

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 524 574 A1

(12)

EUROPEAN PATENT APPLICATION(21) Application number: **92112346.9**(51) Int. Cl.⁵: **E05B 47/00**(22) Date of filing: **20.07.92**(30) Priority: **23.07.91 IT TO910580**(43) Date of publication of application:
27.01.93 Bulletin 93/04(84) Designated Contracting States:
DE ES FR GB(71) Applicant: **ROLTRA-MORSE S.p.A.**
Via Albenga, 9
I-10090 Cascine Vica-Rivoli(IT)(72) Inventor: **Ottino, Franco Giovanni**
Via Ippolito Nievo, 8
56017 San Giuliano Terme(IT)
Inventor: **Bigazzi, Luca**
Via Gramsci, 64
56038 Ponsacco(IT)(74) Representative: **Plebani, Rinaldo et al**
c/o Studio Torta, Via Viotti 9
I-10121 Torino(IT)(54) **Actuating device, particularly for activating the safety lever of a vehicle door lock.**

(57) An actuating device (1), particularly for activating the safety lever (2) of a vehicle door lock (3), defined by a fork-shaped lever (45) connectable to the safety lever (2); an electric motor (13); and a gear mechanism (14) located between the electric motor (13) and the fork-shaped lever (45); the gear mechanism (14) being housed inside a casing (4), and presenting a sector gear (25) pivoting on the casing (4) so as to rotate in relation to the same about an axis (26) coincident with the rotation axis of the fork-shaped lever (45), and connected integral with the lever (45) on one side, and angularly to the output shaft of the electric motor (13) on the other.

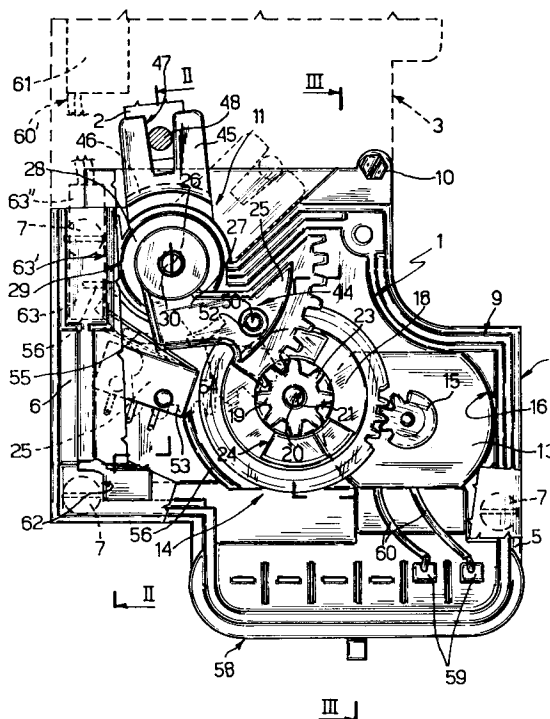


Fig. 1

EP 0 524 574 A1

The present invention relates to an actuating device, particularly for activating the safety lever of a vehicle door lock.

In most applications of the aforementioned type, the actuating device comprises control means connectable to the safety lever on the lock; an electric motor for powering the control means; and a gear mechanism located between the electric motor and the control means, and comprising a reduction unit and a rack. The control means, normally consisting of a fork element connectable to the safety lever, are connected to the rack, which is normally connected to a guide so as to move between two limit positions wherein the safety lever is respectively locked and released.

Though widely used, known devices of the type briefly described above present several drawbacks, foremost of which is the relatively poor mechanical efficiency and dynamic performance of the gear mechanism due to the rack being connected in sliding manner to the guide. A sliding connection in fact requires considerable force for activating the moving element and overcoming friction and inertia at the more critical, i.e. breakaway, stage, thus requiring the use of a relatively high-power electric motor, which poses serious design problems for enabling manual operation of the safety lever in the event of failure of the electric motor. In the majority of cases, manual operation is assisted by providing the gear mechanism with systems for disconnecting and so preventing operation of the actuating device when manually operating the safety lever.

A further drawback of known devices of the aforementioned type is that they are fairly noisy.

It is an object of the present invention to provide an actuating device, particularly for activating the safety lever of a vehicle door lock, designed to overcome the aforementioned drawbacks, and which, in particular, is cheap and easy to produce, and provides for troublefree manual operation of the safety lever in the event of failure of the actuating device itself.

