(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 2 541 577 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
02.01.2013 Bulletin 2013/01

(51) Int Cl.:
H01H 37/76 *(2006.01)* ***H01C 7/12*** *(2006.01)*

(21) Application number: **11172220.3**

(22) Date of filing: **30.06.2011**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **EPCOS AG**
81669 München (DE)

(72) Inventors:
- **Qin, Jifeng**
  Zhuhai Guangdong 519030 (CN)
- **Sun, Shaoyu**
  Zhuhai Guangdong 519030 (CN)
- **Song, Dongjian**
  Zhuhai Guangdong 519030 (CN)
- **He, Zhouquan**
  Zhuhai Guangdong 519030 (CN)

(74) Representative: **Epping - Hermann - Fischer**
Patentanwaltsgesellschaft mbH
Ridlerstraße 55
80339 München (DE)

(54) Electric device

(57) An electric device (1) comprising:
an electric element (2) that comprises an element terminal (8), and
a conductive spring (7) being deflected, the spring (7) having a spring terminal (9) that is electrically connected to the element terminal (8) by a fusible joint (10) wherein a spacer (11) is located on one of the element terminal (8) and the spring terminal (9).

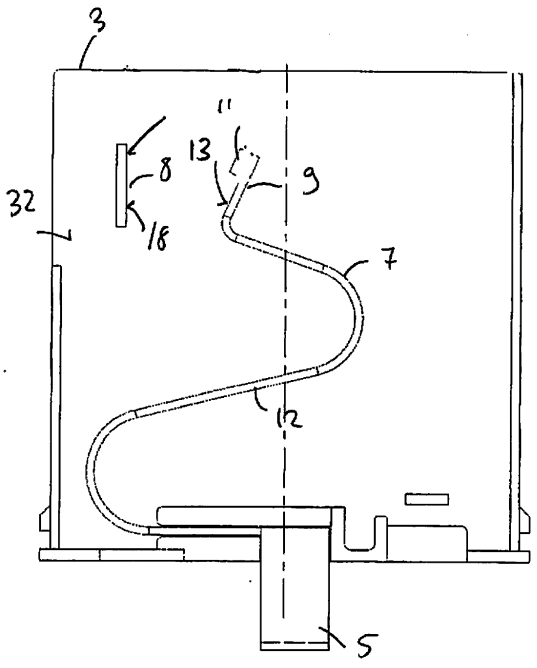

Fig. 8

EP 2 541 577 A1

Description

[0001] The invention concerns an electric device comprising an electric element.

[0002] An electric device, e.g. comprising a varistor, may catch fire under abnormal overvoltage conditions.

[0003] An electric device including a thermal fuse and a varistor may be considered as a thermal fuse varistor. The device may be a hybrid design of a varistor and a thermal fuse that is designed in such way that varistor functions and thermal fuse functions are integrated. When a long-lasting abnormal overvoltage is applied to the varistor and the heat generated by the overvoltage is high enough, the thermal fuse melts, thereby forming an open circuit to disconnect the whole device from the power supply to avoid catching fire.

[0004] The thermal fuse may be formed by a fusible joint that may include solder. The amount of solder may influence the quality of the fusible joint. On the one hand too little solder may cause disconnection during the normal operation mode; on the other hand too much solder may cause solder bridges when the joint melts, which means that the electric element and the spring are still connected by solder though they have moved apart. It is an aim of the invention to ensure that the thermal fuse has a given quality, so that disconnection during normal operation and solder bridges in case of abnormal overvoltage conditions are prevented.

[0005] This aim is achieved by an electric device comprising an electric element, which comprises an element terminal, and a conductive spring being deflected. The spring has a spring terminal that is electrically connected to the element terminal by a fusible joint wherein a spacer is located on one of the element terminal and the spring terminal.

[0006] During normal operation the element terminal and the spring terminal are coupled by the fusible joint that may solder the terminals together by low melting point solder, so that the power supply can be applied to the element via the spring. In case of abnormal voltage supply the joint melts, thereby disconnecting the terminals, which enables relaxation of the spring and the formation of an open circuit.

[0007] The spacer forms a gap and defines the width of this gap between connection sides of the spring and element terminals. The amount of solder that can be placed between the terminals is determined by the width of the gap, which ensures that a given amount of solder is provided between the spring terminal and the element terminal causing sufficient soldering strength in order to withstand high surge current between the spring and the element. Thus, the height of the spacer determines the quality of the fusible joint.

[0008] If the sides of the terminals facing each other would be plane, a given and steady quantity of solder could possibly not be held between the spring terminal and the element terminal. A lesser quantity of solder may cause insufficient soldering strength so that the thermal fuse or the fusible joint may be open during normal operation or high surge current conditions. On the other hand, if too much solder is provided, a solder bridge between the spring terminal and the element terminal may be formed after melting of the fuse and movement of the terminals, which causes high fire risk during abnormal overvoltage conditions.

