

This Sheet Has Been Replaced



-1-

CHIP FUSE

REPLACED SHEETS	SG
☒ Description : paged 1 to paged 13	
☒ Claim(s) : paged 14 to paged 18	
☒ Drawing(s) : paged 19 to paged 26	
☒ Abstract : paged 19 to paged 26	
DATE OF RECEIPT	

The present invention relates to a chip fuse and
 5 more particularly to a chip fuse having a structure wherein
 the body of the fuse and conductive terminals are securely
 fixed.

As a fuse for use in an electric circuit, there is
 10 known such a fuse wherein electrically conductive terminals
 are provided respectively at the opposite ends of a tubular
 body utilizing a heat-resistant insulating material with the
 end portions of a fusible element being sandwiched between
 the body and the conductive terminals and they are securely
 15 and electrically connected by means of a soldering material
 applied at the inner side of the conductive terminals.

However, according to such a fuse, since the body
 is composed of a heat-resistant insulating material such
 as ceramic or the like, the soldering material has dif-
 20 ficulty in adhering to the ceramic material, resulting in
 a situation that although electrical connection between
 the fusible element and the conductive terminals may be
 satisfactorily attained, the coupling force between the
 body of the ceramic material and the conductive terminals
 25 is so weak that the conductive terminals may become loose
 if a fuse is not properly assembled.

In order to solve such a problem, it is disclosed in
 Japanese Utility Model Laid-Open No. 5-17903 to bake silver
 or vapor-deposit at the opposite end portions of the body



made of a ceramic material and to then adhere a soldering material on the layer made of silver so as to prevent the conductive terminals from becoming detached from the body.

However, since a chip fuse is highly miniaturized,
5 it is not only difficult to bake or vapor-deposit silver at the opposite end portions of the body made of ceramic material but also very expensive, resulting in an increase in unit price. Furthermore, since solder serves to connect the body with the conductive terminals, there is a
10 possibility that the conductive terminals will loosen.

An object of the present invention is to provide a chip fuse which is capable of enhancing a coupling force between the body comprised of a heat-resistant insulating
15 material and the electrically conductive terminals and which is inexpensive and has a simple construction.

To achieve the object, a chip fuse according to the present invention comprises: a body made of a heat-resistant and insulating material, said body having a pair
20 of polygonal end surfaces spaced opposed to each other, side surfaces attached to and extending between said pair of polygonal end surfaces, a through-bore defined in said body and extending through said body between said pair of end surfaces, and at least two grooves, each of said at
25 least two grooves being provided on one of said side surfaces near one of said end surfaces in a direction substantially parallel to said end surfaces, and the other one of said at least two grooves being provided on one of said side surfaces near the other of said end surfaces in



a direction substantially parallel to said end surfaces;
an elongated fusible element, the length of said fusible
element being greater than that of said through-bore, said
fusible element being disposed within and extending through
5 said through-bore in said body, each of the end portions
of said fusible element extending along and being in contact
with each of said end surfaces and one of said side surfaces
of said body, whereby said fusible element is engaged with
said body; and a pair of conductive terminal members
10 respectively fitted onto a corresponding one of said pair
of end surfaces of said body to electrically connect to
each of the end portions of said fusible element, each one
of said pair of terminal members including a polygonal wall
having an inner face opposing the respective polygonal end
15 surface of said body, side walls angularly extending from
the periphery of said polygonal wall and covering said side
surfaces near each one of said pair of end surfaces of said
body, and at least a projected member provided on one of
said side walls and fitted into a corresponding one of said
20 grooves of said body.

Thus, since the projected members of the conductive
terminal members are respectively fitted into corresponding
grooves of the body, the body and the conductive terminals
members can be fixed to each other under a highly coupled
25 condition, preventing the conductive terminals from coming
off.

