handle of the door. In fact, by turning the lever 62 towards its position at rest in the direction N starting from the position to activate the device 73, the portion 98 thrusts the lever 79 in an opposite direction of rotation to the direction P, to return the disk 47 to its aforesaid first end of travel position, simultaneously moving the tooth 67 back towards the tooth 61. Thanks to the fact that the end 89 is constrained angularly between the tooth 68 and the portion 98, for the lever 62 the at rest and activation positions of the device 73 are stable and defined by the elastic positioning action exerted by the spring 86 on the lever 79.

[0040] With reference to Figure 4, the branch 97 also comprises a terminal rectilinear stop portion 100, which is parallel to the portion 98, is connected to said portion 98 by means of a transverse portion 101, and is designed to cooperate positioned against the portion 32 of the projection 30 when the fork 15 is disposed in its opening position. In this opening position the projection 26 of the dog 16 is side by side with the tooth 22 of the fork 16 (in a way not shown), while the arm 28 is reversed with respect to the connecting rods 36, 37, in a position wherein the portion 32 intercepts the trajectory of the portion 100 during any rotation of the lever 79 in the direction P to prevent the external safety function from being engaged.

[0041] If the lever 79 is in any case forced to activate the device 73, interception of the portion 32 causes the branch 97 to bend elastically determining, on said lever 79, an elastic return action in the direction of rotation opposite the direction P, without causing breakages on

the unit 1.

[0042] With reference to Figure 1, instead, when the fork 15 is disposed in its closing position and is blocked by the dog 16, the arm 28 is advanced towards the connecting rods 36, 37, in a position whereby the portion 100 is free to pass beyond the projection 30 during any rotation of the lever 79 in the direction P aimed at engaging the external safety function.

[0043] According to the illustrations in Figures 1 and 5, the unit 1 also comprises an auxiliary inhibiting device 103, which can be activated selectively to make actuation of the inside handle of the door ineffective and inhibit opening of the door from the inside, producing an internal safety function of the lock 2, normally indicated with the term "dead lock".

[0044] The device 103 comprises the disk 48 and an actuation element 104, which is superimposed on and coaxial to the element 74 and is designed to rotate the disk 48 about the axis G analogously to the action performed by the element 74 on the disk 47. In brief, in a first end of travel position of the disk 48, the end 39 of the connecting rod 37 is aligned with the portion 31 along the direction F and is able to thrust the projection 30 to rotate the dog 16 and disengage said dog 16 from the fork 15, so that the internal safety function is disengaged (figure 1), while in a second end of travel position of the disk 48, the end 39 translates towards its advanced position without encountering the projection 30 and, therefore, without being able to cooperate with the dog 16, so that the internal safety function is engaged (figure 5).

[0045] The actuation element 104 is coupled in an angularly fixed way to the disk 48 by means of a cylindrical pin 105, which extends through the element 74 and is hinged at the wall 7 to the body 6 about the axis G. The element 54 carries in a cantilever fashion a stop tooth 107 extending parallel to the axis G towards the sector 75 and comprises a sector 108 with external toothing (figure 2), which can be actuated by an electrical actuator (not shown) to cause rotation of the element 104 about the axis G between a first configuration (Figure 1), wherein the disk 48 is disposed in its first end of travel position and the tooth 107 engages the groove 77 with clearance, and a second configuration (not shown), wherein the disk 48 is disposed in its second end of travel position and the tooth 107 is disposed radially against the portion 80 of the lever 79. In this second configuration, the tooth 107 engages a stop seat 109 (figure 2) defined circumferentially by the portion 87 and by the sector 81, to block rotation of the lever 79 in the opposite direction to the direction P when the external safety function is engaged, in order to prevent this external safety function from being disengaged by means of tools inserted into the passenger compartment from the outside, for example between the window and the body of the door, when the motor vehicle is left unattended.

