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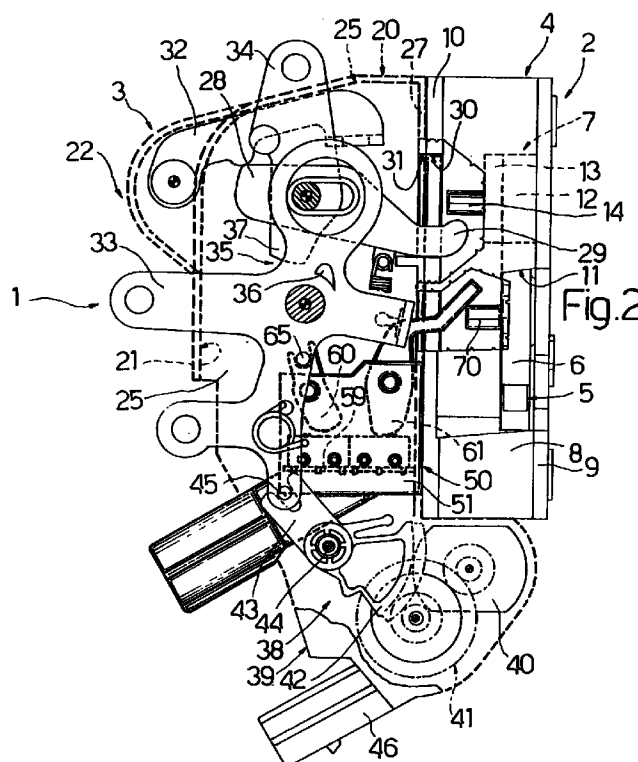
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### (54) Lock for a vehicle door

(57) Lock (1) for a vehicle door, comprising a support body (4, 20), a closure mechanism (5) with a fork (6) and a stop (7), and an actuating mechanism (22) arranged to interact with the closure mechanism (5) and comprising a plurality of levers (32, 33, 34) allowing actuation by means of manual control components associated with the door and at least one exit component (28) arranged to cooperate with the stop (7) to release the fork (6); the lock also comprises a signalling module (50) provided with a plurality of micro switches (52, 53, 54) to define the position of the mechanical components (33, 6) of the lock (1) and comprising a box-type body (51) enclosing the micro switches (52, 53, 54) and the relevant connecting means (59) to an electrical installation on the vehicle.



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## Description

[0001] This invention concerns a motor vehicle door lock.

[0002] It is emphasized that the term "door" is used in this description and in the claims in its very widest sense, to indicate whatsoever moving component between an opening position and a closing position of an access aperture to an internal compartment of a vehicle. The above terms consequently comprise in addition to the side doors of the motor vehicle, which will be referred to in the following without the loss of any general sense, also the hoods or front and rear doors or hatches.

[0003] It is known that closure systems for motor vehicle doors essentially comprise a lock and a striker mounted respectively on the door and on a fixed part of the bodywork in the proximity of the aperture of the door itself (or more rarely, vice versa).

[0004] The lock comprises a closure system arranged to cooperate with the striker in such a way as to achieve a relative locking between the lock and the striker itself when the door is closed.

[0005] The known locks comprise in addition to the closure mechanism, an actuation mechanism which is a coupled with a closure mechanism and comprises a plurality of levers arranged to fulfil the opening and safety functions.

[0006] In the case of a lock for a door, the actuation mechanism comprises in general an opening lever from the inside arranged to be connected with an internal handle on the door, an opening lever from the outside arranged to be connected with an external handle on the door, and a safety kinetic assembly operating by means of a key from the outside of the door and by means of a knob and/or the internal handle from the inside of the door and arranged to assume a set safety position in which the lever for opening from the outside is disabled and consequently any opening by means of the external handle is inhibited, and an invalidated safety position in which the opening by means of the external handle is enabled.