To achieve the object mentioned above, another chip
fuse according to the present invention comprises: a body
made of heat-resistant and insulating material, said body



having a pair of polygonal end surfaces spaced opposed to each other, side surfaces attached to and extending between said pair of polygonal end surfaces, and a through-bore defined in said body and extending through said body between said pair of end surfaces; an elongated fusible element, the length of said fusible element being greater than that of said through-bore, said fusible element being disposed within and extending through said through-bore in said body, each of the end portions of said fusible element extending along and being in contact with each of said end surfaces and one of said side surfaces of said body, whereby said fusible element is engaged with said body; and a pair of conductive terminal members respectively fitted onto a corresponding one of said pair of end surfaces of said body to electrically connect to each of the end portions of said fusible element, each one of said pair of terminal members including a polygonal wall having an inner face opposing the respective polygonal end surface of said body, side walls angularly extending from the periphery of said polygonal wall and covering said side surfaces near each one of said pair of end surfaces of said body, and at least a projected member provided on one of said side walls, said projected member being frictionally in contact with a corresponding one of said side surfaces of said body to fix said conductive terminal member to said body.

Thus, the projected members of the conductive terminal members serve to enhance friction between the projected members and corresponding side surfaces of the body upon attached the conductive terminal members to the

body, so that the coupling force between the body and the conductive terminal members are enhanced and the conductive terminal members are accordingly prevented from coming off.

These and other objects and advantages will become clear by reading the following description of the invention with reference to the accompanied drawings.

Fig. 1 illustrates the constitution of the components of a chip fuse prior to assembly, according to the present invention;

Fig. 2 is an enlarged sectional view of the essential part of the chip fuse assembled by use of the components shown in Fig. 1;

Fig. 3 illustrates the constitution of the components of another chip fuse prior to assembly according to the present invention;

Fig. 4 is the enlarged sectional view of the essential part of the chip fuse assembled by use of the components shown in Fig. 3;

Fig. 5 illustrates the constitution of the components of still another chip fuse prior to assembly, according to the present invention;

Fig. 6 is the enlarged sectional view of the essential part of the chip fuse assembled by use of the components shown in Fig. 5;

Fig. 7 illustrates the constitution of the components of a further chip fuse prior to assembly, according to the present invention;





Fig. 8 is the enlarged sectional view of the essential part of the chip fuse assembled by use of the components shown in Fig. 7;

Fig. 9 illustrates the constitution of the components of a still further chip fuse prior to assembly, according to the present invention;

Fig. 10 is an enlarged sectional view of the chip fuse assembled by use of the components shown in Fig. 9; and

Figs. 11 and 12 illustrate the constitution of the components of another chip fuses prior to assembly, which chip fuses employ conductive terminals having two projections similar to those as disclosed in the second embodiment shown in Figs. 3 and 4.

Some embodiments of the present invention will now be explained by referring to the accompanying drawings.

Firstly, the first embodiment of a chip fuse according to the present invention is explained wherein a plurality of grooves are provided at the body.

Fig. 1 illustrates the constitution of the components of a chip fuse prior to assembly. In Fig. 1, the reference numeral 1 designates the body, which is comprised of a heat-resistant insulating material such as a ceramic or the like and is shaped in a prismatic configuration, the body being provided with the through-bore 3 extending longitudinally therethrough. At the opposite side surfaces 20 of the body 1, there are provided, in the same direction as the through-bore 3, grooves 2 for passage of a fusible element. At the other side surfaces 21 where no grooves 2 for passage



of a fusible element are provided, two vertical grooves 5 are respectively provided at a location near to the opposite end surfaces. Reference numeral 4 designates an elongated fusible element. Reference numeral 6 designates electrically conductive terminals which are of rectangular parallelepiped configuration and have a recess 22 adapted to be fitted onto the opposite end portions of the body 1 and soldering material 7 is applied in advance in the interior of the recess 22 to be fit onto the body 1. Furthermore, at one side surface of each of the conductive terminals 6, there is provided a projection 8 adapted to fit in the vertical groove 5.

The fusible element 4 is extended through the through-bore 3 at the time of assembly and engaged in the respective opposite grooves 2 for passage of the fusible element 2.