[0009] The spring may be a flat spring that is formed by a bent metal sheet. The spring comprises a special spring terminal having an improved terminal shape. Alternatively the element terminal may have an improved terminal shape. The spring not only has a spring function but also serves as a conduction path. Such a spring can be used e.g. in a thermal fuse varistor or in connection with other electrical or electronic components. The flat spring has high reliability to withstand high surge current and, on the other hand, can disconnect the varistor from the power supply without residual electric current under abnormal overvoltage conditions.

[0010] In one embodiment the spacer is formed as an elevation that is located on one of a connection side of the element terminal and a connection side of the spring terminal, the connection side of the element terminal facing the connection side of the spring terminal. A spring comprising the spacer may be manufactured in an easy way.

[0011] The fusible joint may comprise solder located between the connection side of the element terminal and the connection side of the spring terminal. The spring terminal moves away from the element terminal when the joint fuses. Since the amount of solder is defined by the spacer, solder bridges may be prevented.

[0012] In one embodiment the spring terminal comprises a plane part, an elevation, which serves as spacer, being a part of the spring terminal that is bent with respect to the plane part. Such a spring may be formed by a bent metal sheet and is a one-piece press-bent part. The spring terminal is formed by an end section of the spring that further comprises an elastically deformable S-shape section.

[0013] In one embodiment the spring is a flat spring comprising a bent elongate section having a flat cross section.

[0014] The spring may comprise a middle section, the width of the spring terminal being smaller than the width of the middle section so that the distance between a lateral side of the spring terminal and an adjacent housing wall is greater than the distance between a lateral side of the middle section and the housing wall.

[0015] An improved fuse that prevents solder bridges is also achieved by a device comprising an electric element, which comprises a body and an element terminal, and a conductive spring being deflected. The spring has a spring terminal that is electrically connected to the element terminal by a fusible joint, and a housing. The distance between a lateral side of the spring terminal and an adjacent housing wall is greater than the distance between a lateral side of the middle section and the housing

wall.

[0016] The gap between a spring terminal having a symmetrical and uniform form and the inner surface of an outer enclosure may be too small, which may cause that the melted solder will adhere to the outer enclosure thereby forming a solder bridge between the spring terminal and the element terminal, which increases the fire risk.

[0017] By combining the features the device may have an improved spring terminal ensuring certain quantity of the solder joint, which will keep steady soldering strength between the spring terminal and the element terminal and provide sufficient gap width between the spring terminal and the wall of the outer enclosure.

[0018] The reduced width may be achieved by a step that is provided between the lateral side of the spring terminal and the lateral side of the middle section facing the housing wall of an outer cover. The spring may be fixed to the housing so that the spring is deflected, wherein the spring terminal moves away from the element terminal when the joint fuses.

[0019] Further features, refinements and expediencies become apparent from the following description of the exemplary embodiments in connection with the figures.

Figure 1 shows a front view of the inside of an embodiment of an electric device.

Figure 2 shows a back view of the inside of the embodiment of the electric device.

Figure 3 shows a three-dimensional view of an embodiment of a spring.

Figure 4 shows a three-dimensional view of a further embodiment of a spring.

Figure 5 shows a three-dimensional view of a further embodiment of a spring.

Figure 6A shows a front view of the spring shown in figure 5. Figure 6B shows a side view of the spring. Figure 6C shows a bottom view of the spring.

Figures 7 and 8 show the back views of the inside of embodiments of a device.

[0020] Figure 1 shows a front view of the inside of an embodiment of an electric device 1 that comprises a housing. Top and bottom covers of the housing are not shown for clarity reasons. Further, the housing comprises an inner wall 3 having a first side 31 and a second side 32. The device 1 further comprises a first, a second and a third electrode 4, 5, 6. Driving potentials can be applied to the device 1 via the electrodes 4, 5, 6.

[0021] The device 1 comprises an electric element 2, which may be a standard electronic component, e.g. a varistor. The element 2 is arranged between the top cover (not shown) and the first side 31 of the inner wall 3. The element 2 comprises a body 15 and at least an element terminal 8 (not shown in figure 1), the latter being located on the side of the body 15 that faces the inner wall 3. The terminal 8 may extend through a cut-out in inner wall 3. The first electrode 4 is connected with the body 15 of element 2.

[0022] Figure 2 shows a back view of the inside of the embodiment of the electric device 1 shown in figure 1. A spring 7 is located between the bottom cover (not shown) and the second side 32 of the inner wall 3. The conductive spring 7 may be formed as a stamping and/or bending part. An end section of the spring 7 serves as spring terminal 9. The other end section of the spring 7 is formed as second electrode 5. The middle section 12 of the spring is S-shaped.