[0007] In vehicles fitted with centralised locking, the actuation mechanism also comprises a door locking actuator and signalling components which define the position of the mechanical components of the lock and generate indicator signals of the said position: as an example, the position of the fork or of components kinetically associated with it to generate an indicator signal of an opening condition or of incomplete closure of the lock, which may be used for a suitable pilot light on the vehicle dashboard, to switch on courtesy lights or to inhibit the centralised locking should one of the doors be open; in addition the enabling and the invalidation of the safety is normally recorded, and the relevant signal actuates to the centralised locking (i.e. the automatic switching of the safety means in the other vehicle locks).

[0008] Locks of the type as described are known, in

which the signalling components are located within the support body and/or envelope of the lock, in close proximity to the components of which the position is to be recorded, within recesses suitably made in the body of the lock. The result is that the various signalling components are generally distant from each other and their connecting cables with the vehicle electrical installation have to be provided; in addition the assembly operations for the signalling components and relevant electrical cables are extensive and costly.

[0009] Finally, since the locking is subject to infiltration of water and dust, failures of the signalling component are not infrequent, and may result in malfunctions of the centralised locking system.

[0010] The purpose of the present invention is to achieve a locking for a vehicle door, which is free from the disadvantages associated with known locks and indicated above.

[0011] The said purpose is achieved by way of the present invention in that it relates to a lock for a vehicle door, of the type comprising:

- a support body;
- a closure mechanism provided with mechanical prevention components arranged to cooperate in a releasable manner with a striker,
- an actuation mechanism comprising a plurality of mechanical actuating components arranged to be controlled from manual controller components associated with the said door and at least an exit component arranged to cooperate with the said closure mechanism to open the said lock,
- recording means for the position of a plurality of the said mechanical components, and
- means of electrical connection of the said recorder means to an electrical installation in the said vehicle, characterized in that it comprises a box-type body within which the said recorder means and the said electrical connecting means are grouped and housed, the said box-type body and the said electrical connecting means forming a pre-assembled signalling module.

[0012] For a better understanding of the present invention a preferred form of operation is described, for the purpose of a non-restrictive example and with reference to appended drawings, wherein:

Fig. 1 is a perspective view of a modular lock created according to the present invention;

Fig. 2 is a side and diagrammatic view of the lock in Fig. 1;

Fig. 3 is a side view of a signalling module for the lock in Fig. 1;

Fig. 4 is a plan view from the top of the signalling module in Fig. 3, partly sectioned along the line IV-IV; and

Fig. 5 is a plan view from the top of the signalling

module in Fig. 3, partly sectioned along line V-V.

**[0013]** With reference to Figs. 1 and 2 the assembly illustrates with reference 1 a lock for a motor vehicle door (not illustrated).

**[0014]** The lock 1 is modular and essentially comprises a closure module 2 and an actuation module 3 allowing assembly of its components to constitute an integrated unit.

**[0015]** The closure module 2 is arranged to be fixed to the said door and to cooperate with a striker (not illustrated), integral with an upright (not illustrated) of the door itself.

**[0016]** More particularly, the closure module 2 essentially comprises an envelope 4 designed to be secured to the aforesaid door, and a closure mechanism 5 housed within the said envelope 4 and comprising in turn, a fork 6, moving between an operative opening position and an operative closure position on the striker, and a stop 7 arranged for snap-connection to the fork 6 to lock it in a releasable manner in the closure position.

**[0017]** The envelope 4 has a prismatic form and is of reduced thickness compared with all other dimensions. The envelope 4 is of "sandwich" structure and consists of an intermediate shell 8 made of plastic material and of a pair of metal base plates 9, 10 having a polygonal form and mounted on opposing parts of the shell 8.

**[0018]** The envelope 4 also has a lateral aperture 11 for inserting the striker, recessed in particular in the shell 8 and in the plate 9.

**[0019]** The fork 6 and the stop 7 are hinged about respective fixed pins (not illustrated) extending between the plates 9, 10, rigidly supported by these, and having respective parallel axes to each other and orthogonal in relation to the plates 9, 10 themselves.