According to the present invention, there is provided an actuating device, particularly for activating the safety lever of a vehicle door lock, comprising a control element connectable to the safety lever on the lock; an electric motor for powering said control element; and a gear mechanism located between said electric motor and said control element and housed inside a casing supporting the actuating device adjacent to said lock; characterized by the fact that said gear mechanism comprises a sector gear located between said control element and said electric motor and pivoting on said casing so as to rotate in relation to the same; said sector gear being connected angularly to said electric motor; and said control element being con-

nected in angularly fixed manner to, and rotating together with, said sector gear.

A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Fig.1 shows a side view, with parts removed for clarity, of a preferred embodiment of the actuating device according to the present invention;

Fig.2 shows a section along line II-II in Fig.1;

Fig.3 shows a section along line III-III in Fig.1, with parts removed for clarity;

Fig.4 shows the same view as in Fig.3 of a variation of a detail on the Fig.1 device;

Fig.5 shows an exploded section along line V-V in Fig.4.

Number 1 in Fig.s 1 to 3 indicates an actuating device for activating the safety lever 2 of a vehicle door lock 3.

Device 1 is housed inside a casing 4 comprising two portions 5 and 6 connected by means of a number of screws 7 and the peripheral annular contacting portion of which defines a labyrinth seal 9. Casing 4 is connected to lock 3 in a predetermined position, preferably by means of two screws 10 (only one of which is shown in Fig.1), or, according to a variation not shown, is fitted firmly to lock 3 by means of a snap-on connecting device.

As shown in Fig.s 1 and 2, device 1 comprises a control element 11 connectable to safety lever 2; an electric motor 13 for powering element 11; and a gear mechanism 14 located between motor 13 and control element 11.

With reference to Fig.1, mechanism 14 comprises a pinion 15 fitted to the output shaft of motor 13, which is housed inside a cavity 16 defined by portion 5 of casing 4; and an intermediate gear 18 (Fig.s 1 and 3) meshing with pinion 15 and mounted for rotation about a cylindrical body 19. As shown in Fig.3, cylindrical body 19 is mounted for rotation in relation to casing 4 by means of a pin 20 force-fitted inside a through hole 21 coaxial with cylindrical body 19, and the opposite ends of which project outwards of body 19 and engage, in rotary manner, respective seats 22 formed in portions 5 and 6 of casing 4.

Again with reference to Fig.3, between portion 6 of casing 4 and intermediate gear 18, cylindrical body 19 presents a further gear 23 coaxial with pin 20 and secured angularly to intermediate gear 18 via a known butterfly face coupling 24 (not described) enabling predetermined relative rotation of gear 23 and intermediate gear 18.

As shown in Fig.1, mechanism 14 also comprises a sector gear 25 meshing with gear 23 and secured to casing 4 so as to rotate in relation to the same about an axis 26 coincident with the axis of rotation of control element 11. More specifically (Fig.2), sector gear 25 is connected by an elbow 27

to the intermediate portion 28 of a pin 29 parallel to pin 20 and also comprising two end portions 30 and 31; portion 30 engaging in rotary manner a seat 33 formed in portion 6 of casing 4; and portion 31 extending outwards of casing 4 through a hole 34 engaged loosely by portion 31 and formed in a recess 35 on portion 5 of casing 4.

Again with reference to Fig.2, portion 31 is fitted in angularly fixed manner with the end portion 37 of control element 11, which is substantially Z-shaped. More specifically, a free end portion 38 of portion 31 presents two diametrically-opposed flat milled portions 39, and engages a seat 40 formed in end portion 37 of control element 11 and so shaped as to define two flat surfaces interacting with milled portions 39. Control element 11 is also secured axially in relation to pin 29 by a screw 42 extending through a hole 43 formed in end portion 37 of control element 11 and coaxial with seat 40, and engaging a threaded hole 44 formed in pin 29.

As shown in Fig.2 and particularly Fig.1, in addition to end portion 37, control element 11 also comprises a fork-shaped lever 45 extending outwards of casing 4 and made integral with portion 37 by a wall 46 also extending outwards of casing 4 and defined, on the side facing casing 4, by a curved surface having its concave side facing pin 29. Lever 45 extends outwards of casing 4 substantially on the opposite side of intermediate portion 28 of pin 29 as compared with elbow 27, and presents a substantially V-shaped opening 47 extending substantially perpendicularly to pin 29, with its concavity facing safety lever 2. Lever 2 comprises a pin 48 extending through and engaging in sliding manner opening 47, so as to angularly secure lever 45 to lever 2 of lock 3.

