Trial decision

Invalidation No. 2013-800007

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The case of trial regarding the invalidation of Japanese Patent No. 3552539, entitled "THERMAL FUSE WITH RESISTANCE" between the parties above has resulted in the following trial decision.

Conclusion

The correction shall be approved as requested.

The demand for trial of the case was groundless.

The costs in connection with the trial shall be borne by the demandant.

Reason

No. 1 History of the procedures

The application regarding the patent of case No. 3552539 (hereinafter referred to as "the Patent") was filed on June 19, 1998, and the establishment of patent right was registered on May 14, 2004.

The history of the procedures in connection with the demand for invalidation trial of the case is as follows.

January 17, 2013 Demand for invalidation trial of the case

April 5, 2013	Submission of written reply
April 25, 2013	Notification of matters to be examined
June 6, 2013	Submission of oral proceedings statement briefs from both parties
June 20, 2013	Submission of oral proceedings statement brief (2) from the demandee
June 20, 2013	Submission of oral proceedings statement brief (2) from the demandant
June 20, 2013	Oral proceedings
July 4, 2013	Submission of written amendment and written statement from the demandant
July 17, 2013	Submission of written statement from the demandee
August 28, 2013	Advance notice of trial decision
October 25, 2013	Submission of written correction request from the demandee
October 28, 2013	Submission of written statement from the demandant
December 12, 2013	Submission of written refutation from the demandant
January 8, 2014	Decision of acceptance or non-acceptance of amendment
February 7, 2014	Submission of written reply (2) from the demandee

The demandant withdrew the oral proceedings statement brief (2) submitted on June 20 in the oral proceedings.

No. 2 Request for correction

1. Object of the request and details of the correction

The correction (hereinafter referred to as "the Correction") demanded by the demandee with the written correction request dated October 25, 2013 is to correct the specification attached to the application of the patent for each claim or each group of claims as the corrected specification attached to the written correction request, and the details of the request are as follows.

(1) Correction A

The limitation matter, "flux is arranged around the low-melting point alloy body and a case is brought into airtight contact with the ceramic substrate, to protect the flux from an outdoor air environment," is added to Claim 1 of the scope of claims before correction.

(2) Correction B

The description of Claim 2 of the scope of claims before correction,

"a thermal fuse with resistance described in Claim 1 configured so that an intermediate part of the low-melting point alloy body is supported by a high heat conductor arranged on the ceramic substrate,"

is corrected to the description,

"a thermal fuse with resistance formed by arranging a low-melting point alloy body on one side of a ceramic substrate and a heating element on the other side, and configured to melt and cut the low-melting point alloy body with heat via the ceramic substrate by applying electric power to the heating element, to shut off a circuit, the low-melting point alloy body being flat and arranged in a position opposite the heating element on one side of the ceramic substrate, having both ends and an intermediate part connected

to electrodes, the heating element being powered via the electrode of the intermediate part, and the intermediate part of the low-melting point alloy body being supported by a high heat conductor arranged on the ceramic substrate."

(3) Correction C

The description of Claim 3 of the scope of claims before correction,

"a thermal fuse with resistance, in the implementation structure on a circuit substrate of the thermal fuse with resistance described in Claim 1 or 2, configured so that a lead wire protrudes from the ceramic substrate to form a gap between the heating element and the circuit substrate,"

is corrected to the description,

"a thermal fuse with resistance formed by arranging a low-melting point alloy body on one side of a ceramic substrate and a heating element on the other side, and configured to melt and cut the low-melting point alloy body with heat via the ceramic substrate by applying electric power to the heating element, to shut off a circuit, the low-melting point alloy body being flat and arranged in a position opposite the heating element on one side of the ceramic substrate, having both ends and an intermediate part connected to electrodes, the heating element being powered via the electrode of the intermediate part, in the implementation structure on a circuit substrate of the thermal fuse with resistance, the thermal fuse with resistance being configured so that a lead wire protrudes from the ceramic substrate to form a gap between the heating element and the circuit substrate."

(4) Correction D

The description of Claim 3 of the scope of claims before correction,

"a thermal fuse with resistance, in the implementation structure on a circuit substrate of the thermal fuse with resistance described in Claim 1 or 2, configured so that a lead wire protrudes from the ceramic substrate to form a gap between the heating element and the circuit substrate,"

is corrected to the description,

"a thermal fuse with resistance formed by arranging a low-melting point alloy body on one side of a ceramic substrate and a heating element on the other side, and configured to melt and cut the low-melting point alloy body with heat via the ceramic substrate by applying electric power to the heating element, to shut off a circuit, the low-melting point alloy body being flat and arranged in a position opposite the heating element on one side of the ceramic substrate, having both ends and an intermediate part connected to electrodes, the heating element being powered via the electrode of the intermediate part, the intermediate part of the low-melting point alloy body being supported by a high heat conductor arranged on the ceramic substrate, in the implementation structure on a circuit substrate of the thermal fuse with resistance, the thermal fuse with resistance being configured so that a lead wire protrudes from the ceramic substrate to form a gap between the heating element and the circuit substrate."

2. Judgment of suitability of the correction

(1) Regarding the Correction A

The Correction A is to add the flux and the case to the invention according to Claim 1 before correction, and aims at "restriction of the scope of claims" stipulated in Article 134-2(1)(i) of the Patent Act.

The following description is included in [0016] of the patent specification, "...

when in use, the case 14 is brought into airtight contact with the ceramic substrate 11, to protect the low-melting point alloy body 12 or the flux arranged around the low-melting point alloy body, which is not shown, from an outdoor air environment." The Correction A is a correction that is within the matters described in the patent specification.

The Correction A is to restrict the scope of claims, and does not substantially enlarge or modify the scope of claims of the patent.

(2) Regarding the Corrections B to D

The Correction B dissolves the citation relation between the claims, to change the description of Claim 2 before correction dependent on Claim 1 to an independent claim to be Claim 2 after correction.

The Correction C dissolves the citation relation between the claims, to change the description in Claim 3 before correction dependent on Claim 1 to an independent claim to be Claim 3 after correction.

The Correction D dissolves the citation relation between the claims, to change the description in Claim 3 before correction dependent on Claim 2 to an independent claim to be Claim 4 after correction.

Thus, the Corrections B to D are "to change the description of claims dependent on other claims into claims which are not dependent on other claims" as prescribed in Article 134-2(1)(iv) of the Patent Act, and are within the matters described in the patent specification. The Corrections do not substantially enlarge or modify the scope of claims of the patent.

3. Summary

As described above, the Correction of the case aims at matters prescribed in Article 134-2(1)(i) and (iv) of the Patent Act and falls under the provisions of Article 126-5 and 6 of the Patent Act, which is applied mutatis mutandis in the provisions of Article 134-2(9).

Therefore, the corrections shall be approved.

No. 3 The Invention

As described above, the Correction is approved, and the inventions according to Claims 1 to 4 of the Patent are as follows as described in Claims 1 to 4 of the scope of claims of the corrected specification attached to the written correction request.

"[Claim 1]

A thermal fuse with resistance formed by arranging a low-melting point alloy body on one side of a ceramic substrate and a heating element on the other side, and configured to melt and cut the low-melting point alloy body with heat via the ceramic substrate by applying electric power to the heating element, to shut off a circuit, the low-melting point alloy body being flat and arranged in a position opposite the heating element on one side of the ceramic substrate, having both ends and an intermediate part connected to electrodes, the heating element being powered via the electrode of the intermediate part, wherein flux is arranged around the low-melting point alloy body and a case is brought into airtight contact with the ceramic substrate, to protect the flux from an outdoor air environment.

[Claim 2]

A thermal fuse with resistance formed by arranging a low-melting point alloy body on one side of a ceramic substrate and a heating element on the other side, and configured to melt and cut the low-melting point alloy body with heat via the ceramic substrate by applying electric power to the heating element, to shut off a circuit, the low-melting point alloy body being flat and arranged in a position opposite the heating element on one side of the ceramic substrate, having both ends and an intermediate part connected to electrodes, the heating element being powered via the electrode of the intermediate part, and the intermediate part of the low-melting point alloy body being supported by a high heat conductor arranged on the ceramic substrate.

[Claim 3]

A thermal fuse with resistance formed by arranging a low-melting point alloy body on one side of a ceramic substrate and a heating element on the other side, and configured to melt and cut the low-melting point alloy body with heat via the ceramic substrate by applying electric power to the heating element, to shut off a circuit, the low-melting point alloy body being flat and arranged in a position opposite the heating element on one side of the ceramic substrate, having both ends and an intermediate part connected to electrodes, the heating element being powered via the electrode of the intermediate part, in the implementation structure on a circuit substrate of the thermal fuse with resistance, the thermal fuse with resistance being configured so that a lead wire protrudes from the ceramic substrate to form a gap between the heating element and the circuit substrate.