**[0020]** The fork 6 consists of a moulded plate essentially parallel with the plates 9, 10, whereas the stop 7 comprises a locking component 12 arranged to cooperate under spring-loading with the fork 6, and an actuation arm 13, located in a superimposed and angular position coupled to the locking component 12, and carrying as an overhang a projection 14 defining a stop control section 7 itself intended to interact with the actuating module 3.

**[0021]** The actuating module 3 essentially comprises a envelope 20 coupled with envelope 4 and internally defining an aperture 21 and an actuation mechanism 22 housed in the aperture 21 and not described in detail since it does not form part of the present invention.

**[0022]** The envelope 20 is of substantially prismatic structure and has in the same way as envelope 4, a reduced thickness in relation to all other dimensions. The envelope 20, advantageously made of plastic material, consists of a hollow body 23 in which is lodged the actuating mechanism 22 and having a base wall 24 essentially flat and a side wall 25, and a cover 26 essentially flat. The side walls 25 present an essentially flat face 27, defining the larger dimension of the envelope

20.

**[0023]** When the lock 1 is assembled, the envelope 20 is knife-edge-mounted on the envelope 4 with the face 27 in contact with plate 10, in adjacent position to aperture 11.

**[0024]** The actuation mechanism 22 comprises a transmission lever 28 defining an exit component of the mechanism 22 itself and presenting an end section 29 engaging in respective apertures 30, 31 of the face 27 of the envelope 20 and of the plate 10 on the envelope 4 and arranged to cooperate with the closure mechanism 5, and in particular with the projection 14 of the stop 7, to define the decoupling of the stop 7 from the fork 6 and the opening of the lock 1.

**[0025]** The actuation mechanism 22 also comprises a first opening lever 32 which connects with an external handle (not illustrated) of the door and is arranged to cooperate with the lever 28 to open the lock 1 from the outside, a safety lever 33 actuated by means of a key from the outside of the door and by means of a knob and/or an internal handle (not illustrated) from the inside of the door, cooperating with the lever 28 and arranged to assume a connected safety position, in which section 29 of lever 28 is held out of alignment with the projection 14 of the stop 7 inhibiting the opening of the lock 1, and a position of disconnected safety (Fig. 2), in which the section 29 of lever 28 is held in line with the projection 14 of the stop 7 allowing the opening of the lock 1. The actuating mechanism 22 comprises in addition, a second opening lever 34 which connects with the internal handle of the door and is movable along an opening stroke to cooperate by thrust with lever 28 and open the lock 1 from the inside, and means of kinetic connection 35 of the opening lever 34 and the safety lever 33, active during a first portion of the stroke of the opening lever 34, to move the safety lever 33 from the connected safety position into the disconnected safety position; in particular the means of kinetic connection 35 comprise a tooth 36 on the safety lever 33 arranged to be intercepted by a cam portion 37 of the opening lever 34.

**[0026]** The actuation mechanism 22 finally comprises an electrically actuated door lock actuator 38 of known type.

**[0027]** The actuator 38 is housed within a lower portion 39 of the envelope 20, and comprises a reversible electric motor 40, a reducer gearbox 41, having as exit component a toothed segment 42, and a fork-type actuating component 43, integral with the toothed segment 42 and hinged with the latter in common a pin 44. The actuating component 43 cooperates with a dowel 45 carried by the safety lever 33 to displace the latter, after actuation of the motor 40, from the connected safety position to the disconnected safety position.

**[0028]** An electric connector 46, of which the insulating body 47 is integral with the envelope 20, allows the connection of the motor 40 with the vehicle electrical installation.

**[0029]** The lock 1 finally comprises a signalling mod-

ule 50 associated with the actuating module 3.

[0030] With reference to Figs. 2 to 5, the signalling module 50 comprises an oblong box-type body 51 housed within the envelope 20 and envelope a plurality of micro switches 52, 53, 54 to record the position of the mechanical components of the lock 1, as described below.

[0031] The body 51 comprises a hollow section 55 with a base wall 56 essentially flat arranged to come into contact with the face 27 of the envelope 20 and a side wall 57, and an essentially flat cover 58.

