

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

(51) Int Cl.7: H01H 3/16

27.06.2001

Bulletin 2001/26

(21) Application number: 00103013.9

(22) Date of filing: 15.02.2000

(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	(72) Inventor: Ganado, Steve Leone Balzan (MT) (74) Representative: Haft, Uwe Michael, Dipl.-Phys. Patentanwälte Haft, von Puttkamer Berngruber, Czybulka Franziskanerstrasse 38 81669 München (DE)
(30) Priority: 21.12.1999 DE 19961600	
(71) Applicant: Methode Electronics Malta Ltd. Mriehel QRM 09 (MT)	

(54)

Switch, in particular self-adjusting pedal-box switch

(57) The switch (1) serves in particular to monitor the adjustment of brake or clutch pedals for vehicles. It has facilities for self-adjustment, with protection, when the switch is installed into a pedal-box carrier (2) that is mounted perpendicular to the pivot plane of a spindle (3) and above the moveable pedal body (4). The switch (1) has a housing (6) with fixed contacts (7) that are connected to terminals (7a) on the side of the switch housing. In the switch housing (6) is a moveable contact bridge carrier (8), which pivots on a spindle (9) when the switch is installed and which is positioned parallel to the pivot bearing spindle (3) of the pedal body (4). The contact bridge carrier (8) in the switch housing (6) is constructed in two parts, consisting of a rotor (11) with a contact bridge (12), which is located in the switch housing (6) and rotates against the force of a return spring (10), and a swivel plunger (13), which can be adjusted

incrementally and which is pivoted on the same spindle (9) as the rotor (11) and works together with the shaft (5) of the pedal body (4) or with a pedal flag attached to the pedal body (4). When the switch (1) is mounted in the pedal box carrier (2), external stops (14) on the rotor (11) that are perpendicular to the direction of movement of the rotor (11), work together with the moveable locking pins (15) to lock the rotor (11) until just before the switch reaches its final installed position. When the switch is inserted into the U-shaped mounting slot (16) in the pedal box carrier (2), the locking pins (15) on the switch housing (6) are held in a locked position by the edges of the slot, and are released by the clearance notches (16a) in the mounting slot when the switch is in its final installed position. While the rotor (11) is locked, the plunger (13) is forced by the pedal flag or pedal body to index incrementally by means of indexing pin (25) into the rotor's ratchet teeth (24).

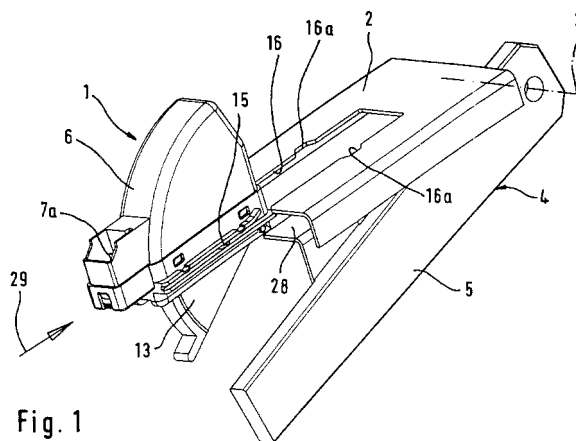


Fig. 1

Description

[0001] The device concerns a switch, in particular a self-adjusting pedal-box switch, with facilities for self-adjustment of the switch during mounting, and with adjustment protection. The switch is inserted into a pedal box panel above the pedal shaft, and perpendicular to the plane of the pivot bearing of the moveable foot-pedal body.

[0002] During vehicle assembly, when installing switches which are used in particular to monitor the positioning of clutch or brake pedals and as brake light switches, many problems occur with the adjustment needed to ensure correct operation. This applies in particular to accurate adjustment of the switch position and contact travel required to take account of the tolerance involved in manufacture of the pedal housing. This leads to the need for switches with adjustable lengths which often fail to provide the required precision. Moreover, installation and adjustment of such switches is time consuming and thus more expensive.

[0003] Self-adjusting switches can be prone to the following problems:

- Accidental or unintentional maladjustment during shipment of parts, vehicle assembly or servicing;
- Fatigue or gradual slackening of the adjustment system;
- Maladjustment of the switch by excessive pressure on the pedal.

