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(54) Automotive switching device with an antinoise filter, particularly for controlling stop lights

(57) The switching device (1) has an outer casing (2) housing an antinoise filter (46), a movable contact (22), and fixed contacts (15a, 15b). The antinoise filter is formed by a low-pass LC filter (46), and eliminates the

radiofrequency noise generated by switching of the switching device (1), to prevent disturbance to the radio receiving devices on the vehicle.

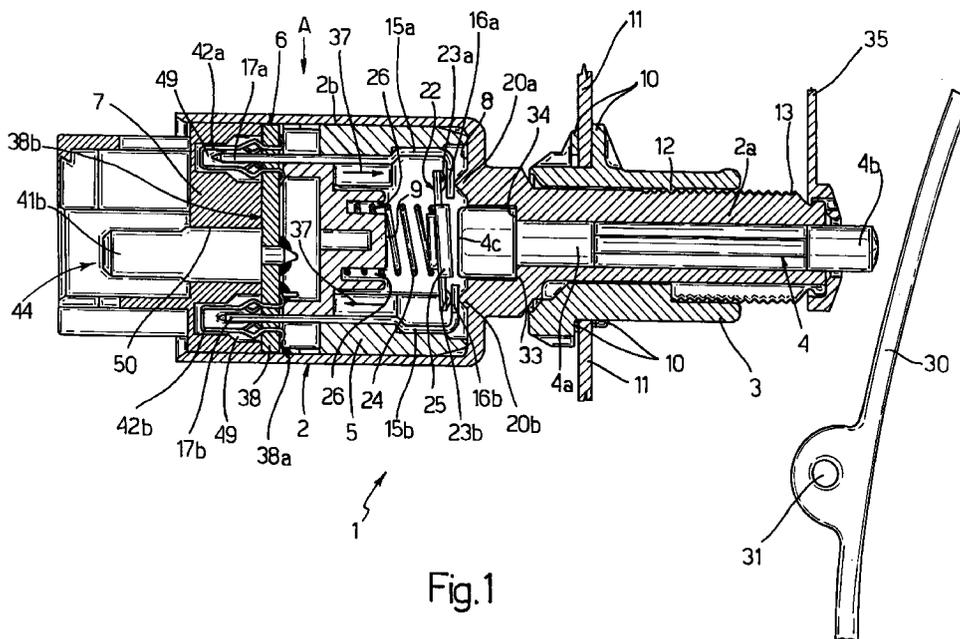


Fig.1

Description

The present invention relates to an automotive switching device with an antinoise filter, particularly for controlling stop lights.

As is known, pushbutton switches are used on cars to detect the position of a vehicle member, e.g. the brake pedal, and generate a corresponding signal or command by closing the electric circuit comprising the switch. Pushbutton switches of this type normally comprise a tubular casing housing a contact carrier and a so-called push rod movable between an extracted and a withdrawn position depending on the position of the member being monitored. The contact carrier houses at least one fixed contact and one movable contact; the fixed contact is secured to the contact carrier, whereas the movable contact is subjected to the counteraction of a spring and the push rod. When the push rod is pushed into the withdrawn position by the monitored member, it moves the movable contact away from the fixed contact to open the relative electric circuit; whereas, when the push rod is no longer activated by the monitored member, the noncontrasted spring pushes the movable contact against the fixed contact to close the electric circuit.

When detecting the position of the brake pedal, the tubular casing is fitted to the vehicle body; the push rod is extracted when the pedal is pressed and withdrawn when the pedal is released; and the pressure of the pedal closes the circuit to supply and turn on the stop light connected to the electric circuit.

As is also known, opening and closing of the contacts normally give rise to radiofrequency noise, which, via the power supply, reach or interfere with the operation of any radio receiving devices on the vehicle, thus causing discomfort to the listener. To solve this problem, provision is therefore already made for an antinoise filter for eliminating the radiofrequency noise generated by electrical switching of the switching device.

Currently used automotive filters comprise three reactive components permitting highly selective low-pass frequency responses, and are fitted to the outside, e.g. welded to the outgoing conductor, of the switching device. Using three reactive components results in a fairly bulky package requiring particular assembly operations in addition to those required for assembling the switching device.