[0046] With reference to Figure 5, when the dead lock function is engaged and the lever 62 is forced to be ro-

tated in the direction N from its position to activate the device 73 towards its position at rest, the lever 79 is blocked by the device 103 and holds the branch 97 enabling it to bend elastically, while the tooth 68 tends to move away from the tooth 94 (in a way not shown) and the tooth 67 tends to move towards the tooth 61. Bending of the spring 71 exerts an elastic thrust on the lever 62 in the opposite direction of rotation to the direction N towards its position to activate the device 73, without causing breaking stresses on the components of the devices 73 and 103. Moreover, even if the force applied to the lever 62 was sufficient to act on the tooth 61 to thrust the lever 57, the engaged "dead lock" function would prevent the connecting rod 37 from interacting with the projection 30 and, therefore, prevent opening of the door from the inside.

[0047] Summarizing the description above and starting from the operating condition shown in Figure 4, when the door is open the projection 30 is spaced from the connecting rods 36, 37 and is designed to cooperate with the portion 100 of the spring 71 to obstruct engagement of the external safety function.

[0048] Under the thrust of the lock striker 3 and following slamming of the door, the fork 15 rotates towards the closing position thereof, wherein it is stopped by the dog 16 (Figure 3). In this operating condition the projection 30 is disposed in a position adjacent to the connecting rods 36, 37 and aligned with the ends 38, 39 along the directions E and F, so that it is possible to control release of the mechanism 8 from the lock striker 3 by operating the levers 62 or 51 respectively by means of the inside or the outside handles of the door.

[0049] With reference to the operating condition shown in Figures 1 and 2, by activating the device 73 from inside the passenger compartment, for example using the lever 62, or from outside the motor vehicle, for example using the lever 84, the connecting rod 36 is rotated about the axis C to divert the trajectory of advance defined by the direction E, so that rotation of the external control lever 51 and translation of the connecting rod 36 are made ineffective, producing the external safety function.

[0050] Finally, passing to the operating condition shown in Figure 5, activation of the device 103 from outside the motor vehicle by rotation of the sector 108 causes rotation of the connecting rod 37 about the axis D to divert the trajectory of advance defined by the direction F, so that the opening travel path of the internal control lever 62 and translation of the connecting rod 37 are made ineffective, producing the internal safety function. Simultaneously, activation of the device 103 causes blocking of the device 73 by means of engagement of the tooth 107 in the seat 109 and thereby prevents deactivation of the internal safety function from inside the passenger compartment.

[0051] As described above, any forcing aimed at engaging the external safety function when the door is open, or aimed at rotating the lever 62 in the direction

N of rotation to disengage the external safety function when the dead lock function is engaged, cause the spring 71 to bend and, therefore, prevents breakage of any of the components of the unit 1.

[0052] From the above it is apparent that the lever 62 and the end 89 of the lever 79 have a relatively simple shape, are hence relatively simple to produce and to mount and, in particular, are not subject to risks of interference or of disengagement during their movement during activation/deactivation of the device 73.

[0053] Moreover, when the "dead lock" function is engaged and the device 73 is blocked by the tooth 107, any forcing on the lever 62 merely causes the spring 71 to bend, without the risk of breakages of the components of the unit 1.

[0054] Moreover, the configuration of the spring 71 and of the levers 62, 79 enables relatively low overall dimensions and a relatively low number of pieces to be obtained.

[0055] Finally, the presence of the portion 100 designed to cooperate with the projection 30 enables activation of the device 73 to be prevented when the door is open.

[0056] From the above, finally, it is apparent that modifications and variants may be made to the unit 1 and to the lock 2 described with reference to the attached figures, without however departing from the scope of protection of the present invention.

[0057] In particular, the lock 2 may be modular, or the unit 1 and the mechanism 8 may be mounted on separate supporting bodies.

[0058] The lock 2 may be fixed to the upright of the door compartment and interact with a lock striker carried by the door.

[0059] The unit 1 may be produced without the device 103, or the device 103 may be produced without the tooth 107 and perform a "child safety" function, instead of the "dead lock" function.