[0023] The spring terminal 9 is coupled with the element terminal 8 by means of a fusible joint 10 which may be formed by solder. The spring 7 is fixed to the housing so that the spring 7 is in a deflected state if the spring terminal 9 is connected with the element terminal 8.

[0024] Power supply for the element 2 may be applied via the first and second electrodes 4, 5, the latter being coupled with the element terminal 8 via the fusible joint 10. Using the device 1 as surge protection device, the element 2 may be a varistor and the second electrode 5 and the first electrode 4 may connected in parallel to a device or circuit to be protected. The third electrode 6 may or may not be used for other purposes, e.g. indicating whether the spring and electrode terminals 9, 8 are electrically connected.

[0025] When an abnormal overvoltage increases a given value is applied between the first electrode 4 and the second electrode 5 and the heat generated by the abnormal overvoltage increases the melting temperature, the fusible joint 10 melts, which enables relaxation of the spring 7 so that the spring terminal 9 of the spring 7 moves away from the element terminal 8 due to the elastic force of the spring 7, thereby electrically disconnecting the element terminal 8 and the spring terminal 9. In other words, in case of applying abnormal overvoltage, the fusible joint 10 serving as a thermal fuse, having a low melting point temperature and acting as a solder joint between the spring terminal 9 and element terminal 8 , will melt and thereby form an open circuit due to the elasticity of the spring 7. As a result, the electric current between the second electrode 5 and the element terminal 8 will be cut off and no overvoltage is applied to the element 2 anymore, which may prevent the element 2 from catching fire.

[0026] Figure 3 shows a three-dimensional view of an embodiment of a conductive spring 7. The spring 7 has an end section serving as spring terminal 9, an S-shaped middle section 12 and a further end section formed as electrode 5. The elasticity of the spring 7 enables movement of the spring terminal 9 with respect to the electrode 5. In this embodiment the spring 7 is made by a bent metal sheet wherein at least the spring terminal 9 and

the middle section 12 are of elongated flat band shaped metal that is bent. The spring 7 may be made by L-shaped metal sheet, one arm forming the terminal 9 and the middle section 12 and the other arm forming the electrode 5. The cross section of the metal sheet forming the spring 7 is flat, e.g. rectangular or ellipsoid. The spring 7 formed by a bent metal sheet and having a flat rectangular cross section is considered as flat spring 7. In this embodiment, the spring terminal 9 and the middle section 12 have the same width.

[0027] The spring terminal 9 has a connection side 13 that faces the element terminal 8 if the spring 7 is mounted in the device 1. An elevation is provided on the connection side 13, the elevation serving as spacer 11 between a connection side 18 of the element terminal 8 and the connection side 13 of the spring terminal 9. If the terminals 8, 9 are connected, the solder of the fusible joint 10 is provided between the connection sides 13, 18, where the elevation 11 defines the gap between the connection sides 13, 18. Coupling the terminals 8, 9 includes moving the spring terminal 9 towards the element terminal 8 until the elevation 11 touches the element terminal 8 and inserting solder into the gap between the connection sides 13, 18 of the element terminal 8 and the spring terminal 9.

[0028] The spacer 11 enables to keep the gap width between the connection sides 13, 18 of the spring terminal 9 and the element terminal 8, thereby determining the amount of solder provided between the spring terminal 9 and the element terminal 8, which ensures a given quality of the solder connection between the terminals 8, 9. Ensuring that the giving solder quantity is provided causes steady soldering strength, which can withstand high surge current and melt without too much residual solder under abnormal overvoltage conditions.

[0029] The elevation 11 may be a tip with approximately or exactly 90° bending angle with respect to the plane connection side 13 of the spring terminal 9. The elevation may be a bent part of the end section of the spring 7.

[0030] The spring 7 may be made of bronze, e.g. ISO type CuSn6, with tin or nickel plating. Such a spring 7 may be soldered with PCB in an easy way and has good electric conductivity and elasticity.

[0031] The spring 7 enables transition of high electric current during normal operation of the device 1 and forms an open circuit under abnormal overvoltage conditions with high action speed and high reliability. Other materials e.g. steel alloy may be used.

[0032] The spring 77 may have a rectangular, ellipsoid or round cross section. The spring 7 is not limited to a flat S-shaped spring. Other forms serving as spring 7 may be used, such a spring 7 being connected with the element terminal 8 during normal use and moving away from the element terminal 8 under abnormal overvoltage conditions, thereby disconnecting the element terminal 8 and the spring 7.

[0033] The flat spring 7, that withstands high surge current and has reliable disconnection characteristics, can be used in connection with a varistor as one embodiment of the element 2 or other electrical elements or components.