[0032] The micro switches 52, 53, 54 are mechanically supported by a printed circuit 59 located within the body 51 in orthogonal relation with the walls 56 and the cover 58 and electrically connected with the printed circuit 59 itself.

[0033] Each micro switch 52, 53, 54 is associated with a respective control lever 60, 61 cooperating with the mechanical component of which the position is to be recorded and hinged on the body 51 about a relative pin 62, 63 integral with the body 51 itself and parallel with the wall 56 and the cover 58.

[0034] More particularly, the micro switch 52 is associated with a first (60) of the above control levers having an arm 64 with a fork pegged to a pin 65 carried by the safety lever 33 and a control arm 66 for the micro switch 52 itself having a cam profile. Micro-switch 52 thus records the position of the safety lever 33 and switches during the stroke of the lever 33 between the connected and the disconnected safety position, in such a way as to generate an electrical signal S1 to actuate the centralised locking operation for all the vehicle locks.

[0035] The micro switches 53, 54 are associated with another of the said control arms (61), which has a shaped arm 67 projecting from the actuation module 3 through an opening 68 in the face 27 and penetrates inside the closure module 2 through an aperture 69 to interact with a dowel 70 carried by the fork 6, and an arm 71 with a fork presenting a prism and a second control branch 72, 73 with regard to the micro switches 53, 54.

[0036] The micro switches 53, 54 thus record the position of the fork 6 and switch in the proximity of the closure position of the fork 6 itself, in such a way as to generate respectively a first and a second electrical signal S2, S3; signal S2 is used to switch on the courtesy lights of the vehicle, whereas signal S3 is used for signalling the non-closed door and/or to inhibit the centralised locking when a lock is not in the closure position.

[0037] The signalling module 50 also presents an electrical connector 74 to connect the printed circuit 59 with the electrical installation of the vehicle. The connector 74 comprises an insulating body 75 extending integrally with the body 51, projecting outside the envelope 20, in an essentially parallel position with the connector 46 of actuator 38, through an opening 76 in the envelope 20 itself.

[0038] In service as resulting from the description pre-

viously given the displacement of the safety lever 33 from the disconnected safety position into the connected safety position determines by way of the interaction of the dowel 65 with the arm 64, the rotation of the control lever 60 about the pin 62; that rotation switches the micro switch 52 and thereby generates the electrical signal S1 to actuate the centralised locking of all vehicle locks.

[0039] Similarly, the displacement of the fork 6 from the closure position to the opening position determines by way of the interaction of the dowel 70 with the arm 67, the rotation of the control lever 61 about the pin 63; that rotation switches the micro switches 53, 54 so that the electrical signals S3, S4 are generated to determine the switching on of the courtesy lights in the vehicle and the switching on of a suitable pilot light on the vehicle dashboard; in addition the signal S3 may be used also to inhibit the centralised locking when a lock on the vehicle is not in the closure position.

[0040] Following an examination of the characteristics of the lock 1 the advantages that may be obtained by it become evident.

[0041] In particular, since the various signalling components (52, 53, 54, 59) are all grouped inside the body 51 and form with it a preassembled module (50), the electrical wiring for the connection of each signalling component with the vehicle electrical installation may be grouped into a single bundle projecting from the body 51 itself through electrical connector 74; the assembly operation for the signalling module 50 on the lock 1 can thus be particularly speedy, in that it suffices to insert the signalling module 50 itself inside the envelope 20 in a predetermined position to ensure correct interaction of the arms 64, 67 of levers 60, 61 with relative dowels 65, 70.

[0042] In addition the fact that the signalling components are located within the body 51, which in turn is located inside the envelope 20, ensures an extensive protection of the signalling components themselves against the infiltration of water and dust inside the lock 1.

[0043] Finally it will be clear that the lock 1 as described allows modifications and variations not exceeding the scope of the lesson of the present invention.