Finally, as shown in Figs 1 and 2, device 1 comprises a limit stop device 49 for limiting rotation of sector gear 25 and lever 45 to a first and second limit position wherein the safety lever is respectively locked and released, as shown by the dotted and continuous lines respectively in Fig.1. More specifically, limit stop device 49 comprises a cylindrical projection 50 integral with sector gear 25, extending on the opposite side of sector gear 25 as compared with intermediate gear 18, and cooperating, in use, with substantially semicylindrical walls 51 (Fig.2) integral with an inner surface of portion 6 of casing 4 extending towards sector gear 25. For cushioning the impact between projection 50 and walls 51, as sector gear 25 switches from one to the other of said limit positions, projection 50 is fitted with an elastomeric shock absorber 52.

As shown in Fig.1, device 1 comprises a microswitch 53 adjacent to intermediate gear 18 and pin 29, and activated by an appendix 54 (Fig.2) integral with elbow 27, extending on the opposite side of

elbow 27 as compared with projection 50, and cooperating with the control lever 55 of microswitch 53. When activated by appendix 54, microswitch 53 provides for supplying a position signal to a timed control system (not shown) for switching the polarity of electric motor 13 and so inverting motor 13 and, consequently, rotation of sector gear 25. To prevent external pollutants from contacting microswitch 53, the parts facing pin 29 and intermediate gear 18 are protected by two walls 56 integral with portion 5 of casing 4, substantially surrounding pin 29 and partially surrounding intermediate gear 18, and extending below elbow 27.

As shown in Figs 1 and 3, casing 4 is so formed as to define a first electric connector 58 comprising first terminals 59 of wiring 60 of motor 13, and second terminals (not shown) of wiring 60' of a device 61 (Fig.1) for detecting imperfect closure of lock 3. More specifically, wiring 60' comprises a first number of electric cables (not shown) having one end connected to the terminals (not shown) integral with connector 58, extending outwards of casing 4 through an opening 62 (Fig.1) in portion 6, and having the opposite end integral with a first intermediate connector 63 housed inside a seat 63' in portion 6 of casing 4. Wiring 60' also comprises a second number of electric cables having one end connected to a second intermediate connector 63'' connectable in releasable manner to first intermediate connector 63 integral with casing 4, and the opposite end connected to detecting device 61.

According to the variation shown in Figs 4 and 5, detecting device 61 comprises wiring 64 (shown partially) without intermediate connectors 63 and 63'', extending entirely outside casing 4, and terminating in a connector 65 having terminals 66 and designed to click inside a seat 67 in portion 6 of casing 4. Seat 67 is formed next to connector 58 housing terminals 59 of motor 13, and is substantially parallel to the longitudinal axis of connector 58, so that, when connected, terminals 66 of device 61 are substantially parallel to those of motor 13. More specifically (Fig.5), connector 65 of device 61 comprises a first terminal 69 projecting outwards of connector 65; and a second terminal 70 inside connector 65 and defining a seat 71 for the end portion 72 of a metal element 73 substantially similar to first terminal 69 and fitted firmly to connector 58 integral with casing 4.

In actual use, assuming all the electric connections have been made, and safety lever 2 of lock 3 is set to the release position shown by the continuous line in Fig.1, operation of electric motor 13 results in clockwise rotation of pinion 15 fitted to its output shaft, and in rotation of intermediate gear 18, which, by virtue of being secured angularly, as opposed to fitted, to cylindrical body 19 by face

coupling 24, initially rotates idly about body 19 long enough to bring motor 13 up to substantially normal operating speed. Subsequently, face coupling 24 renders intermediate gear 18 angularly fixed in relation to cylindrical body 19 and, consequently, integral with gear 23 formed on body 19 and meshing with sector gear 25, which thus moves from the limit position shown by the continuous line to that shown by the dotted line in Fig.1. For the reasons already stated, rotation of sector gear 25 results in similar clockwise rotation of lever 45, which moves safety lever 2 into the locked position wherein projection 50 forming part of limit stop device 49 of sector gear 25 contacts semicylindrical wall 51 on casing 4, thus limiting clockwise rotation of sector gear 25; and appendix 54 integral with elbow 27 cooperates with control lever 55 of microswitch 53, which supplies a position signal to the timed control system (not shown), which in turn provides for inverting in known manner the polarity of electric motor 13. A further control signal supplied to the control system by the user provides for activating motor 13 in the opposite direction, and for resetting safety lever 2 to the released position, at which point the original operating conditions, pending further operation of safety lever 2, are restored by the control system.