[0034] Figure 4 shows a three-dimensional view of a further embodiment of a spring 7. The spring 7 has an end section serving as spring terminal 9, an S-shaped middle section 12 and a further end section formed as electrode 5. The spring terminal 4 differs from the one shown in figure 3. The width of the spring terminal 9 shown in figure 4 is smaller than the width of middle section 12 of the spring 7, where the width is the distance between lateral sides of the respective section. The lateral sides are the side of the spring 7 that face the inner wall 7 and the opposite side. The reduced width of the spring terminal 9 results a in greater distance between the lateral side of the spring terminal 9 and inner surface of the top cover in comparison with the distance between the middle section 12 of the spring 7 and inner surface of the top cover if the spring 7 is mounted in the device 1.

[0035] If the gap width between the spring terminal 9 and the inner surface of the housing is too small, the solder melted during abnormal overvoltage conditions may adhere to the housing, which may form a solder bridge between the spring terminal 9 and the element terminal 8. Such a solder bridge may increase the fire risk.

[0036] The reduced width of the spring terminal 9 in comparison with the width of the middle section 12 increases the distance between the spring terminal 9 and the housing, thereby reducing the risk that the melted solder forms a solder bridge adhering on the inner surface of the housing if abnormal overvoltage conditions cause melting of the fusible joint 10. If the spring terminal 9 is disconnected from the element terminal 8, the electric current will be completely cut off without any residual electrical current that may flow via a solder bridge.

[0037] Since a solder bridge on the housing should be prevented, the spring terminal 9 is asymmetrical with respect to the symmetry axis of the middle section 12. In other words, there is a step 50 between the lateral sides of the spring terminal 9 and the middle section 12 that face the inner side of the top cover. No step is provided between the lateral sides of the terminal 9 and the middle section 12 that face the inner wall 3.

[0038] Figure 5 shows a three-dimensional view of a further embodiment of a spring 7. The middle section 12 and the end section that forms the electrode 5 are similar to the ones of the embodiments described above. The spring terminal 9 comprises a spacer 11 and has a width being smaller than the width of the middle section 12. Moreover there is a step 50 between the lateral sides of the spring terminal 9 and the middle section 12 that face the top cover of the housing if the spring 7 is mounted in the device 1. The combination of these features ensures a given quality of the solder connection and avoids solder bridges on the housing.

[0039] Figure 6A shows a front view of the spring 7 shown in figure 5. Figure 6B shows the side view of the spring 7. Figure 6C shows the bottom view of the spring 7.

[0040] The figures 6A to 6C clearly show the following

features. The angle 44 between the spring terminal 9 and the middle section 12 is less than 90 degrees, e.g. 85 degrees, which may cause that the connections sides 13, 18 of the spring and element terminals 9, 8 are not arranged in parallel, which enables easy soldering. The width 41 of the spring terminal 9 being smaller than the width 42 of the middle section 12 is clearly shown in Figure 6B. The width is defined between the lateral sides of the respective sections. The lateral sides facing the inner wall 3 are in a same plane. Contrary to that there is a step 50 between the lateral sides facing the top cover. The step 50 may have rectangular edges or round edges. In one embodiment (not shown) steps 50 may be provided on both lateral sides of the spring.

[0041] Figure 7 shows the back view of the inside of an embodiment of the device 1 that comprises an element 2 (not shown in Figure 7) located on the first side 31 of the inner wall 3 and a spring 7 located on the opposite second side 32 of the inner wall 32. The spring terminal 9 comprises an elevation 11 serving as a spacer. Further there is a step 50 between the lateral sides of the spring terminal 9 and the middle section 12 of the spring 7, which causes that the distance between the spring terminal 9 and the top cover (not shown) is larger than the distance between the middle section 12 and the top cover (not shown). The spring terminal 9 is coupled with the element terminal 8 by a fusible joint 10.

[0042] The spring 7 is fixed between protruding parts 40 of the inner wall 3, so that the spring 7 is clamped between these parts 40. If the terminals 8, 9 are coupled, the spring is in a deflected state. If the joint 10 melts, the spring 7 relaxes so that the spring terminal 9 moves away from the element terminal 8 towards part 17 serving as a spring soldering fixture and covering a part of the spring 7 and the inner wall 3.

[0043] Figure 8 shows the back view of the inside of an embodiment of the device, the spring terminal 9 and the element terminal 8 not being connected. The spring 7 is in a relaxed state, where the spring terminal 9 is separated from the element terminal. The spring 7 is relaxed after melting of the fusible joint 10.

[0044] It should be mentioned that the features of the embodiments mentioned in the description can be combined.

Reference numerals

[0045]

1	device
2	element
3	inner wall
4, 5, 6	electrodes
7	spring
8	element terminal
9	spring terminal
10	fusible joint
11	spacer
13, 18	connection sides
15	body
31, 32	first, second side
40	protruding parts
41, 42	width
44	angle
50	step

Claims

1. An electric device (1) comprising:

an electric element (2) that comprises an element terminal (8), and

a conductive spring (7) being deflected, the spring (7) having a spring terminal (9) that is electrically connected to the element terminal (8) by a fusible joint (10) wherein a spacer (11) is located on one of the element terminal (8) and the spring terminal (9).