[Claim 4]

A thermal fuse with resistance formed by arranging a low-melting point alloy body on one side of a ceramic substrate and a heating element on the other side, and configured to melt and cut the low-melting point alloy body with heat via the ceramic substrate by applying electric power to the heating element, to shut off a circuit, the low-melting point alloy body being flat and arranged in a position opposite the heating element on one side of the ceramic substrate, having both ends and an intermediate part connected to electrodes, the heating element being powered via the electrode of the intermediate part, the intermediate part of the low-melting point alloy body being supported by a high heat conductor arranged on the ceramic substrate, in the implementation structure on a circuit substrate of the thermal fuse with resistance, the thermal fuse with resistance being configured so that a lead wire protrudes from the ceramic substrate to form a gap between the heating element and the circuit substrate."

No. 4 Demandant's allegation

The demandant demanded the decision to invalidate the patent for the invention according to Claims 1 to 3 before correction, in the written demand for trial.

The demandant submitted the written refutation as of December 12, 2013, and demanded the decision to invalidate the patent for the invention according to Claims 1 to 4 after correction.

The demandant alleges, in the written refutation, the reason for invalidation with respect to the invention according to Claim 1 after correction, by adding new means of proof to the matters added by correction, and alleges the reason for invalidation with respect to the invention according to Claim 4 after correction by adding new means of proof for the invention according to Claim 2 before correction to the means of proof for

the invention according to Claim 3 before correction due to changing the description from dependent claims to independent claims. The addition of means of proof and modification of reasons correspond to amendment to modify the gist of written demand for trial. Since the amendment falls under the provision of Article 131-2(2)(i) of the Patent Act, "necessity to amend the statement of a demand due to a demand for correction," and is "obviously unlikely to delay a trial decision unduly," it was accepted at the decision of acceptance or non-acceptance of amendment dated January 8, 2014.

The reasons and means of proof are as follows.

1. Reasons for invalidation

The invention according to Claims 1 to 4 of the Patent could have been easily invented by a person skilled in the art on the basis of the invention described in publications distributed in Japan before the application was filed, and the demandee should not be granted a patent under the provisions of Article 29(2) of the Patent Act. Thus, the Patent should be invalidated under the provisions of Article 123-1(2) of the Patent Act.

The outline of the allegation is as follows.

(1) Regarding the invention according to Claim 1

The invention according to Claim 1 is only an invention which could have been easily invented by a person skilled in the art on the basis of Evidences A No. 2, No. 3, and Nos. 15 to 18.

(2) Regarding the invention according to Claim 2

The invention according to Claim 2 is only an invention which could have been easily invented by a person skilled in the art on the basis of Evidences A No. 2, No. 3, and No. 5.

(3) Regarding the invention according to Claim 3

The invention according to Claim 3 is only an invention which could have been easily invented by a person skilled in the art on the basis of Evidences A No. 2, No. 4, and Nos. 6 to 8.

(4) Regarding the invention according to Claim 4

The invention according to Claim 4 is only an invention which could have been easily invented by a person skilled in the art on the basis of Evidences A Nos. 2 to 8.

2. Means of proof

The demandant submitted Evidences A Nos. 1 to 8 attached to the written demand for trial, Evidences A No. 9 and No. 10 attached to the oral proceedings statement brief, Evidences A Nos. 11 to 14 attached to the written statement dated July 4, 2013, and Evidences A Nos. 15 to 18 attached to the written refutation.

Evidence A No. 1:	Japanese Patent No. 3552539 (Patent publication of the case)
Evidence A No. 2:	Japanese Utility Model Publication No. H4-36027
Evidence A No. 3:	Japanese Unexamined Patent Application Publication No. H7-153367
Evidence A No. 4:	Japanese Utility Model Publication No. H6-38351
Evidence A No. 5:	Japanese Utility Model Publication No. H4-36021
Evidence A No. 6:	Japanese Unexamined Patent Application Publication No. S60-

37632

Evidence A No. 7: microfilm of Japanese Utility Model Application No. S51-151505 (Japanese Unexamined Utility Model Application Publication No. S53-67425)

Evidence A No. 8: CD-ROM of Japanese Utility Model Application No. H4-37269 (Japanese Unexamined Utility Model Application Publication No. H5-90776)

Evidence A No. 9: "Electronic technology" Vol. 38 No.11 published by Nihon Kogyo Shinbunsha on November 1, 1996

Evidence A No. 10: Japanese Unexamined Patent Application Publication No. H4-269487

Evidence A No. 11: Electronic Industries Association of Japan standardization promotion, standard of forming size of fixed resistor for consumer electronic appliances, established in July, 1980

Evidence A No. 12: Electronic Industries Association of Japan list of specifications

Evidence A No. 13: Outline of Electronic Industries Association of Japan

Evidence A No. 14: Surface mounting technology Vol. 6 No. 8 published by NIKKAN KOGYO SHIMBUN, LTD. on August 1, 1996

Evidence A No. 15: Japanese Unexamined Patent Application Publication No. H8-161990

Evidence A No. 16: Japanese Unexamined Patent Application Publication No. H9-17302

Evidence A No. 17: Japanese Unexamined Patent Application Publication No. H9-231897

Evidence A No. 18: Japanese Unexamined Patent Application Publication No. H7-230747

Although, in the written demand for trial, "Japanese Unexamined Utility Model Application Publication No. S53-67425" is indicated as Evidence A No. 7, a copy of the "microfilm of Japanese Utility Model Application No. S51-151505 (Japanese Unexamined Utility Model Application Publication No. S53-67425)" is actually attached. Similarly, the "Japanese Unexamined Utility Model Application Publication No. H5-90776" indicated as Evidence A No. 8 is a copy of the "CD-ROM of Japanese Utility Model Application No. H4-37269 (Japanese Unexamined Utility Model Application Publication No. H5-90776)."

No. 5 Demandee's allegation

The demandee demands the trial decision, "The demand for trial of the case was groundless. The costs in connection with the trial shall be borne by the demandant," and alleges as follows.

1. Regarding the reasons for invalidation

The invention according to Claims 1 to 4 of the Patent could not have been easily invented by a person skilled in the art, on the basis of the inventions described in Evidences A Nos. 2 to 5, the well-known matters described in Evidences A Nos. 6 to 8, and the matters described in Evidences A Nos. 15 to 18.

No. 6 Judgment by the body
1. Matters described in Evidences A
(1) Evidence A No. 2
The following matters are described together with drawings in Evidence A No. 2 (Japanese Utility Model Publication No. H4-36027).
(A) "<Industrial Application Field>
The device relates to improvement of a substrate-type thermal fuse with resistance.
<Prior art and problems>
A substrate-type thermal fuse with resistance, which is formed by arranging a film resistor on one side of an insulating substrate and a film low-melting point metal body on the other side of the insulating substrate, is well-known.
The point of using the thermal fuse with resistance is to transmit heat generated in the film resistor due to overcurrent to the film low-melting point metal body, to melt and cut the low-melting point metal body, and to shut off the overcurrent by cutting. However, due to poor heat transfer characteristics of a heat path where the heat generated in the film resistor is transferred to the film low-melting point metal body via the thickness of the insulating substrate, operating characteristics are poor. (p. 1 the first column l. 8-l. 22)
(B) "FIG. 1 is a top-view diagram illustrating the thermal fuse with resistance according to the device. FIG. 2 is a back diagram illustrating the fuse.
In the figures, 1 denotes an insulating substrate, a ceramic board for example. Reference numerals 21, 21 and 22, 22 denote counter film electrodes arranged on one side of the substrate, symmetrically with respect to the center line n-n of the insulating substrate 1. Reference numerals 31 and 32 denote film resistors arranged between the electrodes 21, 21, 22, 22, and are of the same size and thickness. Reference numerals 4, ... denote lead conductors for the counter electrodes. Reference numeral 5 denotes an insulating coat. Reference numerals 61, 62 denote film low-melting point metal bodies arranged on the other side of the substrate 1, in the same positions as the film resistors 31, 32. Therefore, the film low-melting point metal bodies 61, 62 are located symmetrically with respect to the center line n-n.
Reference numerals 71, 72 denote fluxes." (p. 1 the second column l. 10-l. 25)
(C) "... 11 denotes an insulating coat." (p. 2 the third column l. 5)
(D) "When the fuse is in operation, the film low-melting point metal body is melted and cut by heat generated in the film resistor due to overcurrent" (p. 2 the third column l. 6-l. 8)
(E) From FIG. 2, it can be understood that both ends of the film low-melting point metal bodies (61, 62) are connected to the ends of the film conductor (8) and film auxiliary conductors (91, 92), and that the fluxes (71, 72) are arranged around the film low-melting point metal bodies (61, 62).