[0060] The movable manual control elements of the levers 62 and 51 may be defined by push-buttons of the door, rather than by handles.

[0061] Finally, the spring 71 may vary in type to and, in particular, the branch 97 may differ in shape from those shown purely by way of example.

Claims

1. Mechanical actuation unit (1) of a lock (2) for a door of a motor vehicle; the lock comprising a closing mechanism (8) designed to couple in a releasable way with a lock striker (3) to determine closing of said door; the mechanical actuation unit comprising:
 - an opening mechanism (33) controlled to cause release of said closing mechanism (8) from said lock striker (3) following manual actuation by a

user on an external movable element or on an internal movable element associated with said door respectively on the outside and on the inside of said motor vehicle;

- an internal control lever (62) designed to be connected to said internal and element movable rotatable starting from a position at rest along an opening travel path against the elastic action of a return spring (71), to control said opening mechanism (33) and open said door;
 - a principal inhibiting device (73) that can be activated selectively to make actuation ineffective on said external movable element and inhibit opening of said door from the outside; and
 - deactivation means (62,98) of said principal inhibiting device (73) that can be controlled from inside said motor vehicle to enable opening of said door from the outside;
 - **characterized in that** said return spring (71) comprises a first stop portion (98) which is a part of said deactivation means (62,98).
2. Unit as claimed in claim 1, **characterized in that** said internal control lever (62) is rotatable from and towards said position at rest on the opposite side to said opening travel path, to control activation and deactivation of said principal inhibiting device (73).
 3. Unit as claimed in claim 2, **characterized in that** said principal inhibiting device (73) comprises a relay lever (79), with a terminal portion (89) interposed between said first stop portion (98) and a thrust tooth (68) constituting part of said internal control lever (62) and is disposed resting against said first stop portion (98); said return spring (71) exerting on said internal control lever (62) an elastic action to maintain said thrust tooth (68) in contact with said terminal portion (89).
 4. Unit as claimed in claim 3, **characterized in that** said terminal portion (89) defines a U-shaped seat (90) engaged by said first stop portion (98).
 5. Unit as claimed in claim 3 or 4, **characterized in that** said principal inhibiting device (73) comprises a positioning spring (86) mounted in a bistable way to allow said relay lever (79) to rotate selectively between two stable positions corresponding respectively to activation and deactivation of said principal inhibiting device (73).
 6. Unit as claimed in any one of claims 3 to 5, **characterized in that** said internal control lever (62) and said relay lever (79) are rotatable around respective axes (M, H) orthogonal to each other.
 7. Unit as claimed in any one of claims 2 to 6, **characterized in that** said return spring (71) comprises

a second stop portion (100) designed to prevent activation of said principal inhibiting device (73) when said closing mechanism (8) is disposed in a configuration of release from said lock striker (3).

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8. Unit as claimed in claim 7, **characterized in that** said first and second stop portion (98, 100) constitute part of the same terminal branch (97) of said return spring (71).

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9. Unit as claimed in claim 7 or 8, **characterized in that** said closing mechanism (8) comprises a rotatable dog (16); said second stop portion (100) being defined by an end (100) of said return spring (71) designed to cooperate with a shoulder (32) integral with said dog (16) .

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10. Unit as claimed in any one of the previous claims, **characterized in that** said return spring (71) is a wire spring.

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11. Unit as claimed in claims 9 and 10, **characterized in that** said first and second stop portions (98, 100) are rectilinear and parallel with each other.

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12. Unit as claimed in any one of the previous claims, **characterized in that** it also comprises an auxiliary inhibiting device (103) which can be activated selectively to make actuation ineffective on said internal movable element and inhibit opening of said door from the inside.

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13. Lock (2) for a door of a motor vehicle; the lock comprising a closing mechanism (8) designed to couple in a releasable way with a lock striker (3) to determine closing of said door, and a mechanical actuation unit (1) produced according to any one of the previous claims.