Fig. 2 is the enlarged sectional view of the essential part of a chip fuse as assembled by use of the above-mentioned components. The projection 8 shown in Figs. 1 and 2 is constituted by providing two cuts (according to the first embodiment of the present invention, two cuts are provided, but more than two cuts may be formed) at one side wall of the conductive terminals 6 and then by bending inwardly the portion located between the two cuts (or a plurality of portions if more than two cuts are provided).

At the time of assembly, after the fusible element 4 has been engaged, the conductive terminals 6 are fitted onto the opposite ends of the body 1. At this time, the conductive terminals 6 are pressed until the projection 8



is fitted into the vertical groove 5. Since the fusible element 4 is engaged with the inside of the groove 2 for passage of the fusible element, no damage will be experienced to the fusible element when the conductive terminals 6 are pressed nor the fusible element will be stretched.

During the conductive terminals 6 are assembled into the body 1 or after they are assembled, the conductive terminals 6 are heated so that the soldering material 7 applied to the surface of the recess 22 of the conductive terminals 6 are melted to adhere to the fusible element, whereby the conductive terminals 6 are electrically connected to the fusible element 4.

According to the first embodiment of the present invention, the conductive terminals 6 can be securely fixed to the body 1.

The second embodiment of the present invention will next be explained.

Fig. 3 illustrates the constitution of the components of a chip fuse prior to assembly. Fig. 4 is the enlarged sectional view of the essential portion of the chip fuse assembled by use of the components shown in Fig. 3.

The same elements as those employed in the first embodiment are designated by the same reference numerals and the explanation thereof will not be repeated again. The difference between these two embodiments are the configuration of the projections and the location, width and depth of the vertical grooves 5 due to the difference



in configuration of the projections, which will subsequently be explained.

The projection 9 has been provided by pressing substantially the central portion of one side wall of the conductive terminal 6. The location, width and depth of the vertical grooves 5 to be provided at the body 1 have been decided in accordance with the location, width and depth of the projection 9. The configuration of the projection 9 is not limited to the one shown in Figs. 3 and 4. Alternatively, the projection 9 may be elongated to be as long as the vertical groove 5, or a plurality of projections may be provided.

At the time of assembly, after the fusible element 4 has been engaged, the conductive terminals 6 are fitted onto the opposite ends of the body 1. At this time, the conductive terminals 6 are pressed until the projection 9 is fitted into the vertical groove 5. Thus, in accordance with the arrangement mentioned above, the conductive terminals 6 can be securely fixed to the body 1 like the first embodiment.

The third embodiment of the present invention will next be explained.

Fig. 5 illustrates the constitution of the components of a chip fuse prior to assembly. Fig. 6 is the enlarged sectional view of the essential part of the chip fuse assembled by use of the components shown in Fig. 5.

The same elements as those employed in the first embodiment are designated by the same reference numerals and the explanation thereof will not be repeated again. The



difference between these embodiments are the configuration of the projections and the location, width and depth of the vertical grooves 5 due to the difference in configuration of the projections, which will be explained below.

5 Projections 10 are formed by bending the extended portions from one side wall of the conductive terminals 6. Due to alternation of the location of the projections caused by providing the projections 10 at said extended portions, the vertical grooves 5 are spaced somewhat farther from the
10 opposite ends of the body 1 as compared to the embodiments mentioned above.

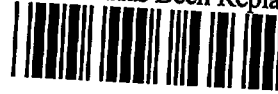
 The projection 10 is fitted into the groove 5 in the same manner 21 as in the aforementioned embodiments.

 Employment of this configuration makes it possible to
15 securely fasten the conductive terminals to the body 1 like the embodiments as above explained.

 The fourth embodiment of the present invention will next be explained.

 Fig. 7 illustrates the constitution of the components
20 of a chip fuse prior to assembly. Fig. 8 is an enlarged sectional view of the essential part of the chip fuse assembled by use of the components shown in Fig. 7.

 The same elements as those employed in the first
embodiment are designated by the same reference numerals
25 and the explanation thereof will not be repeated again. The differences between these embodiments are the configuration of the projections and the location, width and depth of the vertical grooves 5 due to the difference in configuration of the projections, which will be subsequently explained.