According to the description of the above matters and drawings, it can be recognized that the following invention (hereinafter referred to as "Cited invention") is described in Evidence A No. 2.

[Cited invention]
"A thermal fuse with resistance formed by arranging film low-melting point metal bodies (61, 62) on the other side of an insulating substrate (1) formed of a ceramic

board, and film resistors (31, 32) on one side, and configured to apply electricity to the film resistors (31, 32) to melt and cut the film low-melting point metal bodies (61, 62) with heat via the insulating substrate (1), for shutting off a circuit, the film low-melting point metal bodies (61, 62) being formed in a film shape and arranged in the same positions on the other side of the insulating substrate (1) in relation to the film resistors (31, 32), the metal bodies having both ends being connected to a film conductor (8) and film auxiliary conductors (91, 92), and fluxes (71, 72) arranged around the film low-melting point metal bodies (61, 62)."

(2) Evidence A No. 3

The following matters are described together with drawings in Evidence A No. 3 (Japanese Unexamined Patent Application Publication No. H7-153367).

(A) "[0001]

[Industrial Application Field] This invention relates to a protection element having a suitable fuse resistor applied to a chargeable and dischargeable secondary battery, for example, a manufacturing method thereof, and a circuit substrate having the element.

[0002]

[Conventional Art and Problem to be Solved by the Invention] Conventional fuse resistors are roughly classified into two types, current fuses which operate with overcurrent and thermal fuses which operate with temperature. However, the above two operation sources do not satisfy fuse function as industries have been developed recently.

[0003] A protection circuit may be included in a chargeable and rechargeable secondary battery in order to prevent overcharging of the battery. Since an extremely overcharged battery generates a gas internally and may cause explosion, battery function may be disabled by a fuse or the like.

[0004] In this case, a fuse resistor which detects a voltage is required, and a conventional fuse resistor cannot satisfy the requirement.

[0005] For example, in Japanese Unexamined Patent Application Publication No. H4-32879, a fuse resistor configured to melt and cut a low-melting point metal with a PTC as a heat source is specified, where the low-melting point metal and the PTC are electrically connected in series. The heat source does not operate when a large current, such as strobe flash, flows instantaneously, and melts and cuts a fuse with heat generated in the PTC when a current equal to or larger than a prescribed current flows due to overdischarge. Thus, it cannot be used for the above purpose.

[0006] This invention is made in view of the problem, and aims to provide a protection element which operates by detecting a voltage, along with a manufacturing method thereof, and a circuit substrate including the protection element." ([0001]-[0006])

(B) "[0017]

[Operation] The protection element of the invention is formed of a low-melting point metal 6, a heat generator 5, and a detection element 9, and is configured so that the low-melting point metal 6 and the heat generator 5 are brought into contact with each other via an insulation layer 4, to power the heat generator 5 with the detection element 9, thereby cutting a fuse in an arbitrary voltage condition." ([0017])

(C) "[0038] The low-melting point metal is also connected to a fuse electrode 2c in FIG. 4, which is arranged between fuse electrodes 2a, 2b to which both ends of the low-melting point metal are connected. The material of the fuse electrode 2c is the same as

that of the fuse electrode 2a or 2. Other constitutions are the same as in the above example.
[0039] Details of the example are described below. A conductor pattern shown in FIG. 5 is formed on a polyimide film with a thickness of 25μm. Carbon paste FC-403R (manufactured by FUJIKURA KASEI CO., LTD., phenolic resin-based) is applied by screen printing between heater electrodes 3a, 3b so as not to cover the fuse electrodes 2a, 2b, and 2c, and is hardened for 30 minutes at 150°C.
[0040] An insulation layer is applied by screen printing so as to cover the whole surface of the carbon paste without covering the fuse electrodes 2a, 2b, and 2c, and is hardened for 30 minutes at 150°C. The formulation of the insulation layer is the same as in the above example.
[0041] A 7 mm-by-3 mm low-melting point metal with a thickness of 100 μm is bonded by heat press between the fuse electrodes 2a, 2b, and 2c. ..." ([0038]-[0041])
(D) "[0046] The protection element in FIG. 6B is obtained by embedding the fuse resistor and a voltage detection element. When electricity is supplied to the heat generator from the fuse electrode 2a or 2b in FIG. 5, after the low-melting point metal is melted and cut, the electricity supplied to the heat generator is stopped for safety, and the protection element can be used as a protection element for preventing overcharge of a battery.
[0047] Therefore, the circuit (FIG. 6A) indicated in the first example is a voltage detection system configured to, without forming an intermediate electrode, bring the heat generator into thermal contact with the low-melting point metal for allowing a current to flow with a predetermined voltage into the heat generator, to melt and cut the low-melting point metal with the heat. In this case, if a battery is connected to a charger, electricity supplied to the generator through the detection element is not stopped even after cutting the low-melting point metal regardless of whether the connection part e is connected to the electrode a or the electrode c, and the heat generator continues to generate heat, which may cause ignition.
[0048] In the circuit of the example, the protection element is configured to supply electricity to the heat generator via the intermediate electrode through the low-melting point metal at both electrodes f and h. Even when the battery is connected to the charger, electricity supplied to the heat generator can be stopped by melting and cutting the low-melting point metal at two spots." ([0046]-[0048])

According to the description of the above matters and drawings, it can be recognized that the following invention (hereinafter referred to as "Invention A-3") is described in Evidence A No. 3.
[Invention A-3]
"A protection element having a heat generator and a low-melting point metal which melts and cuts with heat generated in the heat generator, configured to detect a voltage for operation, the low-melting point metal having fuse electrodes arranged at both ends and an intermediate point, the protection element being configured to supply electricity to the heat generator through the low-melting point metal via an intermediate electrode, to reliably stop the electricity supplied to the heat generator after melting and cutting the low-melting point metal, for preventing overheating."

(3) Evidence A No. 4

The following matters are described together with drawings in Evidence A No. 4

(Japanese Utility Model Publication No. H6-38351).
(A) "<Industrial Application Field>
This device relates to improvement of a thermal fuse.
<Prior art and problems>
As one application of a thermal fuse, a thermal fuse is arranged close to a heat-generating circuit element, such as a resistor element, and the thermal fuse is actuated with heat generated in the heat-generating element due to overcurrent, to protect a circuit from abnormal heating of the heat-generating circuit element." (p. 1 the first column l. 10-p. 1 the second column l. 2)
(B) "However, when the chip-type circuit element is a heat-generating element such as a resistor element" (p. 1 the second column l. 14-l. 15)
(C) "In FIG 1A and FIG. 1B, reference numeral 1 denotes an insulating substrate, such as a ceramic board. Reference numerals 2, 2 denote foil electrodes arranged on one side of the insulating substrate 1. Reference numeral 3 denotes a low-melting point soluble metal layer bridged between the electrodes, ... (omitted) ... Reference numerals 7, 7 denote foil electrodes arranged on the other side of the insulating substrate 1. Reference numerals 8, 8 denote lead wires connected to the electrodes 7, 7." (p. 2 the third column l. 30-l. 37)
(D) "FIG. 4 illustrates a state of use of the thermal fuse according to the device.
In FIG. 4, reference letter A indicates a printed wiring board, reference numeral 9 indicates a printed circuit conductor, reference numerals 101 and 102, ... are chip-type circuit elements connected (soldered) to a predetermined position of the printed circuit conductor. Reference letter B denotes the thermal fuse according to the device. Reference numeral 100 denotes a chip-type heat-generating circuit element to be connected between rounds 91, 91 of the printed circuit conductor 9, and is attached with a conductive adhesive between the electrodes 7, 7 on the back of the insulating substrate of the thermal fuse B" (p. 2 the third column l. 46-the fourth column l.7)
(E) "In the above description, when the chip-type heat-generating circuit element 100 generates heat, the heat is transferred from the electrode 7 to the low-melting point metal body 3 through the insulating substrate 1 of the thermal fuse B and the low-melting point metal body 3 of the fuse B. The electrode 7 is heated to substantially the same temperature, due to high heat conductivity of the electrode 7, as the temperature of the heat generated in the chip-type heat-generating circuit element 100, to substantially form a large thermal contact area between the chip-type heat-generating circuit element 100 and the thermal fuse B, thereby efficiently transferring the heat generated in the chip-type heat-generating circuit element 100 to the substrate-type thermal fuse B. The heat generated in the chip-type heat-generating circuit element 100 quickly melts and cuts the low-melting point metal body of the substrate-type thermal fuse, to shut off electricity supplied to a circuit quickly." (p. 2 the fourth column l. 12-l. 23)
(F) "The heat generated in the chip-type heat-generating circuit element can be efficiently transferred to the substrate-type thermal fuse by using an attachment electrode of the chip-type heat-generating circuit element as a heat-sensitive board. The overcurrent heat generated in the heat-generating circuit element can quickly melt and cut the low-melting point metal body of the substrate-type thermal fuse." (p. 2 the fourth column l. 30-l. 35)

(4) Evidence A No. 5

The following matters are described together with drawings in Evidence A No. 5 (Japanese Utility Model Publication No. H4-36021).