The advantages of actuating device 1 according to the present invention will be clear from the foregoing description. In particular, it provides for enhanced mechanical efficiency of gear mechanism 14, thus enabling the use of smaller, low-power electric motors 13.

Secondly, it is extremely straightforward in design, and provides for a high degree of reliability. The design of gear mechanism 14 in particular provides for troublefree manual operation of safety lever 2 in the event of failure of electric motor 13, by virtue of all the components of mechanism 14 being connected in rotary manner to the supporting structure, thus greatly reducing friction as compared with sliding components, and enabling the elimination of systems for disconnecting and preventing operation of actuating device 1 when manually operating safety lever 2.

Thirdly, the design of control element 11, in particular the fact that it is formed in two separate parts, provides for safeguarding against external pollutants by eliminating the need for an opening in casing 4 for enabling rotation of lever 45.

Fourthly, electric connector 58, integral with casing 4 and fitted with the terminals of electric motor 13, microswitch 53 and open-door detecting device 61, enables the above to be connected to the vehicle wiring system (not shown) in one single operation, preferably by means of robots, with no need for skilled labour.

Finally, the reliability of device 1 is further

enhanced by labyrinth seal 9 formed along the mating edge of portions 5 and 6 of casing 4, and by walls 56 safeguarding microswitch 53 from external pollution.

To those skilled in the art it will be clear that changes may be made to actuating device 1 as described and illustrated herein without, however, departing from the scope of the present invention. For example, sector gear 25 may be replaced by a normal gear; and the angular position of lever 45 may be determined by detectors mounted on pin 29 supporting sector gear 25.

Claims

1. An actuating device (1), particularly for activating the safety lever (2) of a vehicle door lock (3), comprising a control element (11) connectable to the safety lever (2) on the lock (3); an electric motor (13) for powering said control element (11); and a gear mechanism (14) located between said electric motor (13) and said control element (11) and housed inside a casing (4) supporting the actuating device (1) adjacent to said lock (3); characterized by the fact that said gear mechanism (14) comprises a sector gear (25) located between said control element (11) and said electric motor (13) and pivoting on said casing (4) so as to rotate in relation to the same; said sector gear (25) being connected angularly to said electric motor (13); and said control element (11) being connected in angularly fixed manner to, and rotating together with, said sector gear (25).
2. An actuating device as claimed in Claim 1, characterized by the fact that said sector gear (25) is connected integral with a pin (29) pivoting on said casing (4) so as to rotate about an axis (26) coincident with the rotation axis of said control element (11); said pin (29) presenting an end portion (31) extending outwards of said casing (4) through an opening (34) formed in the same; and said control element (11) being firmly connected to said end portion (31).
3. An actuating device as claimed in Claim 2, characterized by the fact that said control element (11) is substantially Z-shaped, and comprises an end portion (37) extending outwards of said casing (4) and having an axial seat (40) engaged by the end portion (31) of said pin (29); a fork-shaped lever (45) extending outwards of said casing (4) and substantially on the opposite side of said pin (29) as compared with said sector gear (25); and a wall (46) connecting said end portion (37) to said lever

(45); said lever (45) having an opening (47) engaged in sliding manner, in use, by a projection (48) on said safety lever (2) of said lock (3).

4. An actuating device as claimed in Claim 2, characterized by the fact that said sector gear (25) is connected to said pin (29) by an elbow (27), and is fitted integral with a projection (50) extending towards said casing (4) and cooperating with contact surfaces (51) on said casing (4) for defining respective limit positions of said sector gear (25).

5. An actuating device as claimed in any one of the foregoing Claims, characterized by the fact that said casing (4) defines a connector (58) having electric terminals for the wiring (60) of said electric motor (13), for the wiring (60'; 64) of a device (61) for detecting imperfect closure of said lock (3), and for an element (53) for detecting the angular position of said sector gear (25) in relation to said casing (4).

6. An actuating device as claimed in Claim 5, characterized by the fact that said wiring (60') of said device (61) for detecting imperfect closure of said lock (3) extends at least partially inside said casing (4), and comprises intermediate connecting means (63, 63''); said intermediate connecting means (63, 63'') comprising a first connector (63) engaging a seat (63') formed in said casing (4); and a second connector (63'') mating in releasable manner with said first connector (63).