[0004] This has led to various designs of quick-fit, self-adjusting switches which are often still not satisfactory.

[0005] Object of the invention is to develop a switch of the above mentioned type with the capability of self-adjustment only at the time of installation and with a simple construction so that it can be installed and adjusted for correct functioning in a single operation during vehicle assembly.

[0006] This object is accomplished with a switch according to the generic part of claim 1 with the following features:

- a) the switch has a housing with fixed contacts which are connected via terminals to the outside of the housing,
- b) in the switch housing is a moveable contact bridge carrier, which pivots on a spindle when the switch is installed and which is positioned parallel to the pivot bearing spindle of the pedal body,
- c) the contact bridge carrier is constructed in two parts, consisting of a rotor with a contact bridge, which is located in the switch housing and rotates against the force of a return spring, and a swivel plunger, which can be adjusted incrementally and

which is pivoted on the same spindle as the rotor and works together with the shaft of the pedal body or with a pedal flag attached to the pedal body,

d) the rotor has external stops, which work together with moveable locking pins on the switch housing, which are arranged perpendicular to the direction of movement of the rotor, when the switch is mounted in the pedal box carrier, in order to lock the rotor body until just before the switch reaches its final installed position,

e) the locking pins on the switch housing are held in a locked position by the edges of an U-shaped mounting slot in the pedal box carrier, when the switch is inserted into the slot, and are released by clearance notches in the mounting slot when the switch is in its final installed position.

[0007] Specific advantageous developments of the invention are found in the patent claims 2 to 10.

[0008] The device has the advantage that these switches cannot accidentally or unintentionally be maladjusted before it is installed. Furthermore, when the switch, in the condition as when delivered by the manufacturer, is installed in the vehicle in a prepared mounting slot in a suitable carrier (for example in a pedal box carrier), the moveable switch parts are automatically adjusted so that after installation the switch is fully adjusted and ready for operation. The return spring for the rotor of the contact bridge carrier ensures that before the installation of the switch, the contact bridge carrier is in the correct position for the adjustment of the switch when the switch is mounted. This adjustment is achieved by the swivel plunger, which is secured by a ratchet on the rotor in its delivered state, touching the pedal body, or a flag mounted on the pedal body, via the rotor. The rotor is secured in its delivered state by the locking pins on the switch housing, which are pushed inwards by the long edges of the mounting slot during insertion of the switch. Therefore the rotor cannot rotate with the swivel plunger during the automatic adjustment of the swivel plunger to its end position. The adjustment protection for the rotor of the contact bridge carrier is maintained until the switch has reached its installed position in the pedal box carrier. At this time the locking pins, which up to now have secured the rotor of the contact bridge carrier in the switch housing against accidental or unintentional adjustment, are released by a clearance notch in the long edges of the mounting slot and free the rotor of the contact bridge carrier for turning during in-service operation of the switch. At the same time the switch is locked in its installed position by engagement of the locking pins in the clearance notches directly opposite each other on the long edges of the mounting slot.

[0009] A preferred embodiment of the invention is shown in the drawings.

Fig. 1 shows a perspective view of a switch with arrangement for self-adjustment during assembly in a pedal box carrier,

Fig.2 shows a vertical longitudinal section through the switch in the delivered state ready for assembly and the transverse section of Fig. 2 is shown by cutting line II-II in Fig. 3,

Fig.3 shows another section through the switch according to the cutting line III - III in Fig. 2 and

Fig.4 shows a perspective exploded view of the switch components.

[0010] The switch 1 according to Fig. 1 to 4 serves in particular to indicate the functioning position of foot pedals in vehicles and especially when used as a brake light switch.

[0011] The switch 1 has an arrangement for self-adjustment only during assembly of the switch into the pedal box carrier 2 that is mounted above the pedal shaft 5 perpendicular to the plane of the pivot bearing 3 of a moveable foot pedal body 4.

[0012] The switch 1 has a housing 6 with fixed contacts 7 that are connected to the terminals 7a (Fig. 4) on the exterior of the housing.

[0013] There is a moveable contact bridge carrier 8 in the switch housing 6 which is pivoted on a spindle 9, which is parallel to the pivot bearing spindle 3 of the pedal body 4 when in the installed position.