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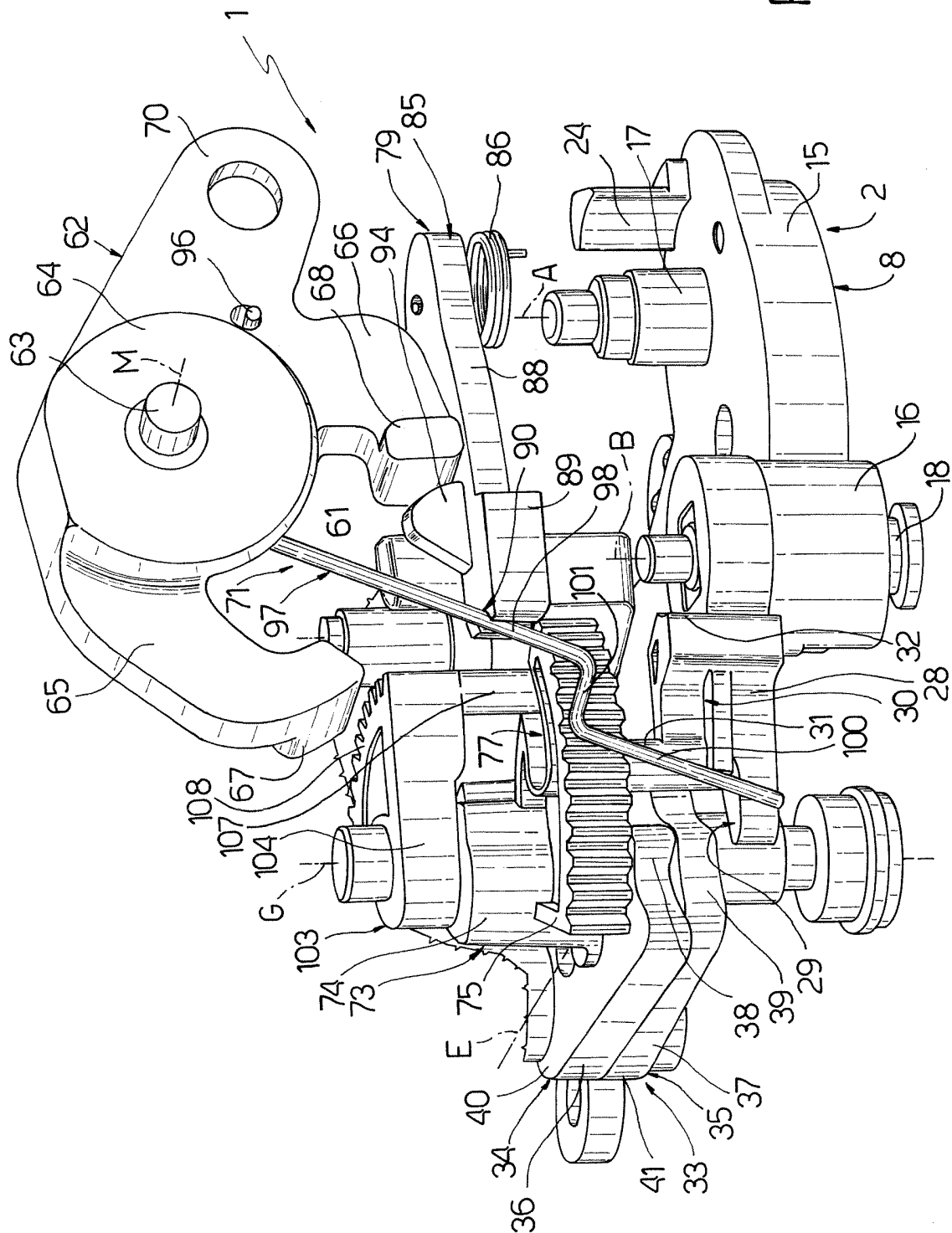
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Fig.1