7. An actuating device as claimed in Claim 5, characterized by the fact that said casing (4) presents a seat (67) formed next to said connector (58) integral with said casing (4) and substantially parallel to the longitudinal axis of said connector (58); said wiring (64) of said detecting device (61) extending outside said casing (4) and comprising electric terminals (66) on a connector (65) designed to click inside said seat (67) so that said terminals (66) are substantially parallel to the terminals (59) of said electric motor (13).

8. An actuating device as claimed in Claim 4, characterized by the fact that said casing (4) consists of at least two portions (5, 6) connected by a number of screws (7) and the peripheral annular contacting portion of which defines a labyrinth seal (9); said element (53) for detecting the angular position of said sector gear (25) being a microswitch connected to one (5) of said portions (5, 6) and protected by

two walls (56) integral with said portion (5) and substantially surrounding said pin (29) and at least part of said gear mechanism (14); said sector gear (25) comprising an appendix (54) extending from the opposite side of said elbow (27) as compared with said projection (50) and cooperating with a lever (55) for controlling said microswitch (53).

9. An actuating device as claimed in any one of the foregoing Claims, characterized by the fact that said casing (4) is connected to said lock (3) in a predetermined position by means of two screws (10).

10. An actuating device as claimed in any one of the foregoing Claims, characterized by the fact that said casing (4) is connected to said lock (3) by means of a snap-on connecting device.