[0014] The contact bridge carrier 8 is constructed in two parts: a contact bridge 12 with a rotor 11 which rotates against the force of a return spring 10 and, inside the rotor 11, a swivel plunger 13 which can be adjusted incrementally and which is pivoted on the same spindle 9 as the rotor 11.

[0015] The return spring 10 is a compression coil spring or torsion spring with one end 10a supported on the inside of the switch housing 6 and the other end 10b on the rotor 11.

[0016] During normal operation the rotor 11 and the swivel plunger 13 are fixed together. The rotor 11 has external lugs 14 which, during the mounting of the switch 1 onto the pedal box carrier 2, work together with the moveable locking pins 15 on the switch housing 6. The locking pins 15 are perpendicular to the direction of movement of the rotor 11. In this way the rotor body 11 is secured by the locking pins 15 until shortly before reaching the final installed position.

[0017] The locking pins 15 on the switch housing 6 are moved into the locking position for the rotor 11, by insertion of the switch into the U-shaped mounting slot 16 in the pedal box carrier 2. The locking pins 15 are released by the clearance notches 16a (Fig. 1) in the mounting slot when the switch is in the final installed position.

[0018] The switch housing 6 is constructed in two

parts - a bottom housing section 17 with the spindle 9 for the contact bridge carrier 8 that includes a rotor 11 and swivel plunger 13, and a top housing section 18 with the contacts 7, 7a fixed to the housing and a support for the return spring 10 for the contact bridge carrier 8.

[0019] On the bottom housing 17 there are parallel, U-shaped external guide rails 19, 20 which overlap the edges of the U-shaped mounting slot 16 on the pedal box carrier 2, and serve to secure the switch 1 in the installed position in the pedal box carrier 2.

[0020] The locking pins 15 for the rotor 11 are formed from the eye-shaped ends 22 of a U-shaped fastening spring 21. The eye-shaped ends 22 protrude through slots 23 in the form of guide openings in the side walls of the bottom housing 17 (Fig. 3 and 4) between the guide rails 19, 20, and are pushed inwards by the long edges of the mounting slot 16 during insertion to the end stop.

[0021] The switch housing 6, the rotor 11 and the swivel plunger 13 of the contact bridge carrier 8 are made in the form of a sector of a circle, referenced to their spindle 9.

[0022] The rotor 11 of the contact bridge carrier 8 is constructed as a hollow body with a cut-out for the swivel plunger 13 and has inward facing ratchet teeth 24 that engage with the protruding spring-loaded indexing pin 25, radial to the spindle 9, on the outer circumference of the swivel plunger 13.

[0023] Moreover, the rotor 11 of the contact bridge carrier 8 is guided by separate guide lugs 30 (Fig. 4) sliding in arc-shaped slots on the inner side of the switch housing 6.

[0024] A radial lug 26 on the rotor 11 serves as anchorage for the contact bridge 12.

[0025] The swivel plunger 13 is incrementally adjustable along the ratchet teeth 24 between two end stops in the cut-out of the rotor 11. Furthermore, it has an outward facing guide shoe 27 to position it on the shaft 5 of the pedal body 4 or an attached flag 28. During the operation of the switch, the guide shoe 27 also serves as an end stop for the movement of the contact bridge carrier against the switch housing 6.

[0026] During the installation of the switch 1 into the mounting slot 16 of the pedal box carrier in the direction of the arrow 29 in Fig. 1, the following sequence of events occur:

[0027] During the insertion of the switch 1 into the mounting slot 16 in the direction of the arrow 29 in Fig. 1, the locking pins 15 of the U-shaped fastening spring 21, which protrude outwards between the parallel guide rails 19, 20 of the switch housing 6, are pushed together by the long edges of the mounting slot 16 in the pedal box carrier 2. During this action the swivel plunger 13 of the switch 1 meets the flag 28 or a projection on the shaft 5 of the pedal body 4 and is thereby gradually pushed into the cavity of the rotor 11.

[0028] As the swivel plunger 13 is bound with the rotor 11 by the indexing pin 25 engaging with the inner ratchet

24 of the rotor 11, the rotor 11 moves with the swivel plunger 13 through a distance "T" in Fig. 3, until the two side stops 14 on the outside of the rotor 11 contact the locking pins 15 of the fastening spring 21 thus preventing the rotor 11 from being pushed further into the switch housing 6.