It is an object of the present invention to provide an automotive switching device with an antinoise filter, particularly for controlling stop lights, designed to overcome the aforementioned drawbacks, i.e. which provides for maximum compactness.

According to the present invention, there is provided an automotive switching device with an antinoise filter, particularly for controlling stop lights, comprising an outer casing and switching means; characterized by comprising filter means housed inside said outer casing.

A preferred, non-limiting embodiment of the present

invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a longitudinal section of the switching device according to the invention;

Figure 2 shows a plan view of the component side of the printed circuit in Figure 1;

Figure 3 shows a detail of Figure 1 in the direction of arrow A and with the blades inserted;

Figure 4 shows an electric diagram of the low-pass filter formed on the printed circuit.

Number 1 in Figure 1 indicates the pushbutton switching device according to the invention, and which comprises a casing 2 having a tubular portion 2a and a cup-shaped portion 2b larger in diameter than tubular portion 2a. Tubular portion 2a is surrounded coaxially by a cylindrical body 3, and houses in sliding manner a push rod 4; and cup-shaped portion 2b houses a cylindrical contact carrier 5, a filter unit 6, and a filter carrier 7. Cup-shaped portion 2b and contact carrier 5 define respective end walls 8 and 9 facing each other. Cylindrical body 3 comprises, externally, a number of projections 10 defining seats by which to fit switching device 1 to the vehicle body 11, and, internally, a projecting portion 12 which snaps onto one of a number of depressions 13 formed on the outside of tubular portion 2a. The engagement of one of depressions 13 by projecting portion 12 provides, in known manner not described in detail, for adjusting the position of push rod 4 in relation to a brake pedal 30 in the released position.

Contact carrier 5 supports two fixed contacts 15a, 15b, each of which is formed by a metal blade comprising an L-shaped end facing end wall 8 and forming a contact portion 16a, 16b, and an end portion 17a, 17b connecting contact carrier 5 to filter unit 6. Fixed contacts 15a, 15b are preferably made of silver-plated brass. End wall 8 comprises two conical portions 20a, 20b projecting inwards of contact carrier 5 from wall 8, and which form spacers for detaching contact portions 16a, 16b from end wall 8 and are of different heights. More specifically, conical portion 20a on which contact portion 16a rests is higher than conical portion 20b.

A movable contact 22 is provided facing contact portions 16a, 16b of fixed contacts 15a, 15b, and which is formed by a substantially rectangular metal blade having two convex contact pads 23a, 23b aligned perfectly with contact portions 16a, 16b of fixed contacts 15a, 15b. Contact pads 23a, 23b are preferably made of Ag Sn 02 92/8, which ensures a low voltage drop. Movable contact 22 is pressed against contact portions 16a, 16b of fixed contacts 15a, 15b by a coil spring 24 compressed between movable contact 22 and end wall 9 of contact carrier 5; end wall 9 comprises seats 26 for ensuring correct axial positioning of a first end of spring 24; and blade 22 comprises two tabs 25, formed by blanking and bending part of blade 22, for axially positioning the other end of spring 24.

Push rod 4 comprises a rod having a wider first end 4a and a wider second end 4b. First end 4a faces cup-shaped portion 2b of casing 2, and is designed to interfere with and open movable contact 22 by means of an end surface 4c; and second end 4b projects partially from the opposite end of tubular portion 2a of casing 2, and is activated in known manner by brake pedal 30 hinged at 31 to body 11 of the vehicle (not shown). First end 4a defines a shoulder 33 designed to contact a stop shoulder 34 formed by tubular casing 2 and defining the extracted limit stop position of push rod 4; and the free end of tubular portion 2a of casing 2, from which end 4b of push rod 4 projects, is provided with an adjusting spacer 35.