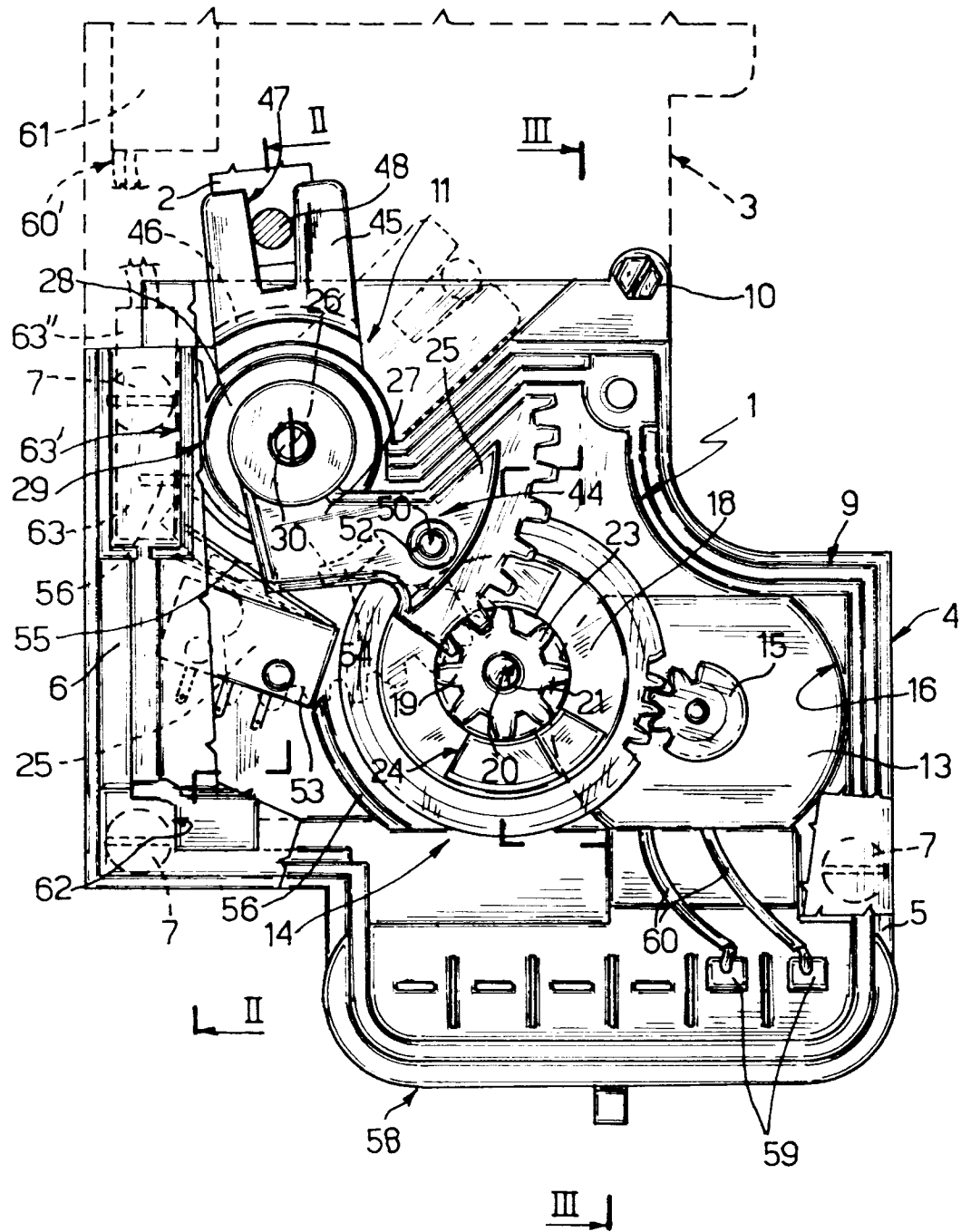


Fig. 1

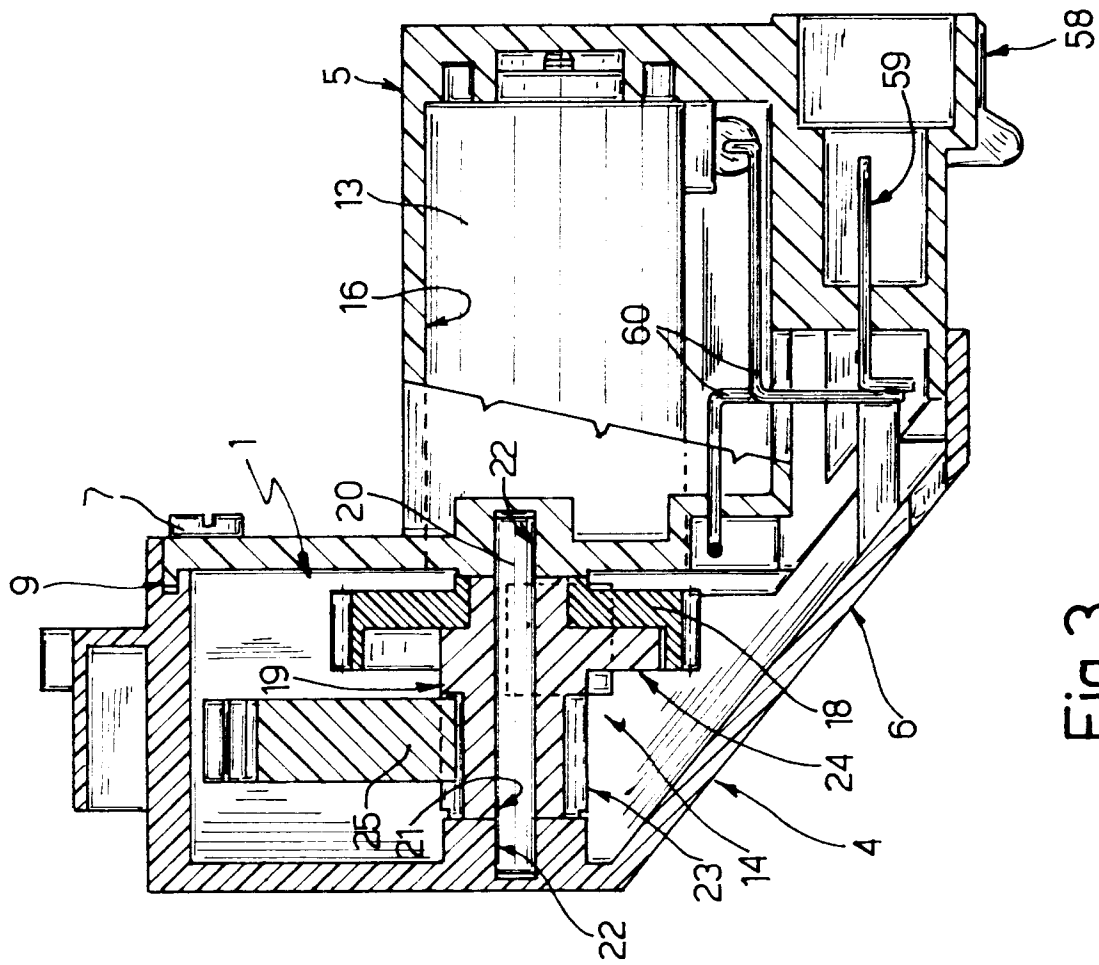


Fig. 2

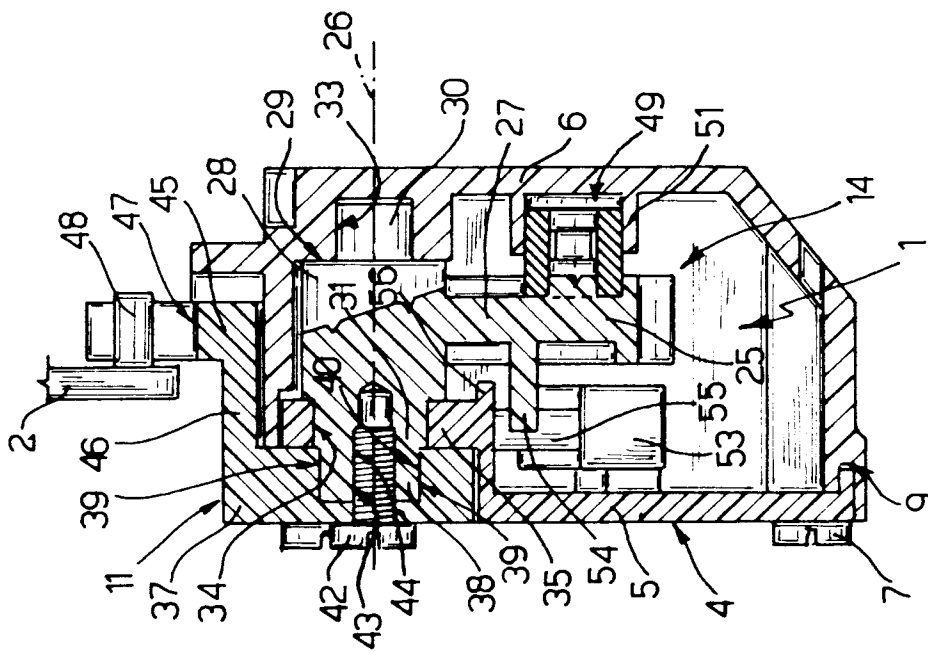


Fig. 3

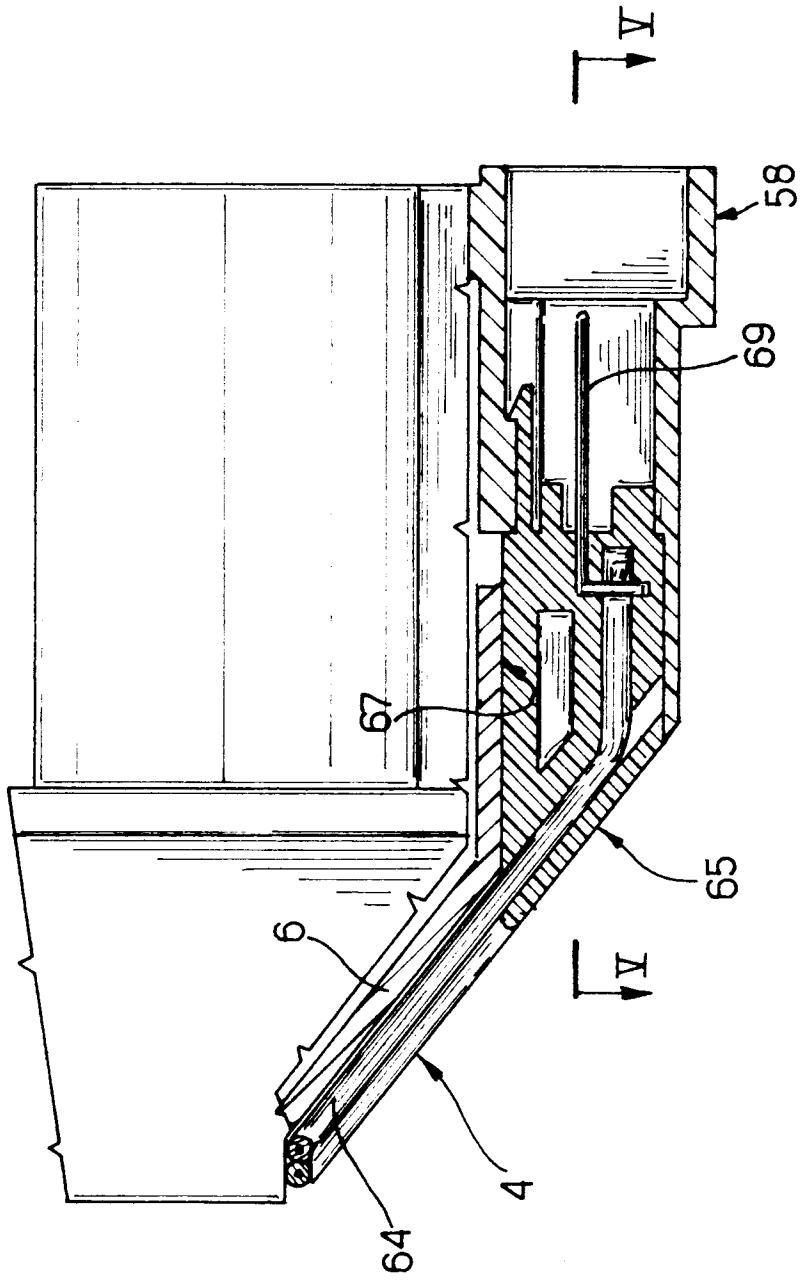


Fig. 4

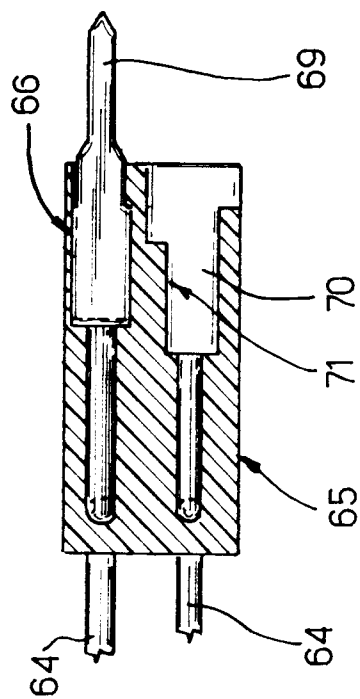
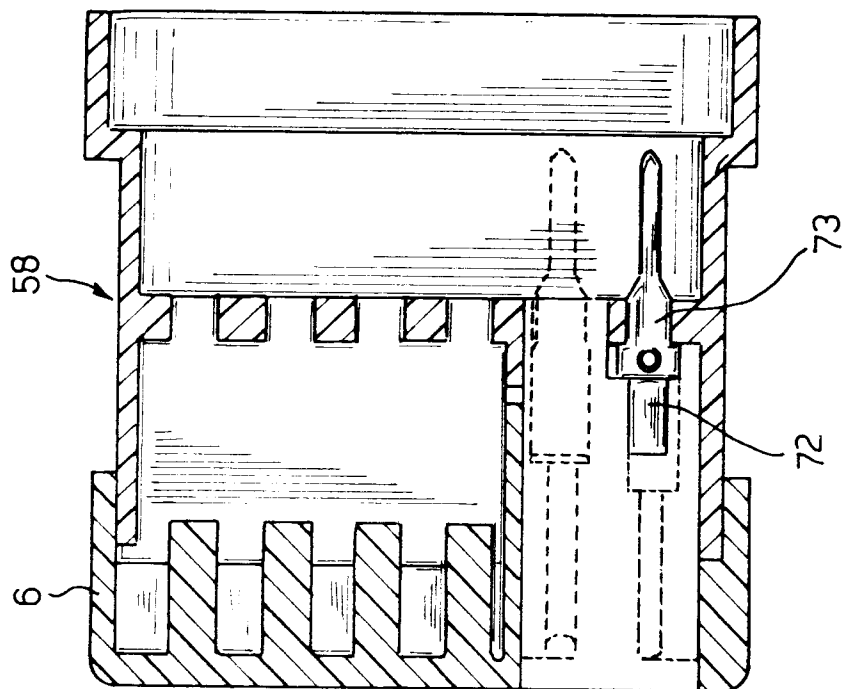


Fig. 5



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number

EP 92 11 2346

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.5)
X	EP-A-0 064 602 (NISSAN)	1,2,4, 8-10	E05B47/00
A	* page 6, line 5 - page 7, line 27 *	5-7	

X	DE-A-3 941 352 (NISSAN)	1-3	
	* column 3 *		

A	FR-A-2 656 030 (VACHETTE)	5-7	
	* page 7, line 26 - page 8, line 22 *		

The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			E05B
Place of search THE HAGUE		Date of completion of the search 15 OCTOBER 1992	Examiner GERARD B.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			