## Claims

### 1. Lock for a vehicle door, of the type comprising:

- a support body (4, 20);
- a closure mechanism (5) provided with mechanical locking components (6, 7) arranged to cooperate in a releasable manner with a striker,
- an actuation component (22) comprising a plurality of mechanical actuating components (32, 33, 34) arranged for control by manual control

- components associated with the said door and at least an exit component (28) able to cooperate with the said closure mechanism (5) to open the said lock (1);
- recording means (52, 53, 54) of the position of a plurality (33, 6) of the said mechanical components (6, 32, 33, 34), and
  - electrical connecting means (59) for the said recording means (52, 53, 54) to an electrical installation of the said vehicle, characterized by the fact that it comprises a box-like body (51) wherein the said recorder means (52, 53, 54) and the said electrical connecting means (59) are grouped and housed, the said box-like body (51) and the said electrical connection means (59) forming a pre-assembly signalling module (50).
2. Lock according to claim 1, characterized in that the said recorder means comprise a plurality of micro switches (52, 53, 54), and the said electrical connection means comprise a printed circuit (59) including and connecting the said micro switches (52, 53, 54), the said signalling module (50) comprising an electrical connector (74) to connect the said printed circuit (59) with the electrical installation of the said vehicle.
  3. Lock according to claim 2, characterized in that the said signalling module (50) comprises a plurality of control levers (60, 61) hinged on the said box-like body (51) and each cooperating with a relative item of the said plurality of mechanical components (33, 6) and with at least one relative item of the said micro switches (52, 53, 54) to generate a corresponding electrical signal (S1, S2, S3).
  4. Lock according to claim 3, characterized in that each said control lever (60, 61) comprises an interaction arm (64, 67) cooperating with the relative said mechanical component (33, 6) and a control arm (66, 71) of the said relative micro switch (52, 53, 54).
  5. Lock according to claim 3 or 4, characterized in that the said mechanical locking components (6, 7) comprise a fork (6) moving between two operational positions, respectively for opening and closing on to the said striker, and that the said mechanical actuating components (32, 33, 34) comprise moving safety means (33) between a position of connected safety, in which the opening of the door from the outside of the said vehicle is invalidated, and a position of disconnected safety in which the opening of the said door from the outside of the said vehicle is enabled, the said signalling module (50) comprising a first and a second of the said control levers (60, 61) cooperating with respective checking means (70, 65) carried by the said safety means (33) and by the said fork (6).
  6. Lock according to claim 5, characterized in that the said safety means comprise a single safety lever (33), and in that the said checking means comprise respective dowels (65, 70) carried by the said safety lever (33) and by the said fork (6).
  7. Lock according to claim 6, characterized in that the said actuating mechanism (22) comprises a door lock actuator (38), and in that the first control lever (60) is associated with at least one of the said micro switches (52), which switches during the movement of the said safety lever (33) between the positions of connected safety and disconnected safety to generate a relative said actuation signal (S1) for the centralised locking of all of the vehicle locks.
  8. Lock according to one or other of claims 5 to 7, characterized in that the second control lever (61) is associated with at least two of the said micro switches (53, 54), which switch in the proximity of the said closure position of the said fork (6) to generate respective electrical signals (S2, S3) to signal an unclosed door and, respectively to switch on the courtesy lights of the said vehicle.
  9. Lock according to one or other of claims 3 to 8, characterized in that the said support body comprises a first and a second support and location envelope (4, 20) respectively of the said closure mechanism (5) and of the said actuation mechanism (22), interconnected together, the said box-like body (51) of the said signalling module (50) being housed inside the second envelope (20), the first and second envelope (4, 20) having respective apertures (69, 68) to allow the interaction of the said second control lever (61) with the said fork (6).