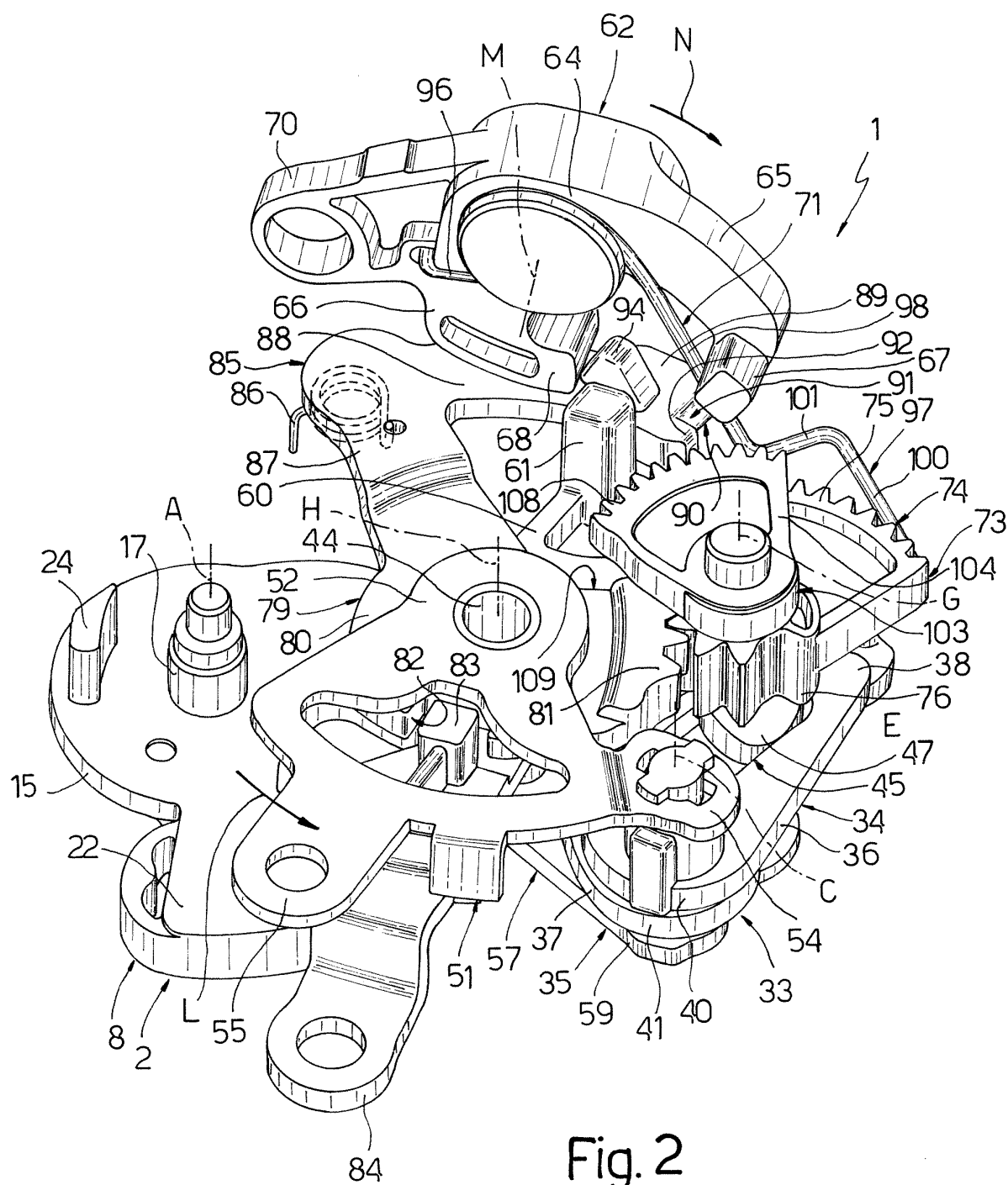