Filter unit 6 - shown in detail in Figure 2 - comprises a supporting base 38 having a printed circuit (not shown in detail) on a first face 38a, and supporting, on the opposite face 38b, a capacitor 39 and inductor 40 forming a filter 46. Supporting base 38 also comprises two openings 43 through which are fitted two elastic fasteners 42a, 42b projecting from face 38b. From the same face, there also project two blades 41a, 41b connected to fasteners 42a, 42b via filter 46 and the printed circuit (not shown) on face 38a. End portions 17a, 17b of fixed contacts 15a, 15b respectively engage openings 43 and fit inside respective fasteners 42a, 42b to form a push-in connection between supporting base 38 and contact carrier 5.

Filter carrier 7 supports filter unit 6 and has seats 49 for fasteners 42a, 42b. As shown in detail in Figure 3, filter carrier 7 also comprises two openings 50 in which are retained blades 41a, 41b, the ends of which project from openings 50 to permit connection of switching device 1 in known manner to a supply 47 and stop lamp 48 (Figure 4) forming, with switching device 1, an electric circuit 44. In actual use, blades 41a, 41b are so connected that, when electric circuit 44 is closed, current flows in the direction shown by arrows 37 in Figure 1. Finally, filter carrier 7 is fitted to cup-shaped portion 2b of casing 2 by means of push-in connections not shown.

Figure 4 shows an electric diagram of filter 46, which is inserted between switching device 1 and battery 47. More specifically, capacitor 39 is located between blades 41a and 41b, and inductor 40 is located in series between blade 41a and switching device 1.

Switching device 1 operates as follows. As with known switching devices, when released, brake pedal 30 acts on end 4b of push rod 4 to keep it in the withdrawn position with end 4a projecting partly inside cup-shaped portion 2b, so that push rod 4 detaches movable contact 22 from contact portions 16a, 16b of fixed contacts 15a, 15b to keep electric circuit 44 open.

Conversely, when brake pedal 30 is pressed, the thrust exerted by the pedal on push rod 4 is released, and spring 24 pushes movable contact 22 onto contact portions 16a, 16b of fixed contacts 15a, 15b to close electric circuit 44 and set switching device 1 to the operating position shown in Figure 1, in which push rod 4 is

pushed by movable contact 22 into the extracted position with end 4b projecting from tubular portion 2a of casing 2. When brake pedal 30 is again released, push rod 4 is again withdrawn to open movable contact 22.

Switching of the contacts as described above generates radiofrequency noise, which, via supply 47, reaches any radio receiving devices on the vehicle. Filter 46 inside switching device 1 therefore eliminates such noise to prevent it from interfering with the loudspeakers.

Conical portions 20a, 20b ensure a high degree of reliability and long life of switching device 1 described, by solving the problem of electromigration, i.e. the passage of material between the facing contacts when the contacts are opened. That is, the material of the fixed contact is detached and deposited on the movable contact when current flows from the fixed to the movable contact; and, conversely, the material of the movable contact is detached and deposited on the fixed contact when current flows in the opposite direction. As the movable contact is normally made of nobler material than the fixed contact to ensure optimum current flow and a low voltage drop at all times between the contacts, it is preferable that electromigration should occur from the movable to the fixed contact. Currently used switching devices, however, in no way provide for ensuring that the movable contact is opened, always and for all switching devices, at the contact portions 16b-23b in which current flows from the movable to the fixed contact.

Conversely, in the case of switching device 1 described herein, the difference in the height of conical portions 20a, 20b ensures electromigration occurs precisely in the required direction. That is, the difference in the height of conical portions 20a, 20b ensures that contact portions 16a, 16b of fixed contacts 15a, 15b are located different distances from end wall 8 of cup-shaped portion 2b and hence from the surface of wider end 4a of push rod 4, as already described above, so that, when brake pedal 30 is released and pushes push rod 4 into the withdrawn position, push rod 4 first detaches pad 23b facing contact portion 16b to open electric circuit 44. During opening, on account of the current flowing, as stated, in the direction of arrows 37, electromigration therefore occurs as required from pad 23b to contact portion 16b. When push rod 4 subsequently detaches pad 23a from contact portion 16a, no electromigration occurs on account of the current already being cut off.