-11-

Projections 11 are formed by folding the extended portion from one side wall of the conductive terminals 6 into a "U" configuration. Since the projections 11 are provided at said extended portions, the location of the vertical grooves 5 are somewhat farther spaced from the opposite ends of the body 1 due to alternation of the location of the projections 11 as compared to other embodiments.

The projection 11 is fitted into the groove 5 in the same manner as in the aforementioned embodiments.

Employment of this configuration makes it possible to securely fix the conductive terminals 6 to the body 1 like other embodiments as explained above.

The fifth embodiment of the present invention will next be explained.

Fig. 9 illustrates the constitution of the components of a chip fuse prior to assembly. Fig. 10 is the enlarged sectional view of the essential part of the chip fuse assembled by use of the components shown in Fig. 9.

The same elements as those employed in the preceding embodiments are designated by the same reference numerals and explanation thereof will not be repeated. The differences between these embodiments are the configuration of the projections and the location, width and depth of the vertical grooves 5 due to the difference in configuration of the projections, which will be subsequently explained.

Projections 12 are formed by bending inwardly the end portion of one side wall of the conductive terminals 6



and the projections 12 are projected inwardly by the length required fitting in the vertical grooves 5.

The projection 12 is fitted into the groove 5 in the same manner as in the aforementioned embodiments.

5 Employment of this configuration makes it possible to securely fix the conductive terminals 6 to the body 1 like other embodiments explained as above.

 Throughout the embodiments as above described, such examples have been described as vertical grooves and
10 projections are provided only at one side surface of the body and the conductive terminals, respectively. However, the projections may be provided at any of the side walls unless the projections are not located at the side surface on which a fusible element is engaged. It is also possible
15 to provide projections at a plurality of side walls of the conductive terminal. It is to be noted, therefore, that the conductive terminals will not less easily come off compared to the case in which when only one projection is provided if projections are provided at a plurality of side walls.

20 It is also to be understood that the projections can be bent in any one of the manners as employed in the second, third and fourth embodiments and provide a similar effect.

 Next, the sixth embodiment of the present invention will be explained wherein no vertical grooves are provided
25 at the body composed of heat-resistant insulating material such as ceramic or the like.

 Figs. 11 and 12 illustrate the constitution of the components of a chip fuse prior to assembly, said chip fuse employing conductive terminals having projections similar



to those as disclosed in the second embodiment. Illustrated examples include two projections.

According to the present embodiment, conductive terminals 6 are formed in such a manner as to be adapted to be fitted on the body 1 and include projections 13 and the conductive terminals 6 have the inside width of the recess 22 narrower than the width of the opposite ends of the body 1. The conductive terminals 6 are pushed along the opposed ends of the body 1 to be fixed thereto by causing the projections 9 to be somewhat collapsed. In this way, the frictional force generated between the conductive terminals 6 and the body 1 is so increased that the conductive terminals 6 can be securely prevented from becoming detached from the body 1.

The configuration of the projections is not limited to those illustrated in Figs. 11 and 12. Similar effects can be attained by one or three of such projections. Similarly, the friction force generated between the conductive terminals and the body can be increased and the conductive terminals can be prevented from becoming detached from the body equally by employing the projections having configurations as employed in the first, third, fourth and fifth embodiments as explained above.

The present invention has been described in detail with reference to certain preferred embodiments thereof, but it will be understood that variations and modifications can be effected within the spirit and scope of the invention.



We claim:

1. A chip fuse comprising:

a body made of a heat-resistant and insulating material, said body having a pair of polygonal end surfaces spaced opposed to each other, side surfaces attached to and extending between said pair of polygonal end surfaces, a through-bore defined in said body and extending through said body between said pair of end surfaces, and at least two grooves, one of said at least two grooves being provided on one of said side surfaces near one of said end surfaces in a direction substantially parallel to said end surfaces, and the other of said at least two grooves being provided on one of said side surfaces near the other of said end surfaces in a direction substantially parallel to said end surfaces;

an elongated fusible element, the length of said fusible element being greater than that of said through-bore, said fusible element being disposed within and extending through said through-bore in said body, each of the end portions of said fusible element extending along and being in contact with each of said end surfaces and one of said side surfaces of said body, whereby said fusible element is engaged with said body; and

a pair of conductive terminal members respectively fitted onto a corresponding one of said pair of end surfaces of said body to electrically connect to each of the end portions of said fusible element, each one of said pair of terminal members including a polygonal wall having an inner face opposing the respective polygonal end surface of said





body, side walls angularly extending from the periphery of said polygonal wall and covering said side surfaces near each one of said pair of end surfaces of said body, and at least a projected member provided on one of said side walls
5 and fitted into a corresponding one of said grooves of said body.