Fig. 2

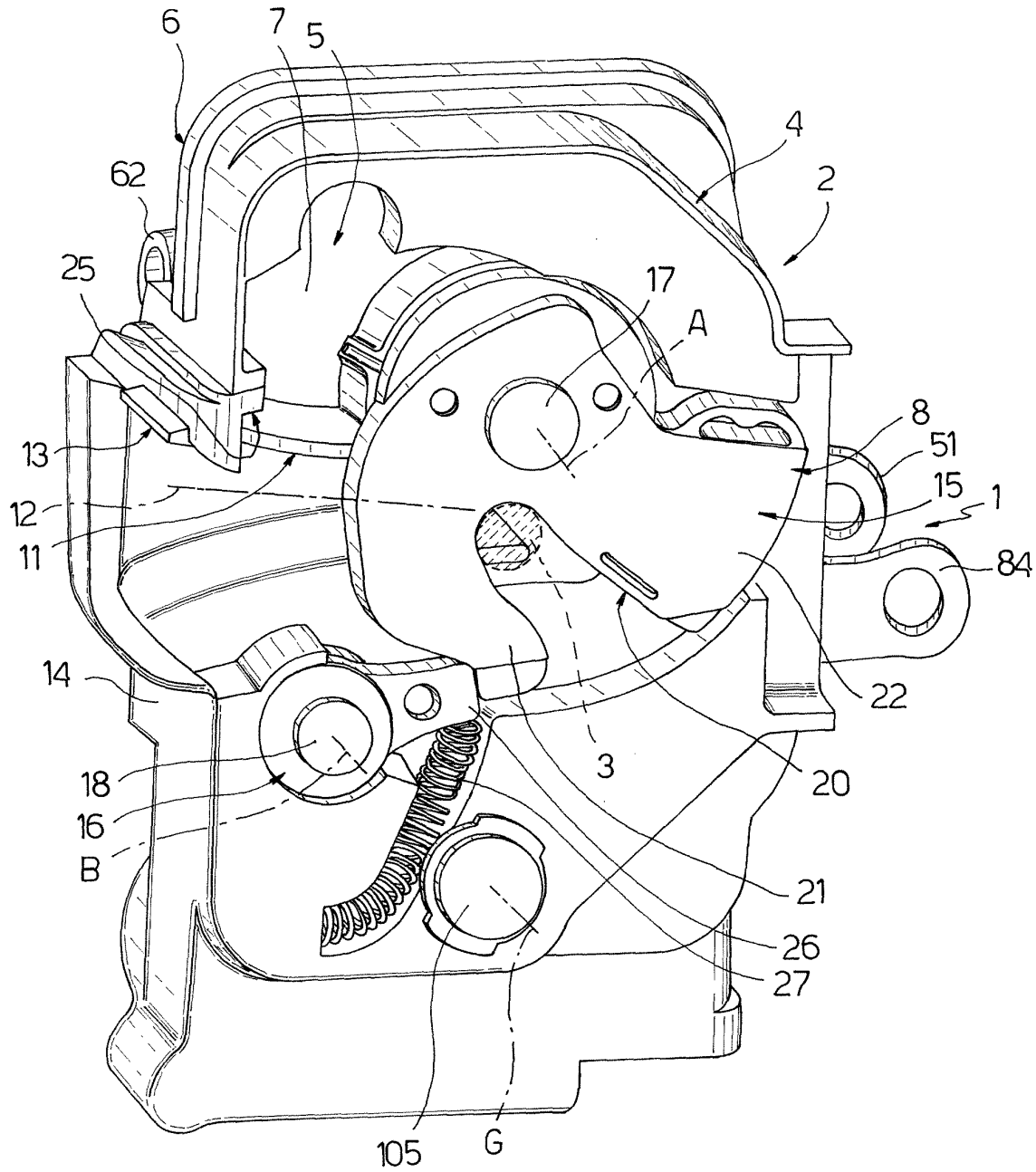