[0029] When the switch 1 is pushed further into the mounting slot 16 the force on the swivel plunger 13 increases, and the indexing pin 25 moves over the ratchet 24 on the rotor, and is thus automatically adjusted.

[0030] Immediately before the switch 1 reaches the end of the mounting slot 16 the locking pins 15 are released.

[0031] In this manner, the adjustment range "L" of the swivel plunger 13 (Fig. 2) relative to the rotor 11 is set to the required distance in a single operation, without any risk that the switch 1 could be later put out of adjustment during the life of the vehicle. During shipment of the switch, the locking pins 15 are not activated so that the swivel plunger 13 cannot be set prior to assembly in the vehicle. The switch 1 can, however, be readjusted by pulling back the swivel plunger 13 with a force greater than that required to set the length adjustment.

[0032] It should be noted that the force required to depress the pedal body 4 with the pedal flag 28 is much greater than the force required for the operation of the switch 1 and for setting its length adjustment. Therefore the pedal flag 28 can be considered as being rigid.

List of reference numbers

[0033]

1	switch	
2	pedal box carrier	
3	pivot bearing spindle	
4	pedal body	
5	pedal shaft	
6	switch housing	
7	contact	
7a	terminal	
8	contact bridge carrier	
9	spindle	
10	return spring	
10a	end of spring	
10b	end of spring	
11	rotor	
12	contact bridge	
13	swivel plunger	
14	stop	
15	locking pin	
16	mounting slot	
16a	clearance notch	
17	bottom housing	
18	top housing	
19	guide rail	
20	guide rail	
21	fastening spring, stopper spring	

22	ends of fastening spring	
23	slot	
24	locking ratched, internal teeth	
25	indexing pin	
26	radial lug	
27	guide shoe	
28	pedal flag	
29	arrow, insertion direction	
30	guide lugs	
T=	dimension in Fig. 3	
L=	adjustment range in Fig. 2	

Claims

1. Switch, in particular self-adjusting pedal-box switch, with facilities for self-adjustment of the switch during mounting and with adjustment protection, when the switch is installed into a pedal-box carrier that is mounted perpendicular to the pivot plane of a spindle and above the moveable pedal body, **characterised** by the following features:

a) the switch (1) has a housing (6) with fixed contacts (7) which are connected via terminals (7a) to the outside of the housing,

b) in the switch housing (6) is a moveable contact bridge carrier (8), which pivots on a spindle (9) when the switch is installed and which is positioned parallel to the pivot bearing spindle (3) of the pedal body (4),

c) the contact bridge carrier (8) is constructed in two parts, consisting of a rotor (11) with a contact bridge (12), which is located in the switch housing (6) and rotates against the force of a return spring (10), and a swivel plunger (13), which can be adjusted incrementally and which is pivoted on the same spindle (9) as the rotor (11) and works together with the shaft (5) of the pedal body (4) or with a pedal flag attached to the pedal body (4),