2. A chip fuse as claimed in Claim 1, wherein said projected member is formed by providing at least two cuts at said one of said side walls provided with said projected
10 member and by inwardly bending the portion located between said at least two cuts.

3. A chip fuse as claimed in Claim 1, wherein said projected member is formed by inwardly projecting a portion of said one of said side walls provided with said projected
15 member by means of pressing.

4. A chip fuse as claimed in Claim 1, wherein said projected member is formed by extending one of said side walls of said conductive terminal member and inwardly bending the extended portion of said one of said side walls.

20 5. A chip fuse as claimed in Claim 4, wherein said projected member is formed by bending said extended portion into a U-shaped configuration.

6. A chip fuse as claimed in Claim 1, wherein said projected member is formed by inwardly bending the end
25 portion of one of said side walls of said conductive terminal member.

7. A chip fuse comprising:

a body made of a heat-resistant and insulating material, said body having a pair of polygonal end surfaces





spaced opposed to each other, side surfaces attached to and extending between said pair of polygonal end surfaces, and a through-bore defined in said body and extending through said body between said pair of end surfaces;

5 an elongated fusible element, the length of said fusible element being greater than that of said through-bore, said fusible element being disposed within and extending through said through-bore in said body, each of the end portions of said fusible element extending along
10 and being in contact with each of said end surfaces and one of said side surfaces of said body, whereby said fusible element is engaged with said body; and

 a pair of conductive terminal members respectively fitted onto a corresponding one of said pair of end surfaces
15 of said body to electrically connect to each of the end portions of said fusible element, each one of said pair of terminal members including a polygonal wall having an inner face opposing the respective polygonal end surface of said body, side walls angularly extending from the periphery of
20 said polygonal wall and covering said side surfaces near each one of said pair of end surfaces of said body, and at least a projected member provided on one of said side walls, said projected member being frictionally in contact
25 with a corresponding one of said side surfaces of said body to fix said conductive terminal member to said body.

8. A chip fuse as claimed in Claim 7, wherein said projected member is formed by providing at least two cuts at said one of said side walls provided with said projected





member and by inwardly bending the portion located between said at least two cuts.

9. A chip fuse as claimed in Claim 7, wherein said projected member is formed by inwardly projecting a portion of said one of said side walls provided with said projected member by means of pressing.

10. A chip fuse as claimed in Claim 7, wherein said projected member is formed by extending one of said side walls of said conductive terminal member and inwardly bending the extended portion of said one of said side walls.

11. A chip fuse as claimed in Claim 10, wherein said projected member is formed by bending said extended portion into a U-shaped configuration.

12. A chip fuse as claimed in Claim 7, wherein said projected member is formed by inwardly bending the end portion of one of said side walls of said conductive terminal member.

13. A chip fuse substantially as described herein with reference to and as illustrated in Figures 1 and 2 of the accompanying drawings.

14. A chip fuse substantially as described herein with reference to and as illustrated in Figures 3 and 4 of the accompanying drawings.

15. A chip fuse substantially as described herein with reference to and as illustrated in Figures 5 and 6 of the accompanying drawings.





- 18 -

16. A chip fuse substantially as described herein with reference to and as illustrated in Figures 7 and 8 of the accompanying drawings.

17. A chip fuse substantially as described herein with reference to and as illustrated in Figures 9 and 10 of the accompanying drawings.

18. A chip fuse substantially as described herein with reference to and as illustrated in Figures 11 and 12 of the accompanying drawings.

This Sheet Has Been Replaced