(A) " <Prior art and problems>

A resistor element with thermal fuses arranged in series is configured to melt and cut the thermal fuses with heat generated by a resistor due to overcurrent, in order to shut off electricity to be supplied to the resistor, and can protect a circuit from abnormal heating of the resistor.

The resistor element with thermal fuses, as shown in FIG. 4, formed by arranging electrodes 21', 22', and 23' on an insulating substrate 1', arranging layered resistor 3' between the electrodes 21' and 22', arranging a layered low-melting point metal body 4' between the electrodes 21' and 23', and arranging an insulation layer 7' on the insulating substrate 1', is well known. Reference numerals 8' and 8' denote lead conductors.

However, since the heat generated in the resistor 3' is efficiently transferred to the layered low-melting point metal body part 40' of the resistor with thermal fuses near the electrode 21', the layered low-melting point metal body part 40' is heated well, while other low-melting point metal body parts are unlikely to be heated. Therefore, the layered low-melting point metal body is heated non-uniformly, resulting in delay of melt-cutting, and causing unfavorable operability.

<Object of the device>

The object of the device is to heat a layered low-melting point metal body uniformly, to thereby provide a substrate-type resistor-thermal fuse combination with excellent operability.

<Configuration of the device>

The resistor-thermal fuse combination according to the device is configured by arranging a layered resistor and a layered low-melting point metal body in different positions on an insulating substrate, arranging a layered high heat conductor on the layered low-melting point metal body via an insulation film, and connecting the layered high heat conductor and the layered resistor so as to transfer heat.

<Description of the example>

The device is described as follows with reference to drawings.

FIG. 1A is a schematic diagram illustrating the resistor element with thermal fuses according to the device, and FIG. 1B shows a cross-sectional view b-b shown in FIG. 1A.

In FIG. 1A and FIG. 1B, reference numeral 1 indicates an insulating substrate, which can employ a ceramic board or heat-resistant plastic board. Reference numerals 21, 22, and 23 indicate foil electrodes. Reference numeral 3 indicates a layered resistor, which is arranged between the electrodes 21 and 22. Reference numeral 4 indicates a layered low-melting point metal body (Pb-Sn alloy-based, for example), which is arranged between the electrodes 21 and 23. Reference numeral 5 indicates a layered high heat conductor having heat conductivity much higher than that of the layered low-melting point metal body 4, and arranged immediately below the layered low-melting point metal body 4 via an insulation film 6. The layered high heat conductor 5 is connected to the electrode 21 and separated from the electrode 23. The same material can be employed for the layered high heat conductor 5 as for the electrode 23. Reference numeral 7 indicates an insulation layer arranged on the insulating substrate. Reference numerals 8, 8 indicate lead conductors." (p. 1 the

first column l. 12-p. 2 the third column l. 11)

(5) Evidence A No. 6

The following matters are described together with drawings in Evidence A No. 6 (Japanese Unexamined Patent Application Publication No. S60-37632).

(A) "(1) A thick film fuse including at least a pair of connection terminal layers arranged on an insulating substrate and a fuse layer arranged between the connection terminal layers to form a gap with the insulating substrate, and using the gap as an air heat-insulating layer." (p. 1 left column l. 5-l. 9)

(B) "When an overcurrent flows in the fuse layer 3, the fuse layer 3 is heated with Joule heat, and heat energy for melt-cutting is sequentially accumulated. The fuse layer 3 uses the air as a heat-insulating layer, and is connected to the insulating substrate 1 only with the connection terminal layers 2, 2, and the amount of heat dissipated due to heat conduction is small. The heat to be dissipated from the fuse layer 3 is small, and the temperature increases rapidly as time passes. Since the insulating substrate 1 hardly functions as a heat sink of the fuse layer 3, there is little influence of difference of heat dissipation depending on the shape and size of the insulating substrate 1, and there is no variability in temperature increase.

The fuse layer 3 is melted and cut when heated nearly to a melting point of a metal layer 6, and agglomerates on the side of the connection terminal layers 2, 2 in the shape of a ball due to surface tension." (p. 2 right column l. 1-l. 14)

(6) Evidence A No. 7

The following matters are described together with drawings in Evidence A No. 7 (microfilm of Japanese Utility Model Application No. S51-151505 (Japanese Unexamined Utility Model Application Publication No. S53-67425)).

(A) "Since the thermal fuse 22 is only arranged close to a heating element 21 generally, shut-off temperature becomes non-uniform due to variability of a relative position for attachment.

And since aA slight airspace is formed between them, response of the thermal fuse 22 is slow and proper protection operation cannot be ensured." (Specification p. 2 . l. 20-p. 3 l. 6)

(7) Evidence A No. 8

The following matters are described together with drawings in Evidence A No. 8 (CD-ROM of Japanese Utility Model Application No. H4-37269 (Japanese Unexamined Utility Model Application Publication No. H5-90776)).

(A) "[0005]

[Operation]

... In the solid insulated switchgear of the device in Claim 2, a plurality of heat shield plates are arranged between phases of the switch unit, and a heat-insulating effect can be exerted with air layers formed between the heat shield plates, thereby allowing temperature increase values of the phases of the switch unit to become further uniform. ([0005])

(8) Evidence A No. 15

The following matters are described together with drawings in Evidence A No.

15 (Japanese Unexamined Patent Application Publication No. H8-161990).
(A) "[0021] As described above, the protection element of the invention can be formed of a heating element 3 made of an inorganic material arranged on an inorganic substrate 2, an insulating layer 4, and a low-melting point metal body 5, and preferably, as shown in FIG. 2 or FIG. 3, the low-melting point metal body 5 is shielded by an inside shielding part 8 and the outside thereof is covered with an outer case or an outside shielding part.
[0022] Thus, FIG. 2 is a cross-sectional view of a protection element 1b configured by shielding the low-melting point metal body 5 of the protection element 1a in FIG. 1 with the inside shielding part 8 having a low melting point or a low softening point lower than that of the low-melting point metal body 5, and covering the inside shielding part 8 with the outer case 9.
[0023] When the surface of the low-melting point metal body 5 is oxidized, the surface oxidization part of the low-melting point metal body 5 does not melt even if heated to the original melting point, and in some cases the low-melting point metal body 5 fails to be cut. However, the low-melting point metal body 5 is shielded by the inside shielding part 8, thereby preventing surface oxidization of the low-melting point metal body 5, and the low-melting point metal body 5 can be reliably melted and cut when heated to a predetermined temperature. Since the inside shielding part 8 is formed of a material having a low melting point or low softening point lower than that of the low-melting point metal body 5, melt-cutting of the low-melting point metal body 5 is not inhibited by shielding the low-melting point metal body 5 with the inside shielding part 8.
[0024] Preferably, the inside shielding part 8 has functions of removing a metal oxide film formed on the surface as well as preventing surface oxidization of the low-melting point metal body 5. Thus, preferably, a shielding material having a function of removing a metal oxide film, such as an organic acid or an inorganic acid, is used as a shielding material for the inside shielding part 8. Especially, a non-corrosive solid flux containing abietic acid as a principal component is preferable. ..." ([0021]-[0024])
(B) "[0026] The outer case 9 is arranged in order to prevent a melted material from flowing out from the protection element when the low-melting point metal body 5 or the inside shielding part 8 is melted. The outer case 9 is arranged preferably with a gap 10 from the inside shielding part 8, as shown in FIG. 2. Preferably, a vertical size d1 of the gap is about 50-500 μm, and a horizontal size d2 thereof is about 0.2-1.0 mm. When the low-melting point metal body 5 or the inside shielding part 8 is melted, the gap 10 of the above size can secure the space where the melted material moves, thereby reliably causing melt-cutting.
[0027] No particular limitation is imposed on a constituent material of the outer case 9. Considering a housing shape having a gap with the inside shielding part 8 and heat resistance or flame resistance, 4.6-nylon with a flame retardant added thereto or liquid polymer is preferably used.
[0028] As described above, when the low-melting point metal body 5 is shielded with the inside shielding part 8 and covered with the outer case 9 with a gap 10 from the inside shielding part 8, the surface of the low-melting point metal body 5 can be protected, reliability of melt-cutting can be ensured when the low-melting point metal body 5 is heated to a predetermined temperature, and the overall thickness D of the protection element can be 1 mm or less. Therefore, the protection element 1b can be

an excellent protection element that satisfies operation reliability and downsizing requirements as a protection element.
[0029] The configuration where the low-melting point metal body 5 is shielded with the inside shielding part 8 and covered with the outer case 9 with a gap 10 from the inside shielding part 8 can be applied to a protection element having no heating element 3. The protection element 1b shown in FIG. 2 includes the heating element 3 so as to function in an overvoltage prevention device as described later. Even in a conventional anti-overcurrent chip-type fuse having no heating element 3, the configuration where a low-melting point metal body is shielded with an inside shielding part and covered externally with an outer case with a gap improves operating reliability as a protection element, and is useful for downsizing of the element, thereby reducing the thickness of a chip-type fuse up to 50%. Thus, this invention contains a low-melting point metal body arranged on a substrate, an inside shielding part formed of a material having a low-melting point or low-softening point lower than that of the low-melting point metal body to shield the low-melting point metal body, and an outer case covering the inside shielding part with a gap from the inside shielding part." ([0026]-[0029])