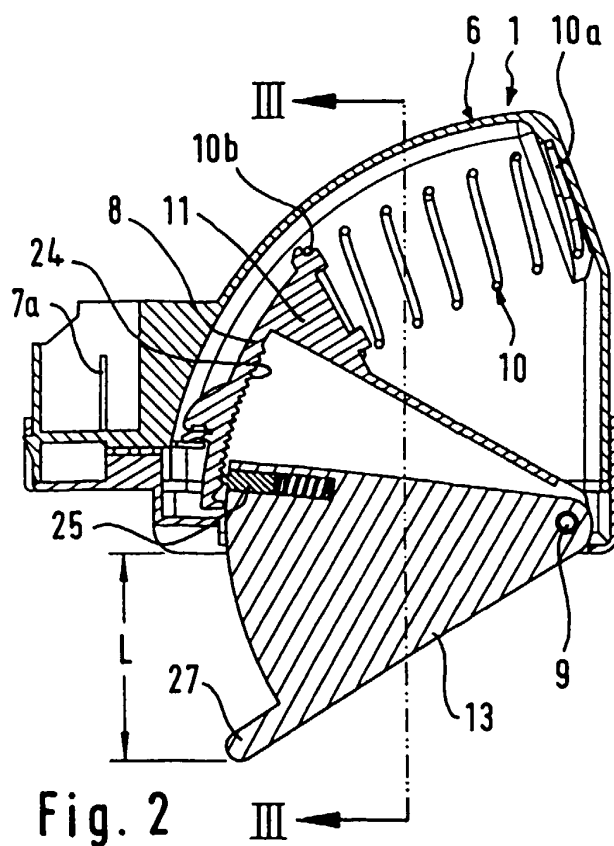
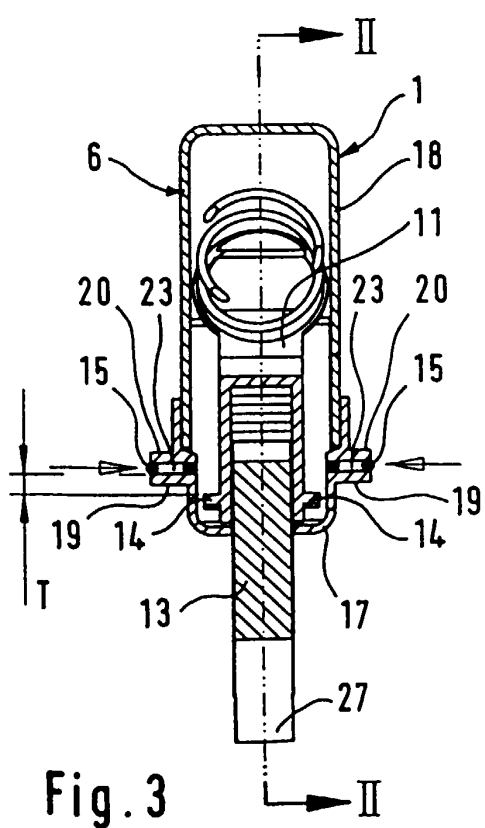
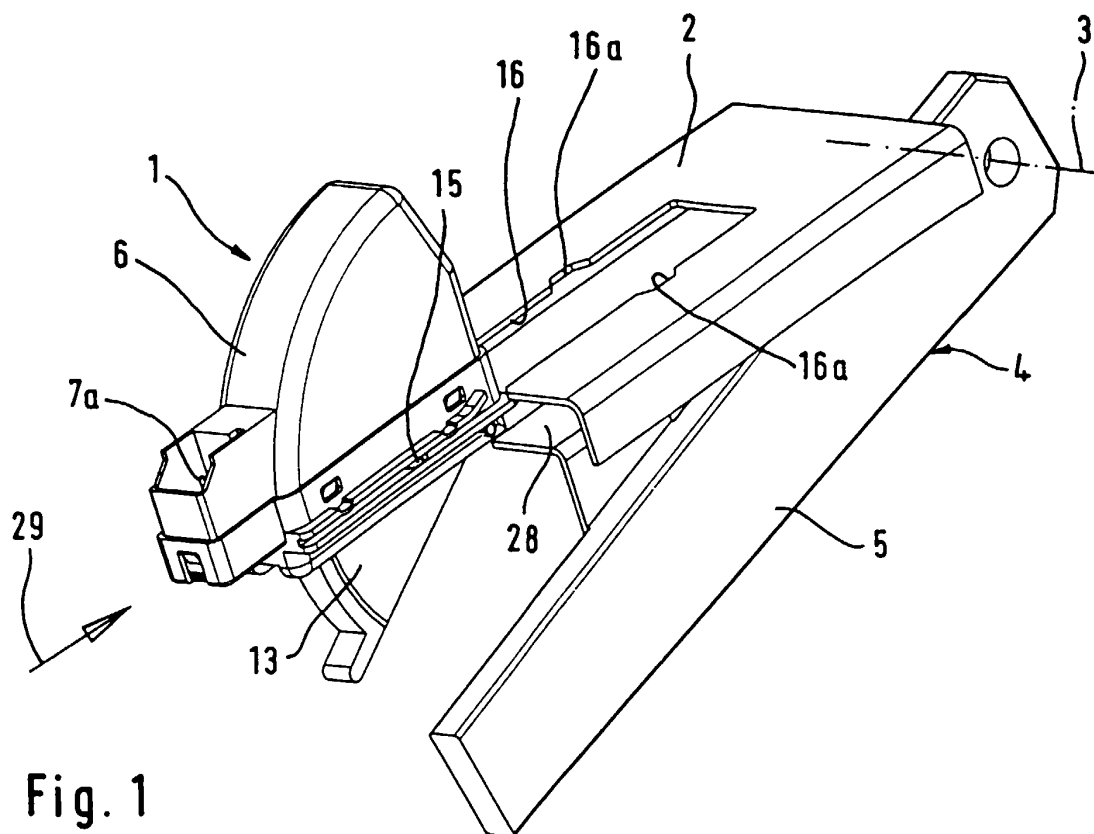
d) the rotor (11) has external stops (14), which work together with moveable locking pins (15) on the switch housing (6), which are arranged perpendicular to the direction of movement of the rotor (11), when the switch (1) is mounted in the pedal box carrier (2), in order to lock the rotor body (11) until just before the switch (1) reaches its final installed position,