2. The device (1) according to claim 1 wherein the spacer (11) is formed as an elevation that is located on one of a connection side (18) of the element terminal (8) and a connection side (13) of the spring terminal (9), the connection side (18) of the element terminal (8) facing the connection side (13) of the spring terminal (9).

3. The device (1) according to claim 1 or 2 wherein the spring terminal (9) moves away from the element terminal (8) when the joint (10) fuses.

4. The device (1) according to claim 2 or 3 wherein the fusible joint (10) comprises solder located between the connection side (18) of the element terminal (8) and the connection side (13) of the spring terminal (9).

5. The device (1) according to any of the previous claims wherein the spring terminal (9) comprises a plane part, the elevation (11) being a part of the spring terminal (9) that is bent with respect to the

plane part.

6. The device (1) according to any of the previous claims wherein the spring terminal (9) is formed by an end section of the spring (7).

7. The device (1) according to any of the previous claims wherein the spring (7) comprises an S-shape section (12).

8. The device (1) according to any of the previous claims wherein the spring (7) comprises a bent elongate section having a flat cross section.

9. The device (1) according to any of the previous claims wherein the spring (7) comprises a middle section (12), the width (41) of the spring terminal (9) being smaller than the width (42) of the middle section (12) so that the distance between a lateral side of the spring terminal (9) and an adjacent housing wall is greater than the distance between a lateral side of the middle section (12) and the housing wall.

10. An electric device (1) comprising:

an electric element (2) that comprises an element terminal (8),
a conductive spring (7) being deflected, the spring (7) having a spring terminal (9) that is electrically connected to the element terminal (8) by a fusible joint (10), and
a housing, wherein the distance between a lateral side of the spring terminal (9) and an adjacent housing wall is greater than the distance between a lateral side of the middle section (12) and the housing wall.

11. The device (1) according to claim 9 or 10 wherein a step (50) is provided between the lateral side of the spring terminal (9) and the lateral side of the middle section (12), both lateral sides facing the housing wall of an outer cover.

12. The device (1) according to claim 10 or 11 wherein the spring (7) is fixed to the housing (40) so that the spring (7) is deflected and wherein the spring terminal (9) moves away from the element terminal (8) when the joint (10) fuses.

13. The device (1) according to any of the claims 10 to 12 wherein the housing comprises an inner wall (3), the element (1) being arranged on one side (31) of the inner wall (3) and the spring (7) being arranged on the opposite side (32) of the inner wall (31).