(9) Evidence A No. 16

The following matters are described together with drawings in Evidence A No. 16 (Japanese Unexamined Patent Application Publication No. H9-17302).
(A) "[0010]
[Examples] The example of the invention is described in detail below with reference to the drawings. (A) in FIG. 1 is a plan view formed by partially cutting one example of a flat thermal fuse according to the invention. (B) in FIG. 1 and (C) in FIG. 1 show B-B cross-sectional view and C-C cross-sectional view in (A) of FIG. 1, respectively. In (A) to (C) in FIG. 1, reference numeral 1 denotes an insulating substrate, which employs a hard thermoplastic sheet (a heat-sealable polyimide sheet or polyester sheet, or the like). Reference numerals 2, 2 denote a pair of electrodes fixed to the insulating substrate 1, formed by thermally fixing a tip 2 of a band-shape conductor 20 extruded with a square contour from a back side of the insulating substrate 1, to expose the square extrusion part 2 on the surface of the insulating substrate 1. Reference numeral 3 denotes a low-melting point metal body having both ends 31, 31 joined to the electrodes 2, 2 by welding. Reference numeral 4 denotes a flux which is applied to cover the low-melting point metal body 3. Reference numeral 5 denotes an insulation external coat coating the insulating substrate 1 to cover the electrodes 2, 2 and the low-melting point metal body 3, which can employ heat seal coating of, for example, a thermoplastic film (a heat-sealable polyimide film or polyester film, or the like) (only a peripheral part is heat-sealed so as not to melt the low-melting point metal body). Reference numeral 6 denotes an elastic body interposed between a connection part between one of the electrodes 2, 2 and the low-melting point metal body 3, and an inside surface of the external coat 5 in a compressed state, which can employ a silicone rubber foam, for example." ([0010])
(B) "[0012] (A) in FIG. 2 is a plan view formed by partially cutting another example of a flat thermal fuse according to the invention, and (B) in FIG. 2 shows B-B cross-sectional view in (A) of FIG. 2. In (A) and (B) of FIG. 2, reference numeral 1 denotes an insulating substrate with good heat conductivity, such as a ceramic board.

Reference numerals 2, 2 denote a pair of electrodes fixed to the insulating substrate 1, which can be formed by printing/baking conductive paste, such as silver paste. Reference numerals 20, 20 denote lead wires connected by welding, or the like, to the electrodes 2, 2. Reference numeral 3 denotes a low-melting point metal body having both ends 31, 31 joined to the electrodes 2, 2 by welding, or the like. Reference numeral 4 denotes a flux applied to cover the low-melting point metal body 3. Reference numeral 5 denotes an insulation external coat coating the insulating substrate 1 to cover the electrodes 2, 2 and the low-melting point metal body 3, and can be formed by dropping epoxy resin to be hardened at ordinary temperature or applying epoxy resin by dripping to be hardened at ordinary temperature." ([0012])
(C)
"[0014]
[Advantage of the Invention] In the flat thermal fuse according to the invention, the low-melting point metal body is pressed when actuated due to an elastic body or a foaming layer interposed between the low-melting point metal body and the inner surface of the external coat. An oxide film in the low-melting point metal body is broken by a pressing force when the low-melting point metal body in the oxide film melts, even if the low-melting point metal body includes the oxide film, thereby allowing reliable operation at a melting point of the low-melting point metal body, and eliminating difference of operation temperature. Since the oxide film is broken by pressure at a low-melting point metal body end on one electrode, even if molten low-melting point metal remains immediately under the pressing position, the remaining metal never reduces insulation between the cut molten low-melting point metal. Electricity can be shut off after melt-cutting the low-melting point metal body quickly by urging disappearance of arc between them. Therefore, according to the invention, an alloy flat thermal fuse which ensures reliable and quick operation can be provided." ([0014])

(10) Evidence A No. 17

The following matters are described together with drawings in Evidence A No. 17 (Japanese Unexamined Patent Application Publication No. H9-231897).
(A) "[0013] Further protection of the link is typically achieved by encapsulating the link and the deoxidant in some type of housing or encapsulant. The housing may take the form of a much larger tube surrounding the link, or may simply be a coating applied directly over the top of the deoxidant where the fuse link is attached to a flat substrate. Sometimes a cover or cap may be applied over the link and deoxidant, to act as an environmental barrier." ([0013])

(11) Evidence A No. 18

The following matters are described together with drawings in Evidence A No. 18 (Japanese Unexamined Patent Application Publication No. H7-230747).
(A) "[0008] However, according to the result of an experiment conducted by the inventor on operation characteristics of a substrate-type thermal fuse with resistance, in the single-sided substrate-type thermal fuse with resistance shown in (A) and (B) of FIG. 7, as expected, variability of operation characteristics is negligible, while in the double-sided substrate-type thermal fuse with resistance shown in (A) to (D) of FIG. 8, the variability of operation characteristics is larger than expected.

[0009] The inventors investigated the cause thereof. In the double-sided substrate-type thermal fuse with resistance, the epoxy resin layer is formed by dip coating, and gelation based on hardening of an epoxy resin bath advances with time, to change viscosity of the resin bath and dip coat thickness, thereby changing the volume of the insulator in the thermal fuse with resistance, and varying heat capacity. Therefore, in the thermal fuse with resistance, when heat resistance of a heat transfer path from the resistance to the thermal fuse element is R, and heat capacity is C, a heat increase speed of the thermal fuse element is evaluated by RC, and the heat capacity C is a function of the volume of insulator. The variability of dip coat thickness causes variability of temperature increase speed of the thermal fuse element, or operation characteristics, accordingly. Against this, in the single-sided substrate-type thermal fuse with resistance, since the amount of epoxy resin per drop can be measured, variability of C can be eliminated.

[0010] The object of the invention is to reduce or prevent variability of operation characteristics of a thermal fuse with resistance formed by arranging a thermal fuse element on one side of an insulating substrate and a film resistor on the other side of the substrate.

[0011]

[Means for Solving the Problem] The thermal fuse with resistance according to the invention is configured by arranging a fuse element from a low-melting point soluble metal piece on one side of a heat-conductive insulating substrate, arranging a film resistor on the other side of the substrate, covering the body formed by connecting lead wires to each of the fuse element and the film resistor, with a bottom-open case, so that the fuse element of the substrate faces the top inner surface in the case, and filling a curable insulating material in the case. When the central part of the top surface of the case with respect to the top center portion of the case is projected by bringing other portions of the top surface of the case into contact with the insulating substrate, the fuse element can be arranged in the projected part.

[0012] The configuration of the Invention is described in detail below with reference to the drawings. FIG. 1(A) is a plan view of a resistance/thermal fuse body to be used in the invention, FIG. 1(B) is a bottom view of the fuse body, FIG. 1(C) shows cross-section C-C in FIG. 1(A), FIG. 1(D) shows cross-section D-D in FIG. 1(B). In FIGS. 1(A) to 1(D), reference numeral 11 denotes a heat-conductive insulating substrate, which preferably is a ceramic substrate. Reference numerals 12, 12 denote a pair of film electrodes arranged on one side of the insulating substrate 11, having a lead-wire attachment part 121 and thermal-fuse element attachment part 122. The film electrodes symmetrical with respect to a vertical center line a-a are arranged vertically symmetrical with respect to a horizontal center line b-b. The film electrodes 12 may be formed by baking conductive paint by screen printing, for example. Reference numeral 13 denotes a lead wire welded or brazed to each of the film electrodes 12. Reference numeral 14 denotes a thermal fuse element bridged along the vertical center line a-a by welding between the film electrodes, which is made from a round or rectangular (formed by flattening a round wire) low-melting point soluble alloy wire. Reference numeral 15 denotes a flux coated on the thermal fuse element 14, which uses rosin as a principal component.