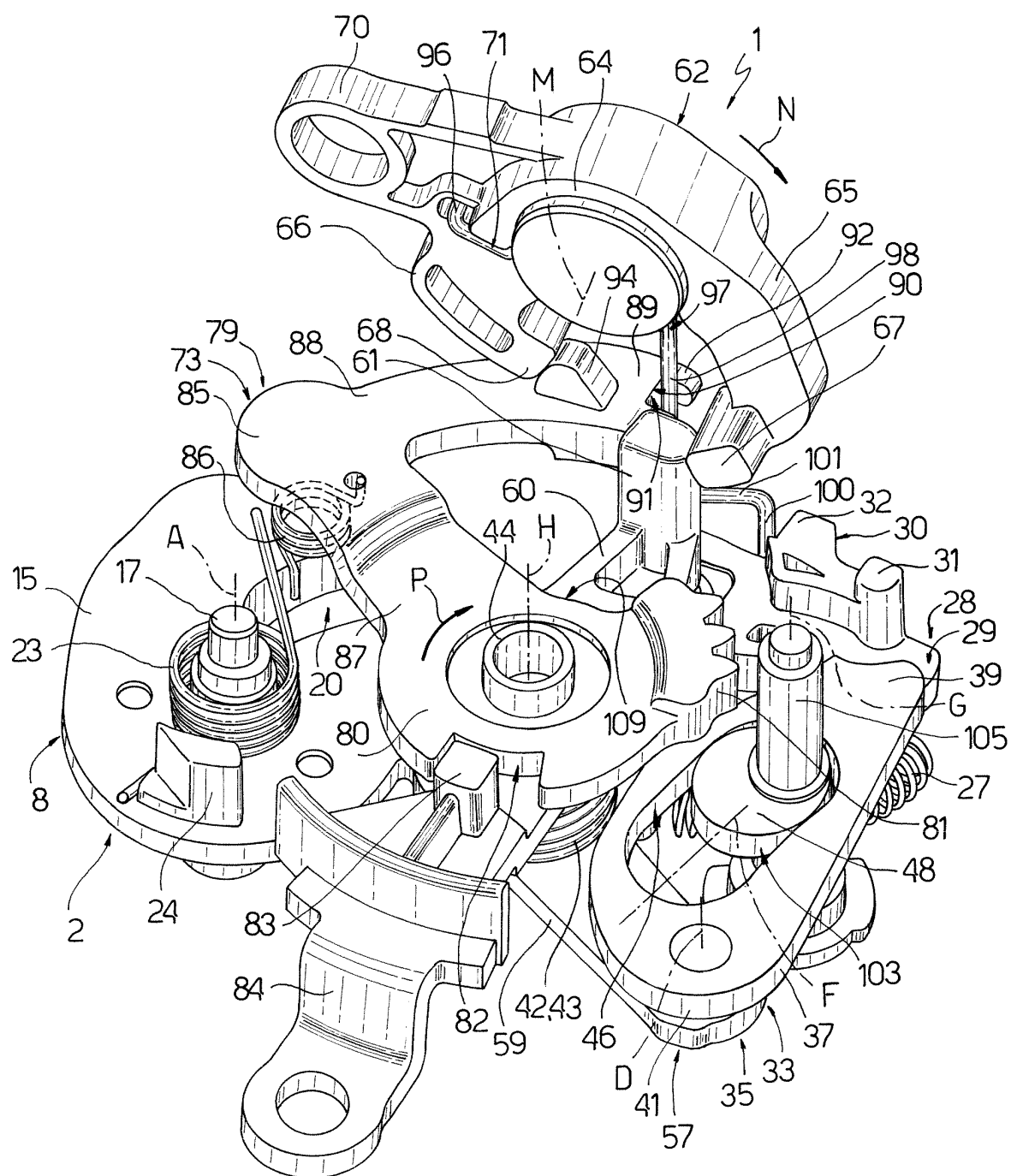