The advantages of the switching device described are as follows. Above all, it provides for directly eliminating switching-induced radiofrequency noise, with no need for external filters. It is therefore more compact, and involves no additional assembly operations over and above those for assembling the switching device itself. Finally, the switching device is of straightforward design, reliable, and cheap to produce.

Clearly, changes may be made to the device as

described and illustrated herein without, however, departing from the scope of the present invention.

Claims

1. An automotive switching device (1), particularly for controlling stop lights, comprising an outer casing (2) and switching means (4, 15a, 15b, 22, 24); characterized by comprising filter means (6) housed inside said outer casing (2). 5
2. A switching device as claimed in Claim 1, characterized in that said filter means (6) comprise a supporting base (38); first push-in connecting means (42a, 42b) for connection to said switching means (4, 15a, 15b, 22, 24); and second push-in connecting means (41a, 41b) for connection to an external electric circuit (44); said first (42a, 42b) and second (41a, 41b) push-in connecting means being supported on said supporting base (38). 10
3. A switching device as claimed in Claim 2, characterized in that said filter means (6) comprise a capacitor (39) and an inductor (40). 15
4. A switching device as claimed in Claim 2 or 3, characterized in that said first push-in connecting means comprise elastic fasteners (42a, 42b) engaged by corresponding electric blade contacts (17a, 17b) forming part of said switching means (4, 15a, 15b, 22, 24); and said second push-in connecting means comprise projecting blades (41a, 41b). 20
5. A switching device as claimed in Claim 4, characterized in that said outer casing comprises a tubular container (2) housing a filter carrier (7) supporting said filter means (6) and having through openings (50); said projecting blades (41a, 41b) being inserted interferentially inside said through openings (50) and projecting from said through openings for connection to said external electric circuit (44). 25
6. A switching device as claimed in any one of the foregoing Claims, characterized in that said switching means comprise a first and second fixed contact (15a, 15b) having respective contact portions (16a, 16b); a blade-type movable contact (22); a spring (24) acting on said movable contact (22) and for pushing said movable contact (22) onto said contact portions (16a, 16b) of said fixed contacts (15a, 15b) in a first limit position; and an actuating element (4) having an actuating surface (4c) and for pushing said movable contact (22) away from said contact portions (16a, 16b) of said fixed contacts (15a, 15b) in a second limit position; and in that, in said first limit position, said movable contact (22) is inclined in relation to said actuating surface (4c) of 30
7. A switching device as claimed in Claim 6, characterized in that said first (16a) and second (16b) contact portions of said fixed contacts (15a, 15b) face respective contact portions (23a) (23b) of said movable contact (22); said contact portions (16a, 16b) of said fixed contacts (15a, 15b) being located in mutually spaced parallel planes. 35
8. A switching device as claimed in Claim 7, characterized in that said contact portions (16a, 16b) of said fixed contacts (15a, 15b) are supported by projections (20a, 20b) formed by said switching device (1) and differing in height. 40