[0013] Reference numerals 16, 16, 16, and 16 denote two pairs of film electrodes arranged on the other side of the insulating substrate 11, symmetrical with respect to the

vertical center line a-a, each having a band-shaped film electrode 162 with a lead-wire attachment part 161 arranged on one end so that the lead-wire attachment part 161 is located at both left and right ends of the insulating substrate 11. The film electrodes 16 are also formed by the above printing method. Reference numeral 17 denotes a film resistor arranged between the pair of electrodes 16, 16 and formed by baking on the other side of the insulating substrate 11, and can be formed by printing/baking resistive paint (a mixture of resistive particles and a binder, the resistive particle using powder of oxidized metal, such as ruthenium oxide, or powder of high-resistive metal, such as nickel or iron, the binder using glass frit). Reference numeral 18 denotes a protection film covering the film resistors 17, 17, uses a glass frit which is more flexible and has lower melting point than the above glass frit, and effectively prevents cracks of the film resistor when a resistance value thereof is adjusted by trimming the film resistor. Reference numeral 19 denotes a lead wire connected to the film electrode 16 by welding or brazing.

[0014] FIG. 2(A) is a cross-sectional view illustrating one example of the thermal fuse with resistance according to the Invention, and FIG. 2(B) shows cross-section B-B in FIG. 2(A). In FIGS. 2(A) and (B), reference numeral 1 denotes the body of the thermal fuse with resistance described above. Reference numeral 2 denotes a bottom-open case, having a frame 22 around a top board 21, configured to cover the body 1 of the thermal fuse with resistance with the fuse element 14 facing the top inner surface in the case, and to draw the lead wires 13, 19 from respective V notches 221 arranged in the frame 22.

[0015] An inner frame of the frame 22 of the case 2 is set to cover an outer frame of the insulating substrate 11 of the body 1 of the thermal fuse with resistance in a tight-fit manner, without leaving a gap substantially. Vertical and lateral sizes of the inner frame are defined to be 1.1 times or less, preferably 1.07 times or less, the vertical and lateral sizes of the insulating substrate. Reference numeral 3 denotes an insulating material filled and solidified in the case 2, formed by dripping measured epoxy resin liquid with viscosity of about 20000 to 200000 cps into the case 2, with the open side of the case up, to be cured at ordinary temperature." ([0008]-[0015])

(B) "[0024]

[Operation] In the thermal fuse with resistance, when heat resistance of a medium on a heat transfer path from the film resistor to the thermal fuse element is R, and heat capacity is C, heat increase speed of the thermal fuse element due to the heat generated in the film resistor is, as described above, evaluated by RC, and when C has variability, the heat increase speed of the thermal increase speed varies with C.

[0025] Variability of C primarily relates to variability of the volume of insulator. Thus, in the thermal fuse with resistance according to the invention, since the insulator can be formed by dropping a measured amount of curable insulating material into the case, the volume of the insulator can be made constant with high accuracy, and the volume of the case and the insulating substrate can also be made constant with high accuracy, thereby favorably eliminating variability of the volume of insulator." ([0024]-[0025])

2. Regarding the Invention 1

(1) Comparison

Comparing the Invention 1 with the Cited invention, according to the functions thereof, the "insulating substrate (1) formed of a ceramic board" in the latter

corresponds to the "ceramic substrate" in the former, the "film low-melting point metal bodies (61, 62)" on "the other side" in the latter correspond to the "low-melting point alloy body" on "one side" in the former, the "film resistors (31, 32)" on "one side" in the latter correspond to the "heating element" on "the other side" in the former, the "thermal fuse with resistance" in the latter corresponds to the "thermal fuse with resistance" in the former, the description, the film low-melting point metal bodies (61, 62) being formed in a "film shape" in the latter corresponds to the description, the low-melting point alloy body being "flat" in the former, the description, the film low-melting point metal bodies (61, 62) arranged in the "same positions" on the other side of the insulating substrate (1) as the film resistors (31, 32), in the latter, corresponds to the description, the low-melting point alloy body arranged in a "position opposite" the heating element on one side of the ceramic substrate, in the former, and the description, the fluxes (71, 72) are arranged around the film low-melting point metal bodies (61, 62), in the latter corresponds to the description, the flux is arranged around the low-melting point alloy body, in the former.

The connections between the ends of the film low-melting point metal bodies (61, 62) in the latter and the film conductor (8) and the film auxiliary conductors (91, 92) correspond, according to the functions thereof, to the "electrodes" at the ends of the low-melting point alloy body in the former. The film low-melting point metal bodies (61, 62) in the latter having "both ends connected to the electrodes" correspond to the low-melting point alloy body in the former having "both ends and an intermediate part connected to electrodes" only when "both ends are connected to electrodes."

Thus, the corresponding features and different features between them are as follows.

[Corresponding feature 1]
"A thermal fuse with resistance formed by arranging a low-melting point alloy body on one side of a ceramic substrate and a heating element on the other side, and configured to melt and cut the low-melting point alloy body with heat via the ceramic substrate by applying electric power to the heating element, to shut off a circuit, the low-melting point alloy body being flat and arranged in a position opposite the heating element on one side of the ceramic substrate, having both ends connected to electrodes, wherein flux is arranged around the low-melting point alloy body."

[Different feature 1]

In the Invention 1, the low-melting point alloy body has "an intermediate part connected to an electrode," and is configured so that "the heating element being powered via the electrode of the intermediate part." In the Cited invention, no electrode is arranged in the intermediate part of the film low-melting point metal body, and the film low-melting metal body is not used in powering the film resistor.

[Different feature 2]

The Invention 1 includes the matter, "a case is brought into airtight contact with the ceramic substrate, to protect the flux from an outdoor air environment." The Cited invention does not include the above matter.

(2) Judgment

The different features are examined.

[Regarding the Different feature 1]

The Cited invention and Invention A-3 belong to the same technical field in the point of a thermal fuse or a protection element which melts and cuts a low-melting point metal with heat generated in a resistor. The Invention A-3 aims to configure a protection element that detects voltages from the low-melting point metal and the heating element.

Thus, it can be recognized that a person skilled in the art can easily conceive of applying a technology of arranging an electrode in the intermediate part of the low-melting point metal in the Invention A-3, in order to detect a voltage for reliable operation, to the Cited invention, which is a thermal fuse formed of a heating element and a low-melting point metal body similar to the Invention A-3, and powering a heating element via the electrode, to be the matters specifying the invention of the Invention 1 according to the Different feature 1.

The demandee alleges in the written reply dated April 5, 2013 that the invention described in Evidence A No. 3, which uses a film insulation layer for insulation between a heating element and a low-melting point metal, constitutes an obstructing factor of application to the Cited invention (see p. 13 "(1-1) Difference of precondition of the invention," p. 14 "(1-2) Short-circuit of insulating film"). However, the circuit configuration of the Invention A-3 "having fuse electrodes arranged at both ends and an intermediate point of a low-melting point metal, and configured to supply electricity to the heat generator through the low-melting point metal via an intermediate electrode" does not necessarily use a film insulating layer for insulation between the heat generator and the low-melting point metal, or the circuit configuration does not premise the structure of an insulation layer. Accordingly, the above description is not an obstructing factor.

The demandee also alleges in the written reply that there is an obstructing factor in combining the Cited invention, which detects overcurrent, with the invention described in the Evidence A No. 3, which detects a voltage (see p. 15 "(1-3) Shut off of overcurrent in Publication 1"). However, as described above, since the Cited invention and the Invention A-3 belong to the same technical field and employ the same structure, it can be recognized that a person skilled in the art in contact with both inventions can easily conceive of the combination.

[Regarding the Different feature 2]

Evidence A No. 15 describes a configuration of a protection element which belongs to the same technical field as the Cited invention and operates by melting a low-melting point metal body with a heating element, configured to externally cover the heating element (3), the low-melting point metal body (5) and the inside shielding part (8) formed of a solid flux with the outer case (9) (see 1. (8) (A) [0021], [0024]). There is a description that the outer case is to prevent a melted material from flowing out from the protection element when the low-melting point metal body or the inside shielding part is melted (see 1. 8 (B) [0026]). The outer case is recognized to be closely attached to the substrate (2). However, there is no description or indication that the space between the outer case, the low-melting point metal body, and the flux are brought into airtight contact with each other. The outer case in Evidence A No. 15, which covers

the heating element with the low-melting point metal body and the inside shielding part, as described in [0007] and [0008] as a prior art in the specification of the Patent, does not completely shield the heating element, the low-melting point metal body, and the inside shielding part in an airtight manner. It should be understood that the outer case is configured to prevent explosion, by forming a hole in a part of the cover in some cases.

Thus, even if the outer case described in Evidence A No. 15 is applied to the film low-melting point metal body and the flux arranged around it in the Cited invention, the configuration of the Invention 1 according to the Different feature 2 cannot be achieved.