Fig. 3



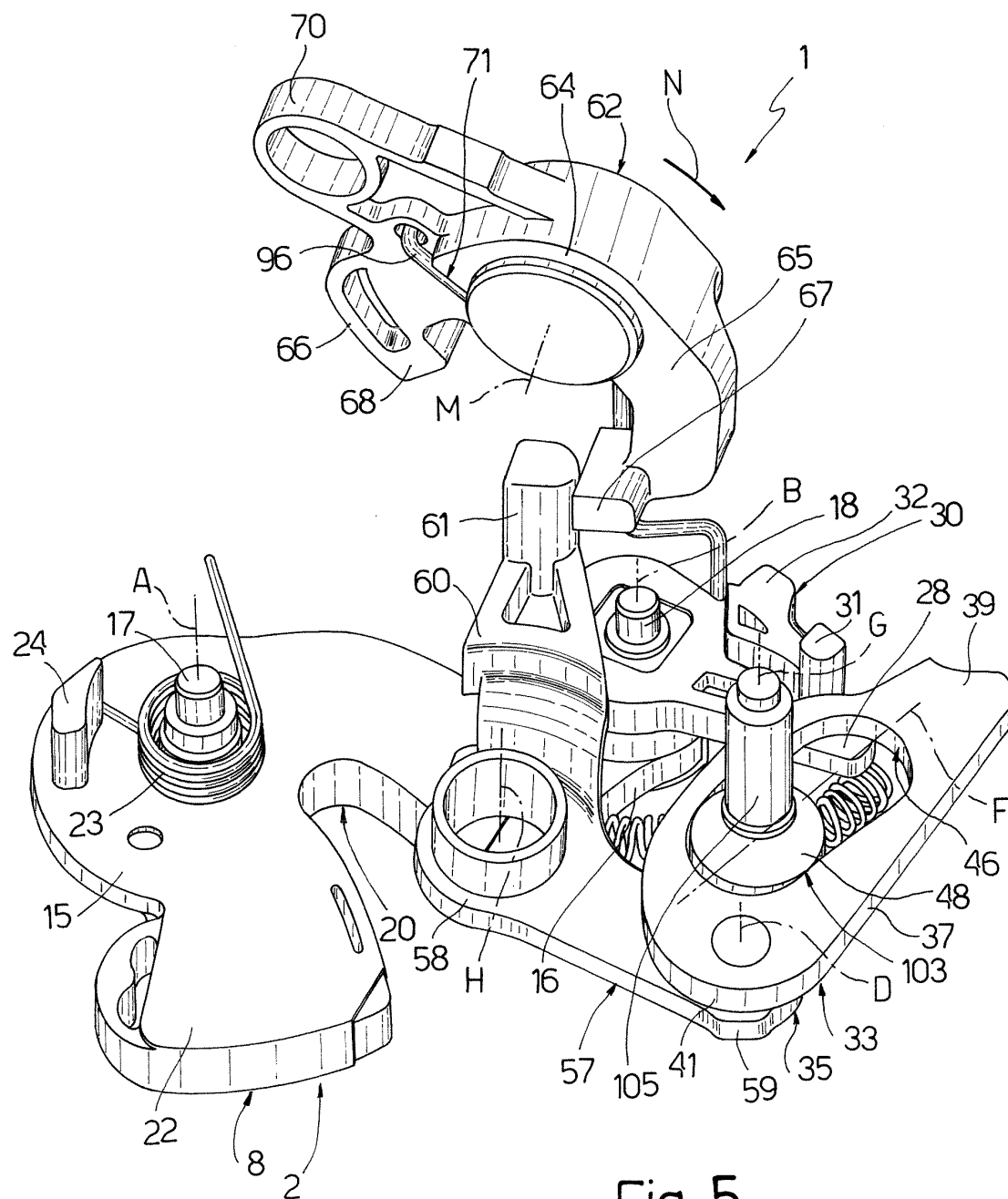


Fig. 5



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EUROPEAN SEARCH REPORT

Application Number
EP 04 10 4505

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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		28 January 2005	Westin, K
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28-01-2005

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