14. The device (1) according to any of the claim 10 to 13 wherein a spacer (11) is located on the spring terminal (9).

15. The device (1) according to any of the previous claims where the electric element (1) is a varistor.

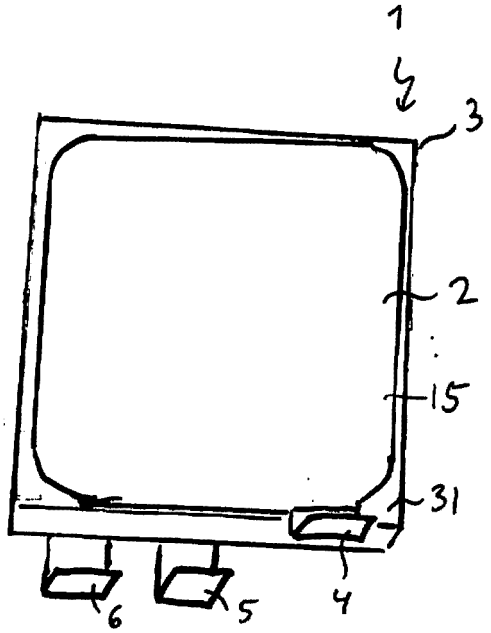

Fig. 1

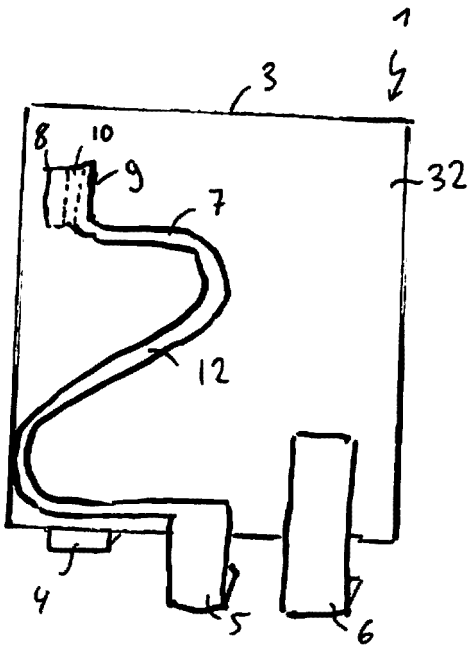

Fig. 2

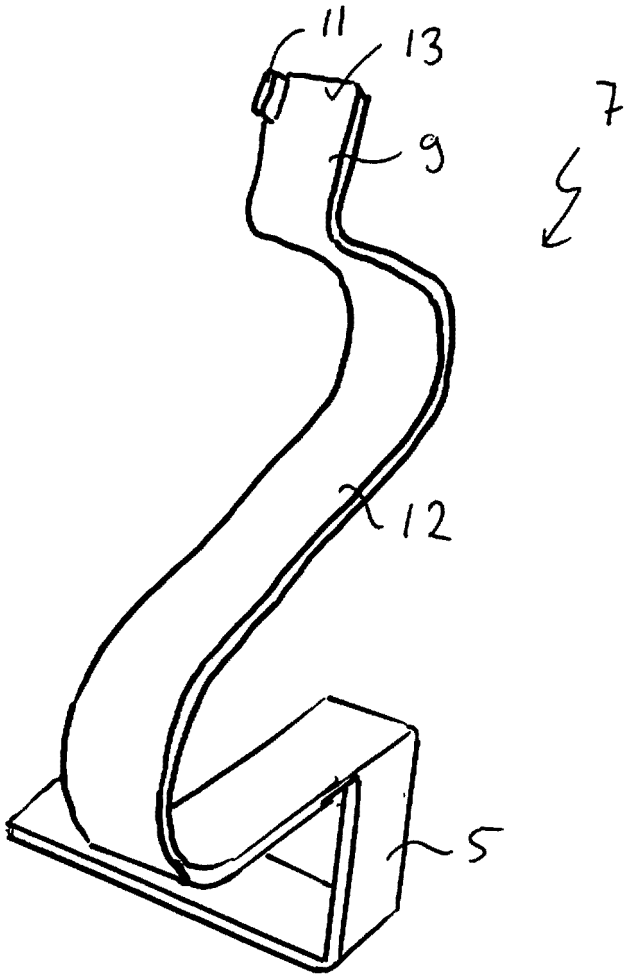

Fig. 3

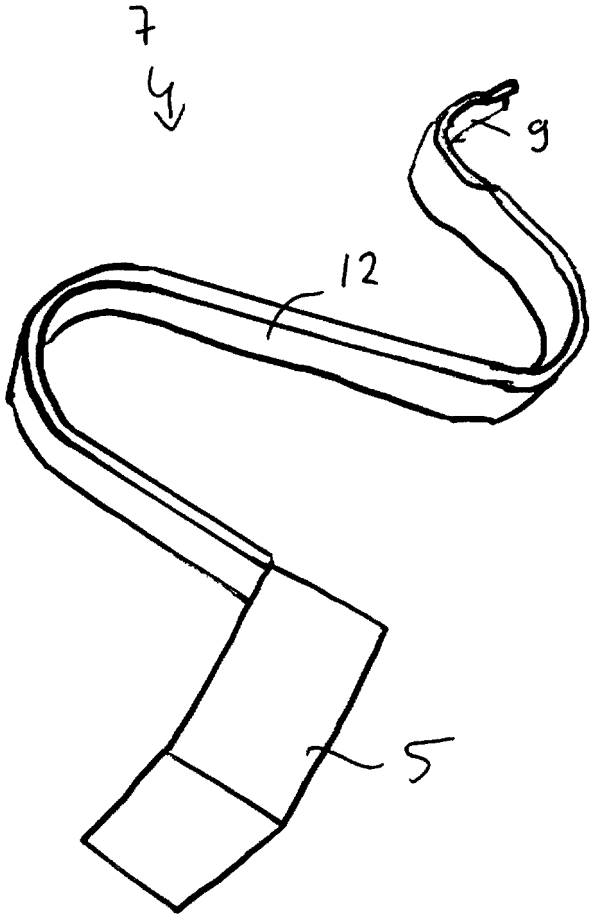

Fig. 4

Fig. 5

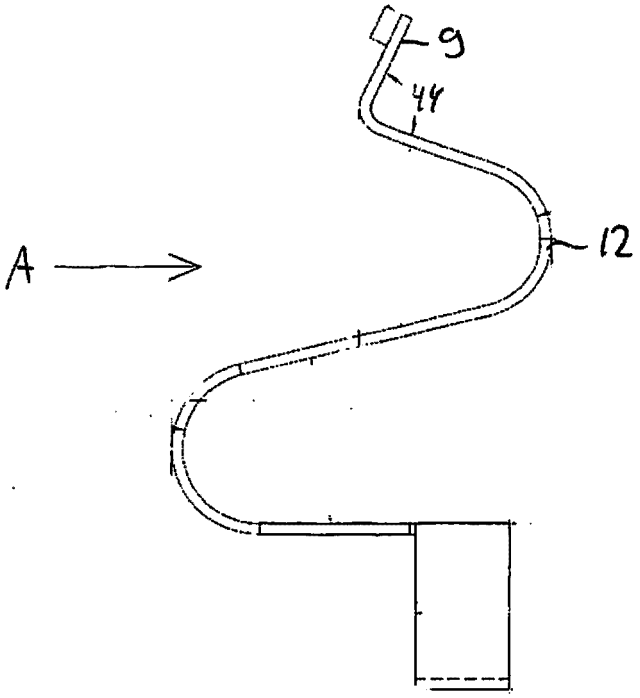

Fig. 6A

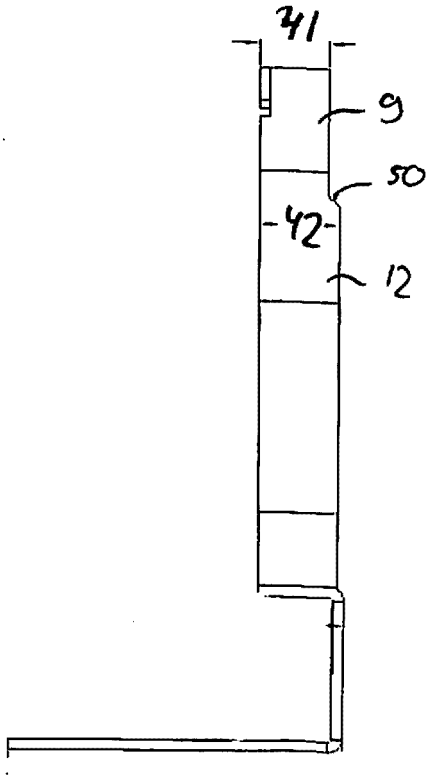

Fig. 6B

Fig. 6C

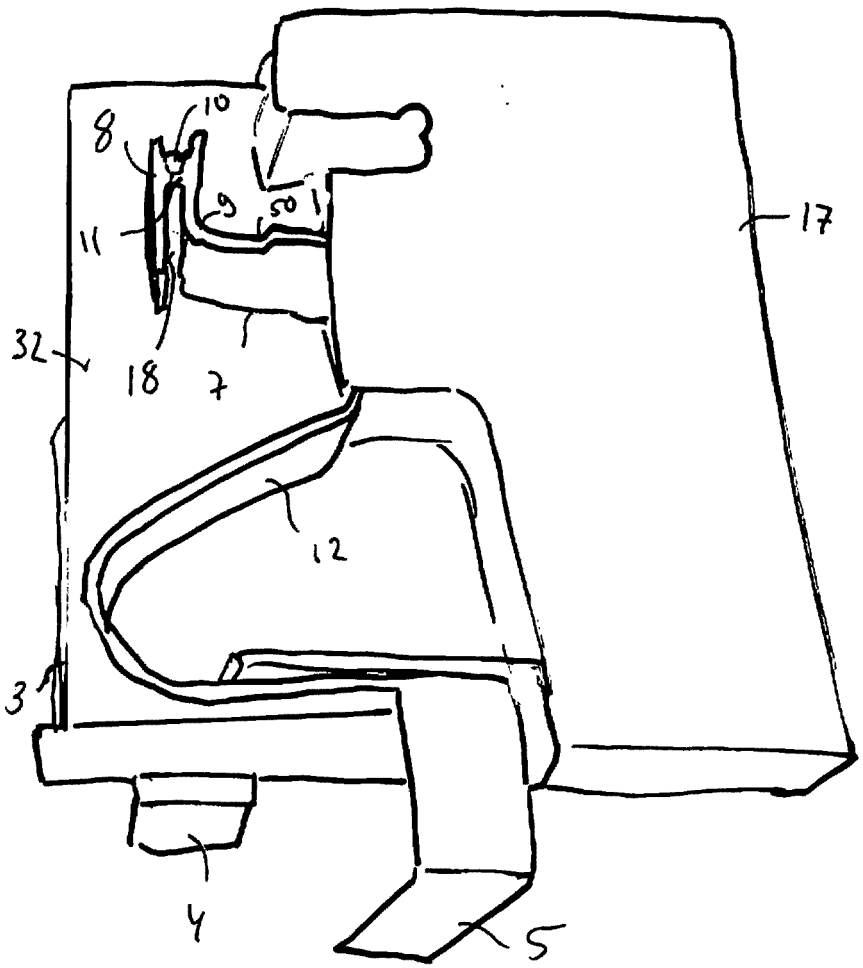

Fig. 7

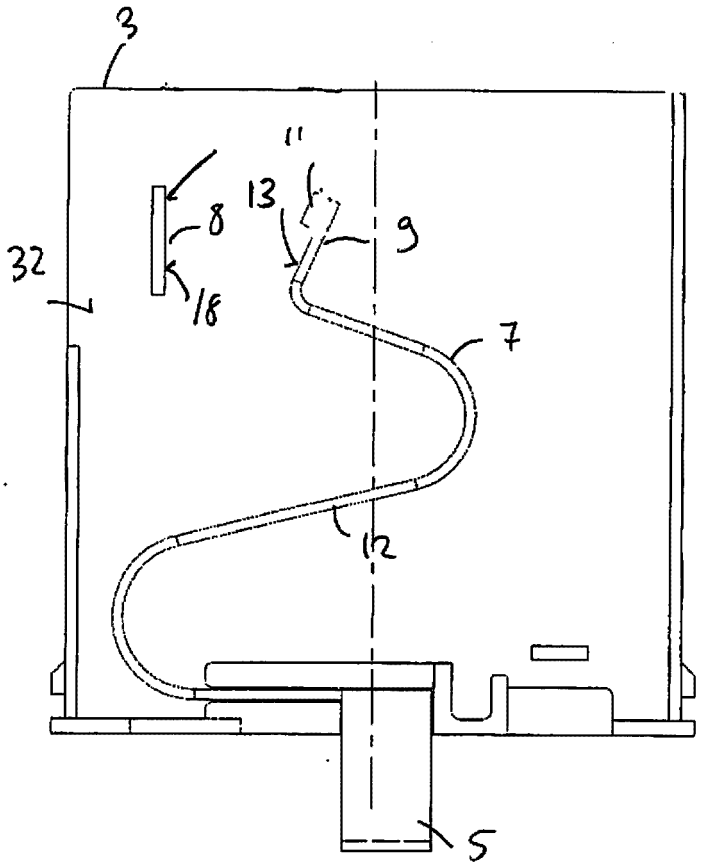

Fig. 8

Europäisches Patentamt
European Patent Office
Office européen des brevets

PARTIAL EUROPEAN SEARCH REPORT

under Rule 62a and/or 63 of the European Patent Convention. This report shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number
EP 11 17 2220

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	DE 10 2006 036598 A1 (DEHN & SOEHNE [DE]) 31 October 2007 (2007-10-31) * paragraph [0020] - paragraph [0021]; figures 1-5 * * paragraph [0024] - paragraph [0062] *	1,3-8,15 2,9	INV. H01H37/76 H01C7/12