In [0029] of Evidence A No. 15, there is a description that the outer case can be applied to a protection element having no heating element. The protection element having no heating element, as described in [0029], indicates a conventional anti-overcurrent chip-type fuse, which is melted and cut by overcurrent of a soluble metal, and does not indicate applying the outer case to a protection element having a heating element arranged on the other side of the insulating substrate having the low-melting point metal body, like the Cited invention.

Therefore, it can be said that there is no motivation to apply the outer case described in Evidence A No. 15 to the low-melting point metal body of the Cited invention, which is a protection element having a heating body.

Evidence A No. 16 describes that the flat thermal fuse which operates when the low-melting point metal body is melted is configured to cover the outside of the flux (4) covering the low-melting point metal (3) with the insulation outer coat (5) (see 1. (9) (A) (B)), and does not describe or indicate application to a protection element having a heating element.

Therefore, it can be said that there is no motivation to apply the insulation outer coat described in Evidence A No. 16 to the Cited invention which is a protection element having a heating body.

The insulation outer coat described in Evidence A No. 16 is to press an elastic body or a foaming layer arranged on the low-melting point metal to a low-melting point metal body (see 1. (9) (C)). It can be said that there is no motivation of application to the Cited invention having no member for pressing the film low-melting point metal body.

Evidence A No. 17 describes, so as to function as an environment barrier, applying a cover or a cap onto a link and antioxidant (see 1. (10)), however, there is no description or indication of applying the cover or cap onto a protection element having a heating element.

Therefore, it can be said that there is no motivation to apply the cover or cap described in Evidence A No. 17 to the Cited invention which is a protection element having a heating body.

Evidence A No. 18 describes a thermal fuse with resistance which belongs to the same technical field as the Cited invention and operates when a thermal fuse element (15) formed on one side of an insulating substrate (11) melts with heat generated in a film resistor (17) formed on the other side, wherein the thermal fuse and a flux (15) applied thereon are covered with a bottom-open case (2), lead wires (13, 19) are drawn

from a V notch (221) formed in a frame (22) of the case, and an inner frame of the frame of the case is set to cover the outer frame of the insulating substrate in a tight-fit manner, without leaving a substantial gap, and describes that a measured amount of epoxy resin is dropped on the case-open side (see 1. (11) (A) [0014] and [0015]). Regarding the tight-fit state between the inner frame of the frame of the case and the outer frame of the insulating substrate, Evidence A No. 18 [0015] describes that the vertical and lateral sizes of the inner frame are defined to be 1.07 times or less the vertical and lateral sizes of the insulating substrate. According to the description, the tight-fit state does not necessarily indicate a completely shielded state. In Evidence A No. 18 [0014], the lead wire of the fuse element is drawn from the V notch; however, it cannot be recognized that the V notch is configured to maintain air tightness. From the description in Evidence A No. 18, the epoxy resin dropped on the case-open side cannot be recognized to aim at shielding between the inner frame of the case and the outer frame of the insulating substrate, and shielding of the V notch.

Therefore, Evidence A No. 18 does not describe or indicate that the space between the case and the flux is configured to be airtight in order to protect the flux from an outdoor air environment, and the configuration of the Invention 1 cannot be achieved even if the case is applied to the insulating substrate of the Cited invention.

Thus, it cannot be said that a person skilled in the art can easily conceive of using the Cited invention as the configuration of the Invention 1 according to the Different feature 2, on the basis of the matters described in Evidences A No. 15 to No. 18.

Thus, it cannot be said that the Invention 1 could be easily invented by a person skilled in the art on the basis of the Cited invention and the matters described in Evidences A No. 3, No. 5, and No. 15 to No. 18. Even if the matters described in Evidences A No. 4, and No. 6 to No. 14 are examined, reasons for refusing the Invention 1 cannot be found.

3. Regarding the Invention 2

(1) Comparison

The Invention 2 corresponds to the invention formed by adding the matter, "the intermediate part of the low-melting point alloy body being supported by a high heat conductor arranged on the ceramic substrate," while excluding the matter, "flux is arranged around the low-melting point alloy body and a case is brought into airtight contact with the ceramic substrate, to protect the flux from an outdoor air environment" of the Invention 1.

The inventions correspond to each other in the following points, and are different from each other in the following points in addition to the Different feature 1 indicated in 2. (1).

[Corresponding feature 2]

"A thermal fuse with resistance formed by arranging a low-melting point alloy body on one side of a ceramic substrate and a heating element on the other side, and configured to melt and cut the low-melting point alloy body with heat via the ceramic substrate by applying electric power to the heating element, to shut off a circuit, the low-melting

point alloy body being flat and arranged in a position opposite the heating element on one side of the ceramic substrate, having both ends connected to electrodes."

[Different feature 3]

The Invention 2 is configured so that "the intermediate part of the low-melting point alloy body is supported by a high heat conductor arranged on the ceramic substrate." The Cited invention does not include the above configuration.

(2) Judgment

The judgment on the Different feature 1 is as indicated in 2. (2). A person skilled in the art can easily conceive of the matters specifying the invention of the Invention 2 according to the Different feature 1.

The Different feature 3 is examined below.

[Regarding the Different feature 3]

The high heat conductor in the Invention 2 can be recognized, according to [0033] and [0034] in the specification of the Patent, to intensively heat a part supported by the high heat conductor by applying the heat transferred in the ceramic board to the low-melting point alloy body through the high heat conductor, and that the high heat conductor collects the heat transferred from the heating element to the ceramic substrate.

The layered high heat conductor in Evidence A No. 5 can be recognized to uniformly heat the layered high heat conductor connected to one electrode of the layered resistor by arranging an insulating film immediately below the layered low-melting point metal body, in order to solve the problem that the heat generated in the layered resistor is transferred well to the electrode of the layered low-melting point metal body when the layered low-melting point metal body and the layered resistor are connected to each other via the electrode, which serves as a heat transfer path, thereby causing non-uniform heating (see 1. (4)). The layered high heat conductor is recognized to uniformly transfer the heat generated from the layered resistor to the layered low-melting point metal body.

The high heat conductor in the Invention 2 and the layered high heat conductor in Evidence A No. 5 correspond to each other in the point of a high heat conductor; however, the former collects heat transferred from the heating element to the ceramic substrate, and the latter diffuses heat directly transferred from the heating element via the electrode. They have different objects and operations.

Therefore, even if the layered high heat conductor described in Evidence A No. 5 is applied to the Cited invention, the object of the Invention 2 cannot be achieved.

The layered high heat conductor of Evidence A No. 5 is formed of the same electrode as the electrode connected to the electrode of the layered resistor, and is arranged together with the layered low-melting point metal body via the insulating film on one side of the insulating substrate (see 1. (4) (A) "<Details of the example>"), and a part of the layered resistor is stacked on the layered low-melting point metal body via the insulating film. The Invention 2 is configured to arrange the low-melting point alloy body on one side of the ceramic board and the heating element on the other side, in order to avoid a structure where the heating element and the low-melting point alloy body are stacked via the insulation layer (see [0004] and [0006] of the specification of the Patent).

Therefore, the configuration of the Invention 2 cannot be achieved when the configuration according to the layered high heat conductor described in Evidence A No. 5 is applied to the Cited invention.

Thus, it cannot be said that a person skilled in the art can easily conceive of applying the matters described in Evidence A No. 5 to the Cited invention to implement the matters specifying the invention of the Invention 2 according to the Different feature 3.

No description indicating the Different feature 3 is included in any of Evidences A.

The demandant alleges in the oral proceedings statement brief dated June 6, 2013, "the demandants consider that '... an intermediate part of the low-melting point alloy body supported by an electrode which serves as a high heat conductor' is included in a technical scope of the Patent invention 2" (p. 18 l. 25-p. 19 l. 4), and "Concrete means for connecting both ends and the intermediate part of the low-melting point alloy body to the electrode in the Patent invention 1 includes means of arranging an electrode on a substrate and arranging a low-melting point alloy body on the electrode. The 'means of arranging an electrode on a substrate and arranging a low-melting point alloy body on the electrode' is, as disclosed in FIG. 2 in Publication 1 (Note by the body: Evidence A No. 2, and the same shall apply hereinafter), FIG. 1 and FIG. 4 in Publication 2 (Evidence A No. 3), only a well-known art. In FIG. 1 A, FIG. 1 B, FIG. 2, FIG. 3, and FIG. 4 in Publication 3 (Evidence A No. 4), 'the means of arranging an electrode on a substrate and arranging a low-melting point alloy body on the electrode' is also disclosed. Since the electrode is a high heat conductor, when an electrode is arranged on the substrate and a low-melting point alloy body is arranged on the electrode, an intermediate part of the low-melting point alloy body is supported by the high heat conductor arranged on the ceramic substrate. Accordingly, when the invention to be easily obtained from the Publication 1 (Evidence A No. 2) and the Publication 2 (Evidence A No. 3) is implemented, the invention included in the technical scope of the Patent invention 2 is necessarily obtained." (p.19 l. 10-l. 20)

However, in Evidences A No. 2 to No. 4, only a structure of connecting both ends of the low-melting point alloy body to an electrode on the substrate is disclosed, and there is no description or indication about a concrete structure for wiring connection to the intermediary of an element on the other surface when connecting wiring from an element formed on one surface of the substrate to the element formed on the other surface, even if the "means of arranging an electrode on a substrate and arranging a low-melting point alloy body on the electrode" is a well-known art from the description thereof. Therefore, it cannot be recognized that an intermediate electrode of the low-melting point alloy body is "necessarily" arranged when the matters described in Evidence A No. 3 are applied to the Cited invention.