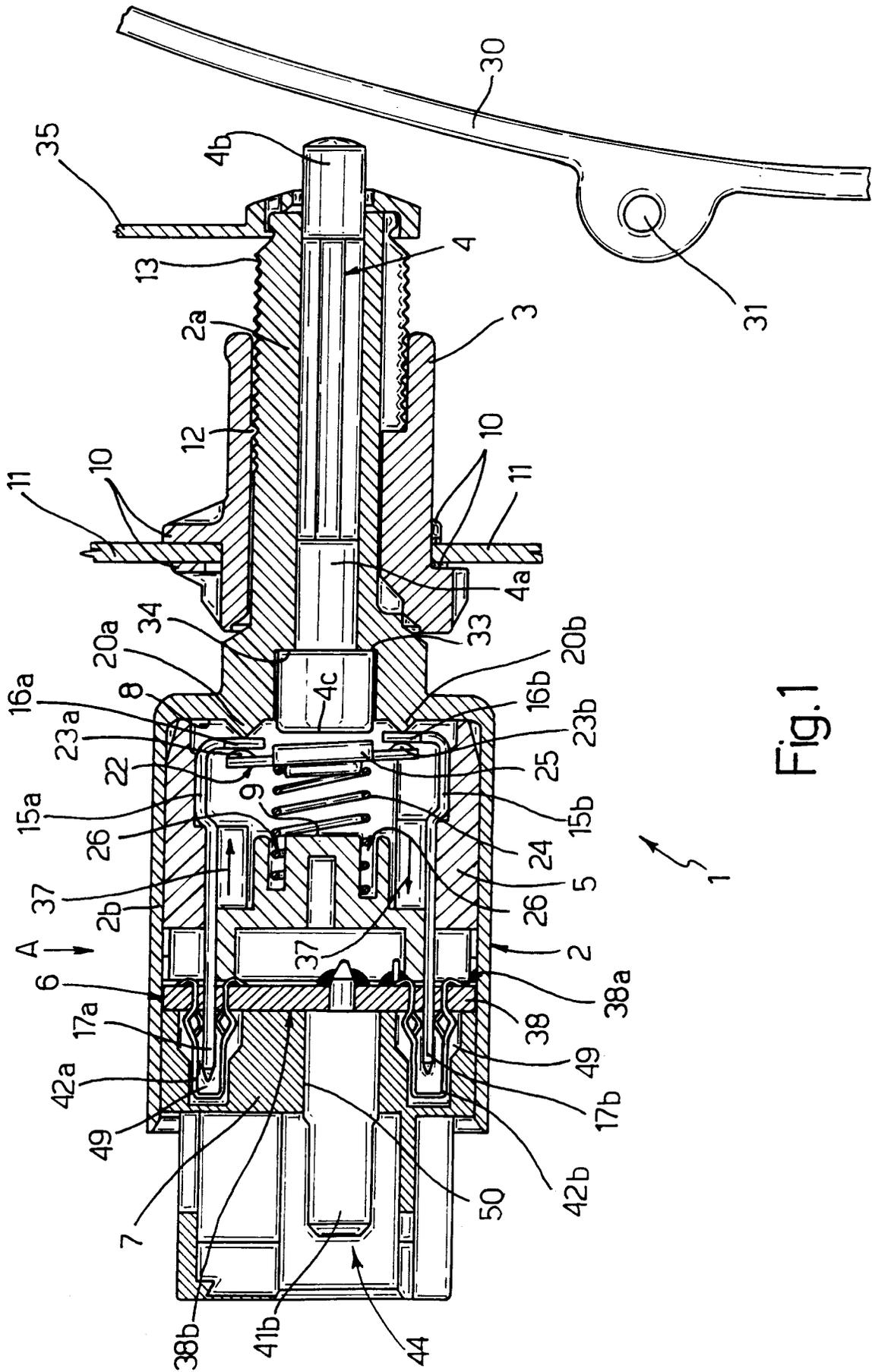


Fig.1

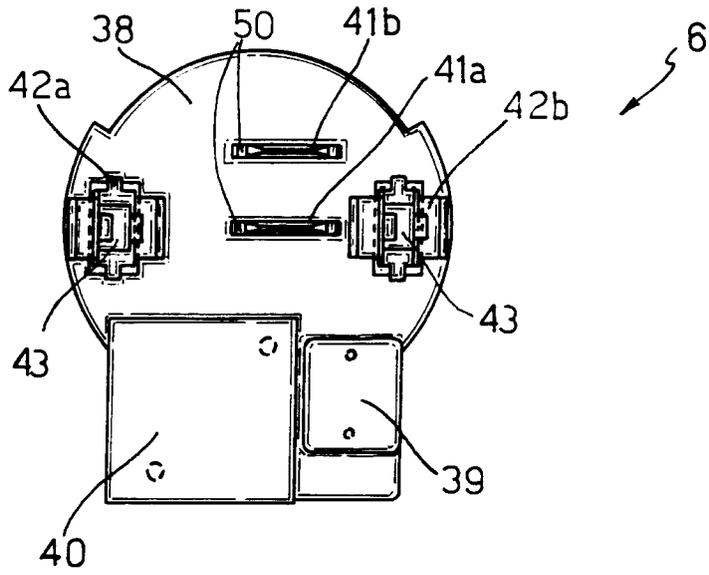


Fig. 2

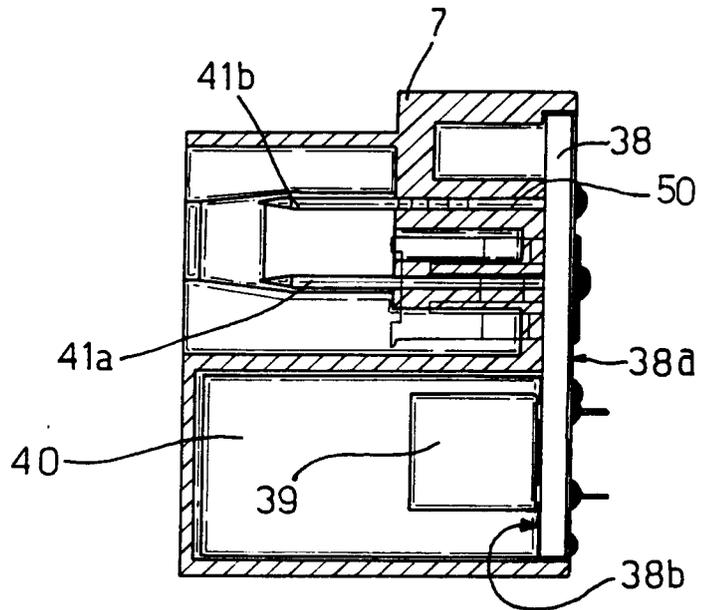


Fig. 3

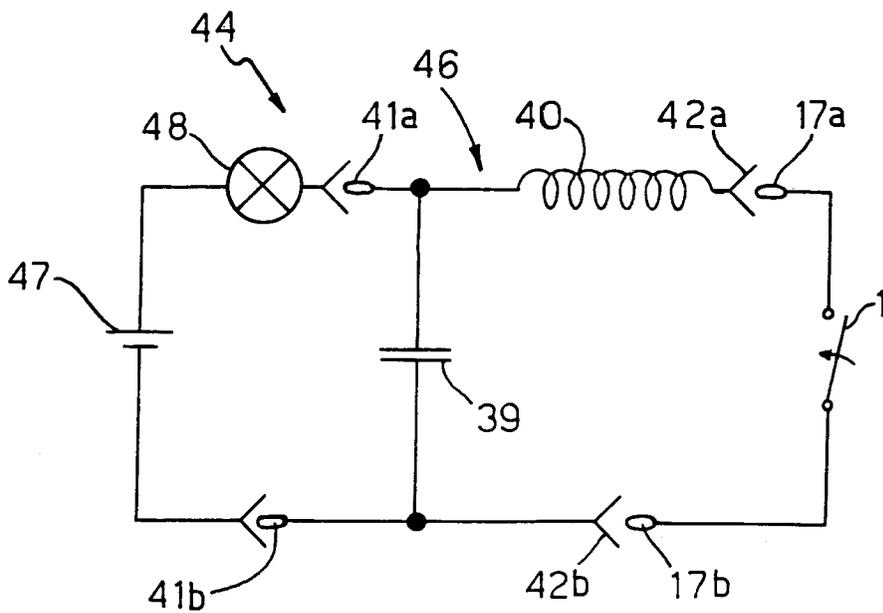


Fig. 4



European Patent
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EUROPEAN SEARCH REPORT

Application Number
EP 96 12 1002

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)
Y A	DE 19 97 369 U (SIEMENS) 28 November 1968 * page 2, last paragraph - page 3; claims 1,2; figures *	1 2,3	H01H9/02 H01H1/20
Y	DE 72 28 350 U (J&J MARQUARDT) 23 November 1972 * claim 1 *	1	
A	DE 70 27 883 U (C&E FEIN) 8 April 1971 * claims *	1	
A	DE 16 90 363 A (UNELEC) 13 May 1971 * page 3 - page 6, paragraph 4; figures 1-4 *	6-8	
			TECHNICAL FIELDS SEARCHED (Int.Cl.6)
			H01H
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 30 May 1997	Examiner Janssens De Vroom, P
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