e) the locking pins (15) on the switch housing (6) are held in a locked position by the edges of an U-shaped mounting slot (16) in the pedal box carrier (2), when the switch (1) is inserted into the slot (16), and are released by clearance

notches (16a) in the mounting slot when the switch is in its final installed position.

2. Switch according to claim 1, **characterised in that** the switch housing (6) consists of two parts, a bottom housing (17) with spindle (9) for the contact bridge carrier (8) with rotor (11) and swivel plunger (13), and a top housing with the contacts (7, 7a), that are fixed to the housing, and a support for the return spring (10) of the contact bridge carrier (8). 5 10
3. Switch according to claims 1 and 2, **characterised in that** on the bottom housing (17) there are parallel, U-shaped external guide rails (19,20) which overlap the edges of the U-shaped mounting slot (16) on the pedal box carrier (2) 15
4. Switch according to claim 1 to 3, **characterised in that** the locking pins (15) for the rotor (11) are formed from the eye-shaped ends (22) of a U-shaped fastening spring (21), which eye-shaped ends (22) protrude through slots (23) in the side walls of the bottom housing (17) between the guide rails (19,20), and are pushed inwards by the long edges of the mounting slot (16) during insertion to the end stop of the rotor (11). 20 25
5. Switch according to claims 1 to 4, **characterised in that** the switch housing (6), the rotor (11) and the swivel plunger (13) of the contact bridge carrier (8) are made in the form of a sector of a circle, referenced to their spindle (9). 30
6. Switch according to claim 5, **characterised in that** the rotor (11) of the contact bridge carrier (8) is made as a hollow body with a cut-out for the swivel plunger (13) and has inward facing ratchet teeth (24) for engagement with a spring-loaded indexing pin (25), which protrudes from the outer circumference of the swivel plunger (13) radially to the spindle (9). 35 40
7. Switch according to claim 1 to 6, **characterised in that** the rotor (11) of the contact bridge carrier (8) is guided by separate lugs (30) sliding in arc-shaped slots on the inner side of the switch housing (6). 45
8. Switch according to claim 7, **characterised in that** a radial lug (26) on the rotor (11) serves as anchorage for the contact bridge (12). 50
9. Switch according to claims 1 to 8, **characterised in that** the swivel plunger (13) is incrementally adjustable between two end stops in the cut-out of the rotor (11). 55
10. Switch according to claims 1 to 8, **characterised in that** the swivel plunger (13) has an outward facing

guide shoe (27) to position it on the shaft (5) of the pedal body (4), which guide shoe (27) during the operation of the switch (1) also serves as an end stop for the movement of the contact bridge carrier (8) against the switch housing (6).