Y	DE 93 05 796 U1 (DEHN & SOEHNE GMBH & CO KG) 17 June 1993 (1993-06-17) * figures 2-4 *	1-8,15	
Y	DE 10 2008 031917 A1 (PHOENIX CONTACT GMBH & CO [DE]) 14 January 2010 (2010-01-14) * paragraph [0024] - paragraph [0031]; figures 1-5 *	1-8,15	
Y A	US 3 242 290 A (JEAN TYLER HUGH) 22 March 1966 (1966-03-22) * figure 6 *	9 1-8,15	
A	JP 54 006541 U (UNKNOWN) 17 January 1979 (1979-01-17) * figures 1-3 *	1-9,15	
	-/--		TECHNICAL FIELDS SEARCHED (IPC) H01H H01C

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
Munich	19 December 2011	Ernst, Uwe

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

1

EPO FORM 1503 03.82 (P04E07)

Europäisches Patentamt
European Patent Office
Office européen des brevets

PARTIAL EUROPEAN SEARCH REPORT

Application Number
EP 11 17 2220

DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (IPC)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	DE 91 15 238 U1 (SIEMENS AG) 13 February 1992 (1992-02-13) * figures 1,2 * -----	1-9,15	
			TECHNICAL FIELDS SEARCHED (IPC)

1

EPO FORM 1503 03.82 (P04C10)

Europäisches Patentamt
European Patent Office
Office européen des brevets

INCOMPLETE SEARCH
SHEET C

Application Number
EP 11 17 2220

Claim(s) completely searchable:
1-9, 15

Claim(s) not searched:
10-14

Reason for the limitation of the search:

According to Rule 62a EPC and the letter of reply of the applicant (dated 29/11/2011) the search has been restricted to the subject matter of independent claim 1 and its dependent claims 2-9 and 15.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 11 17 2220

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.

19-12-2011

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 102006036598 A1	31-10-2007	CN 101427327 A	06-05-2009
		DE 102006036598 A1	31-10-2007
		EP 2011128 A1	07-01-2009
		JP 2009534804 A	24-09-2009
		RU 2008145659 A	10-06-2010
DE 9305796 U1	17-06-1993	NONE	
DE 102008031917 A1	14-01-2010	CN 101626156 A	13-01-2010
		DE 102008031917 A1	14-01-2010
US 3242290 A	22-03-1966	NONE	
JP 54006541 U	17-01-1979	NONE	
DE 9115238 U1	13-02-1992	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82