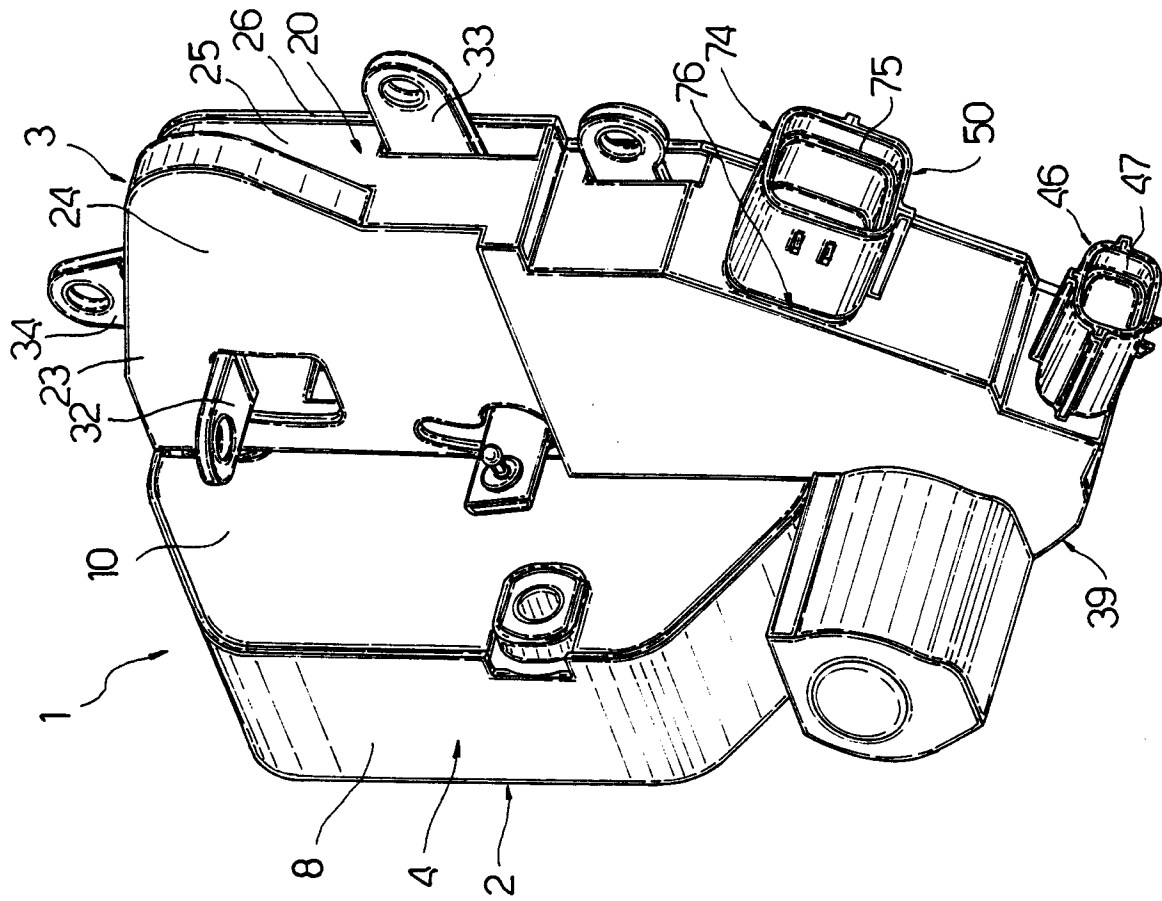
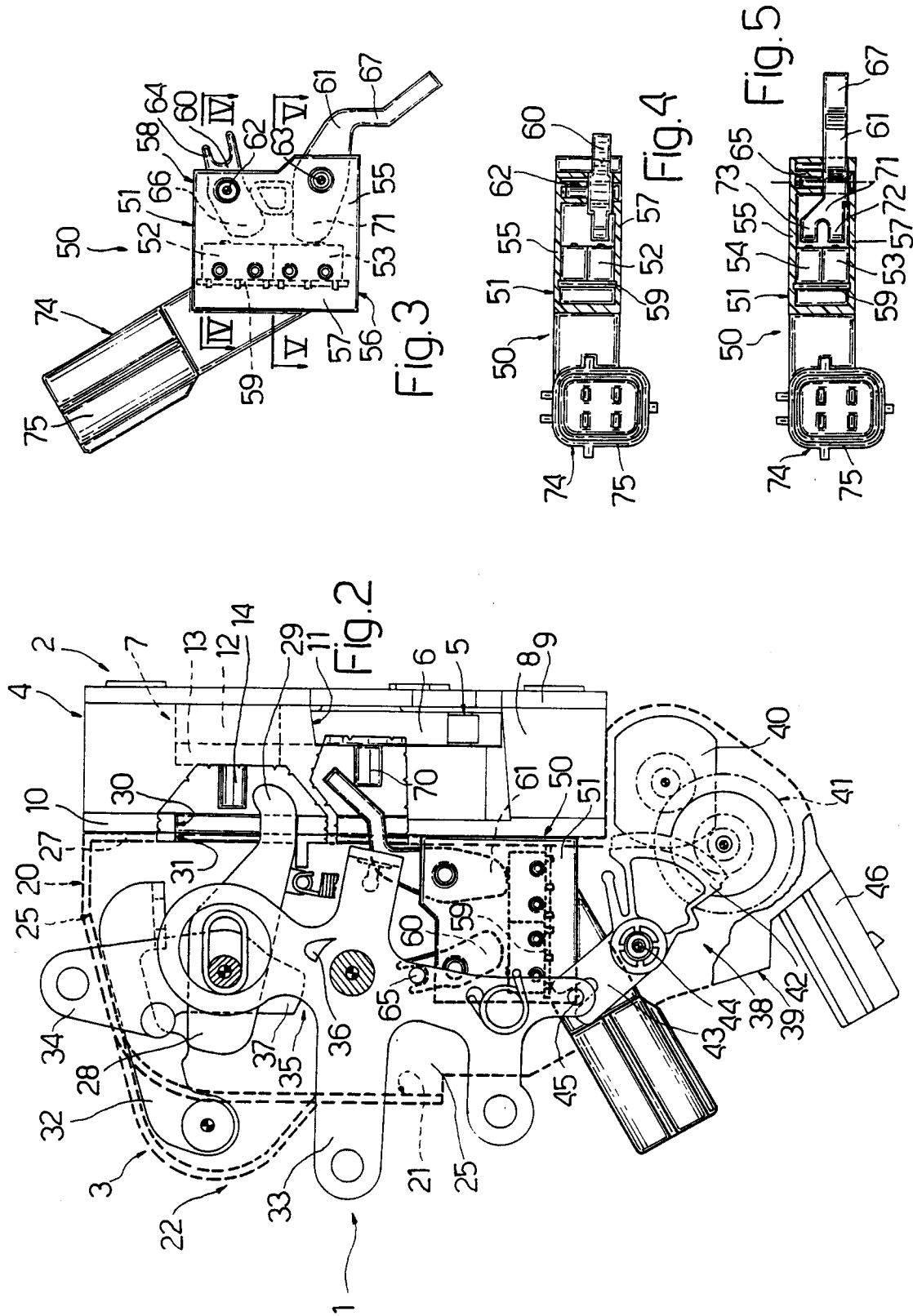


Fig.1





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# EUROPEAN SEARCH REPORT

Application Number  
EP 98 11 4297

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	GB 2 264 392 A (ROCKWELL AUTOMOTIVE BODY SYST) 25 August 1993	1-3,5,7	E05B17/22
Y	* page 2, line 9 - page 8, line 22; figures *	4,8,9	
X	EP 0 686 745 A (GEN MOTORS CORP) 13 December 1995	1,2	
A	* column 2, line 33 - column 7, line 13; figures *	5-8	
X	US 3 747 379 A (CABANES A) 24 July 1973	1	
Y	* column 3, line 22 - column 5, line 24 *	4	
A	* figures *	3,5,7	
X	DE 44 43 564 A (EATON CONTROLS GMBH) 13 June 1996	1	
Y	GB 2 309 481 A (CHEVALIER JOHN PHILLIP) 30 July 1997	8	
Y	DE 196 22 028 A (MITSUI MINING & SMELTING CO) 5 December 1996	9	
	* column 2, line 35 - column 5, line 24; figures 3,4 *		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			E05B
Place of search		Date of completion of the search	Examiner
THE HAGUE		18 November 1998	Westin, K
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