None of Evidences A No. 2 to No. 4 describes or discloses that an electrode is arranged between the low-melting point alloy body and the substrate for the function of collecting the heat transferred from a heating element arranged on the other side of the ceramic substrate to the ceramic substrate.

Therefore, the above demandant's allegation cannot be accepted.

Thus, it cannot be said that the Invention 2 could have been easily invented by a

person skilled in the art on the basis of the Cited invention and the matters described in Evidences A No. 3 and No. 5. Even if the matters described in Evidence A No 4 and Evidences A No. 6 to No. 18 are examined, no reason for refusal is found.

4. The Invention 3

(1) Comparison

The Invention 3 corresponds to the invention formed by adding the matter, "in the implementation structure on a circuit substrate of the thermal fuse with resistance, the thermal fuse with resistance being configured so that a lead wire protrudes from the ceramic substrate to form a gap between the heating element and the circuit substrate," while excluding the matter, "flux is arranged around the low-melting point alloy body and a case is brought into airtight contact with the ceramic substrate, to protect the flux from an outdoor air environment" of the Invention 1.

The inventions correspond to each other in the Corresponding feature 2 indicated in 3. (1), and are different from each other in the following points in addition to the Different feature 1 indicated in 2. (1).

[Different feature 4]

The invention 3 is configured so that "in the implementation structure on a circuit substrate of the thermal fuse with resistance, the thermal fuse with resistance being configured so that a lead wire protrudes from the ceramic substrate to form a gap between the heating element and the circuit substrate." The Cited invention does not include the above configuration.

(2) Judgment

The judgment on the Different feature 1 is as indicated in 2. (2). A person skilled in the art can easily conceive of the matters specifying the invention of the Invention 3 according to the Different feature 1.

The Different feature 4 is examined below.

[Regarding the Different feature 4]

Forming a gap between the heating element and the circuit substrate in the Invention 3 prevents the heat of the heating element from being diffused to the circuit substrate when the thermal fuse with resistance is mounted on the circuit substrate, and allows for efficient use of the heat for melting and cutting the low-melting point alloy body (see [0026] and [0027] in the specification of the Patent). It can be recognized that it is designed to form a gap between the heating element and the circuit substrate regardless of a direction of the heating element and the thermal fuse with resistance mounted on the circuit substrate.

Evidence A No. 4 describes a state of the thermal fuse to be mounted on a printed wiring board (see 2. (3) (G)); however, a state of the thermal fuse mounted on the printed wiring board is not described or indicated.

Regarding this, the demandant alleges in the oral proceedings statement brief dated June 6, 2013, "Accordingly, it is obvious that both the thermal fuse with resistance disclosed in Publication 1 (Note by the body: Evidence A No. 2, and the same shall apply hereinafter) and the device formed by applying the invention disclosed in Publication 2 (Evidence A No. 3) to the thermal fuse are used in the same state as the

thermal fuse with heat-generating circuit element disclosed in Publication 3 (Evidence A No. 4). Thus, both the thermal fuse with resistance disclosed in Publication 1 (Evidence A No. 2) and the device formed by applying the invention disclosed in Publication 2 (Evidence A No. 3) are used so that a lead wire is connected to a round of a printed circuit conductor to form a gap between the film low-melting point metal body and the printed circuit." (p.23 l. 2-l. 8). In short, the demandant alleges that a gap is formed between the film low-melting point metal body of the insulating substrate and the printed circuit board.

However, as described above, Evidence A No. 4 does not describe a state of the thermal fuse mounted on the printed circuit board, and does not clearly indicate that a gap is formed between them, especially between an element on a surface of the thermal fuse on the side of the printed wiring board and the printed wiring board. No description or indication is included on the arrangement for preventing the heat from being diffused to the printed wiring board.

Therefore, even if heat insulating effect of a gap is well-known from the descriptions in Evidences A No. 6 to No. 8, it cannot be said that a person skilled in the art can easily conceive of preventing the heat from being diffused to the circuit substrate and efficiently utilizing the heat for melting and cutting the low-melting point alloy body, from the description of the Evidence A No. 4, when mounting a device formed by applying the matters described in Evidence A No. 3 to the Cited invention on the circuit substrate, to realize the matters specifying the invention according to the Different feature 4.

The demandant alleges in the written statement dated July 4, 2013, with Evidences A No. 11 to No. 14 attached as indirect evidences for the well-known matter that a distance between the substrate and the resistor is required for safety, "Therefore, 'the device formed by applying the invention disclosed in A-3 (Publication 2) to the invention disclosed in A-2 (Publication 1)' 'needs to secure a distance between the resistor and the printed substrate,' and can be considered to 'form a gap with the circuit substrate' in the same way as 'the thermal fuse with heat-generating circuit element disclosed in A-4 (Publication 3)'" (p. 5 l.5-l. 9).

However, the gap of the Invention 3 is arranged, as described above, to prevent the heat of the heating element from being diffused to the circuit substrate and to efficiently use the heat for melting and cutting the low-melting point alloy body, while the well-known matter derived from Evidences A No. 11 to No. 14 is that a gap is formed for safety.

Therefore, even if the matters described in Evidence A No. 3 are applied to the Cited invention, it can be said that there is no motivation for employing the well-known matter for preventing the heat of the heating element from being diffused to the circuit substrate and efficiently using the heat for melting and cutting the low-melting point alloy body.

Thus, the above demandant's allegation cannot be accepted.

Therefore, it cannot be said that the Invention 3 could have been easily invented by a person skilled in the art on the basis of the Cited invention, and the matters described in Evidences A No. 3, No. 4, and No. 6 to No. 8. Even if the matters described in Evidences A No. 5 and No. 9 to No. 18 are examined, reasons for refusing

the Invention 3 cannot be found.

5. The Invention 4
(1) Comparison

Invention 4 corresponds to the invention formed by adding the matters, "the intermediate part of the low-melting point alloy body being supported by a high heat conductor arranged on the ceramic substrate" and "in the implementation structure on a circuit substrate of the thermal fuse with resistance, the thermal fuse with resistance being configured so that a lead wire protrudes from the ceramic substrate to form a gap between the heating element and the circuit substrate," while excluding the matter, "flux is arranged around the low-melting point alloy body and a case is brought into airtight contact with the ceramic substrate, to protect the flux from an outdoor air environment" of Invention 1.

Therefore, the inventions correspond to each other in the Corresponding feature 2 indicated in 3.(1), and are different from each other in the Different feature 1 indicated in 2. (1), Different features 3 indicated in 3. (1), and Different feature 4 indicated in 4. (1).

(2) Judgment

Judgment on Different feature 1 is as indicated in 2. (2). A person skilled in the art can easily conceive of the matters specifying the invention of the Invention 4 according to the Different feature 1.

Judgment on Different feature 3 is as indicated in 3. (2), and judgment on Different feature 4 is as indicated in 4. (2). It cannot be said that a person skilled in the art can easily conceive of the matters specifying the invention of the Invention 4 according to the Different feature 3 and 4.

Thus, it cannot be said that the Invention 4 could easily be invented by a person skilled in the art on the basis of the Cited invention, and the matters described in Evidences A No. 3 to No. 8. Even if the matters described in Evidences A No. 9 to No. 18 are examined, reasons for refusing the Invention 4 cannot be found.

No. 7 Closing

As described above, the correction demanded by the demandee is legal, and the correction shall be approved as requested.

The allegation and the means of proof of the demandant cannot invalidate the patent of Inventions 1 to 4.

The costs in connection with the trial shall be borne by the demandant under the provisions of Article 61 of the Code of Civil Procedure which is applied mutatis mutandis in the provisions of Article 169-2 of the Patent Act.

Therefore, the decision shall be made as described in the conclusion.

March 27, 2014

Chief administrative judge: YAMAGUCHI, Naoshi
Administrative judge: HIRATA, Nobukatsu

Administrative judge: OKUMA, Yuji