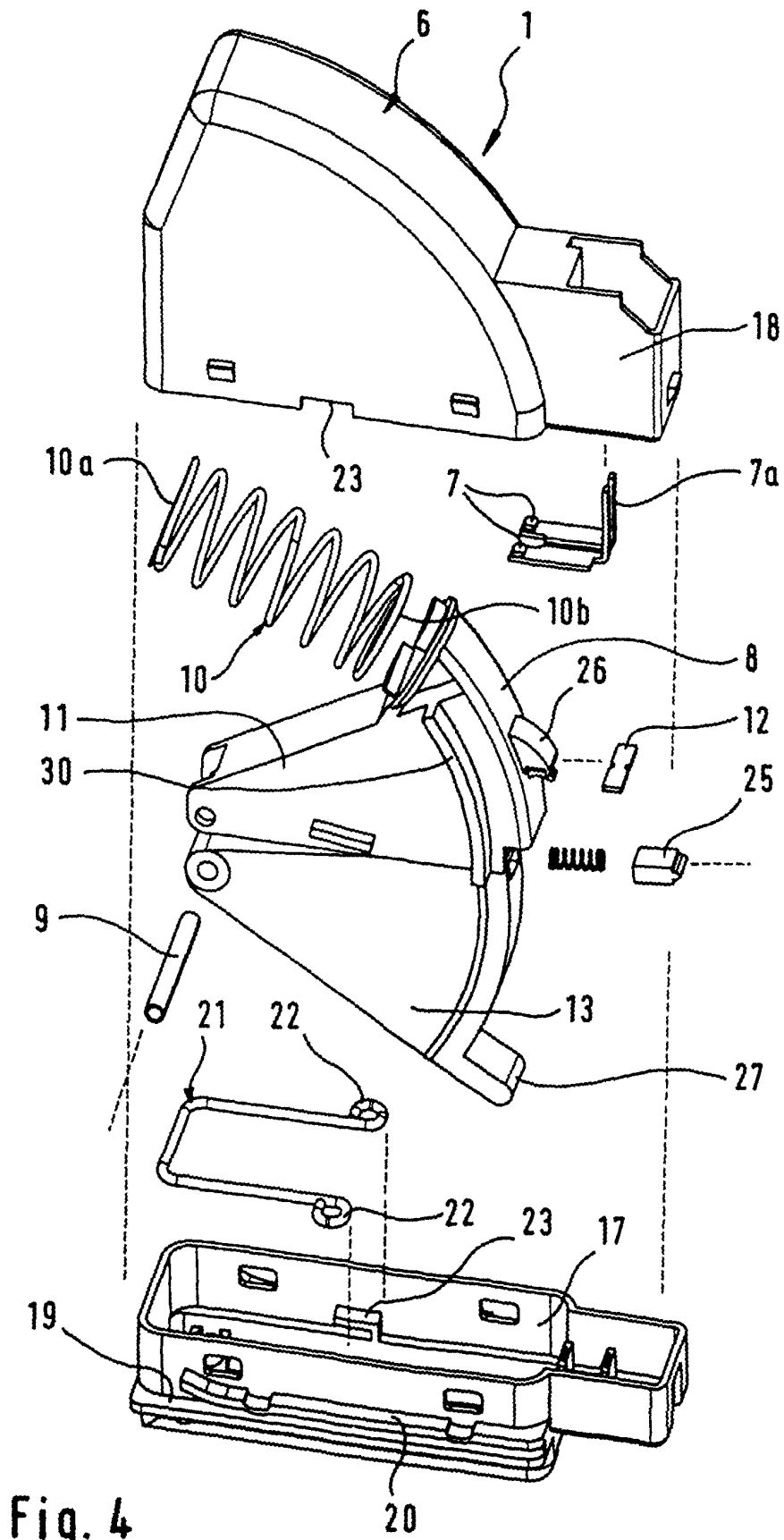


Fig. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 00 10 3013

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.7)
A	US 5 889 246 A (GRIMES MARK S ET AL) 30 March 1999 (1999-03-30) * abstract; figures *	1	H01H3/16
A	US 5 661 275 A (SHAW DUANE C ET AL) 26 August 1997 (1997-08-26) * abstract; figures *	1	
A	US 4 684 769 A (BECK WILLI K ET AL) 4 August 1987 (1987-08-04) * abstract; figures *	1	
A	US 4 604 506 A (GEBHARDT WALLACE E) 5 August 1986 (1986-08-05) * abstract; figures *	1	
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H01H
Place of search		Date of completion of the search	Examiner
THE HAGUE		7 March 2001	Desmet, W
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			

EPC FORM 1503 03/92 (P/4C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 00 10 3013

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

07-03-2001

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 5889246	A	30-03-1999	NONE	
US 5661275	A	26-08-1997	NONE	
US 4684769	A	04-08-1987	NONE	
US 4604506	A	05-08-1986	JP 1613537 C	15-08-1991
			JP 2037054 B	22-08-1990
			JP 62012020 A	21-01-1987