



US 20060260498A1

(19) **United States**(12) **Patent Application Publication**
Hatomoto(10) **Pub. No.: US 2006/0260498 A1**(43) **Pub. Date: Nov. 23, 2006**(54) **IGNITER ASSEMBLY**(30) **Foreign Application Priority Data**

Apr. 5, 2005 (JP) 2005-108612

(75) Inventor: **Atsushi Hatomoto**, Tatsuno-Shi (JP)**Publication Classification**

Correspondence Address:

BIRCH STEWART KOLASCH & BIRCH
PO BOX 747**FALLS CHURCH, VA 22040-0747 (US)**(51) **Int. Cl.****F42B 3/12** (2006.01)(52) **U.S. Cl.** **102/202.14; 102/530**

(57)

ABSTRACT

The present invention provides an igniter assembly comprising: an igniter main body comprising a metallic header, a conductive pin fixed to the metallic header, a heat generating body provided on the metallic header and electrically connected to the conductive pin, a metallic cup having an upper surface of the metallic cup and a side surface on an exterior of the metallic cup and an ignition charge being in contact with the heat generating body, a collar supporting the igniter main body and a resin covering a part of the upper surface of the metallic cup and the side surface of the metallic cup, an other portion than the part of the upper surface of the metallic cup being exposed.

(73) Assignee: **Daicel Chemical Industries, Ltd.**,
Sakai-Shi (JP)(21) Appl. No.: **11/396,659**(22) Filed: **Apr. 4, 2006****Related U.S. Application Data**

(60) Provisional application No. 60/669,886, filed on Apr. 11, 2005.

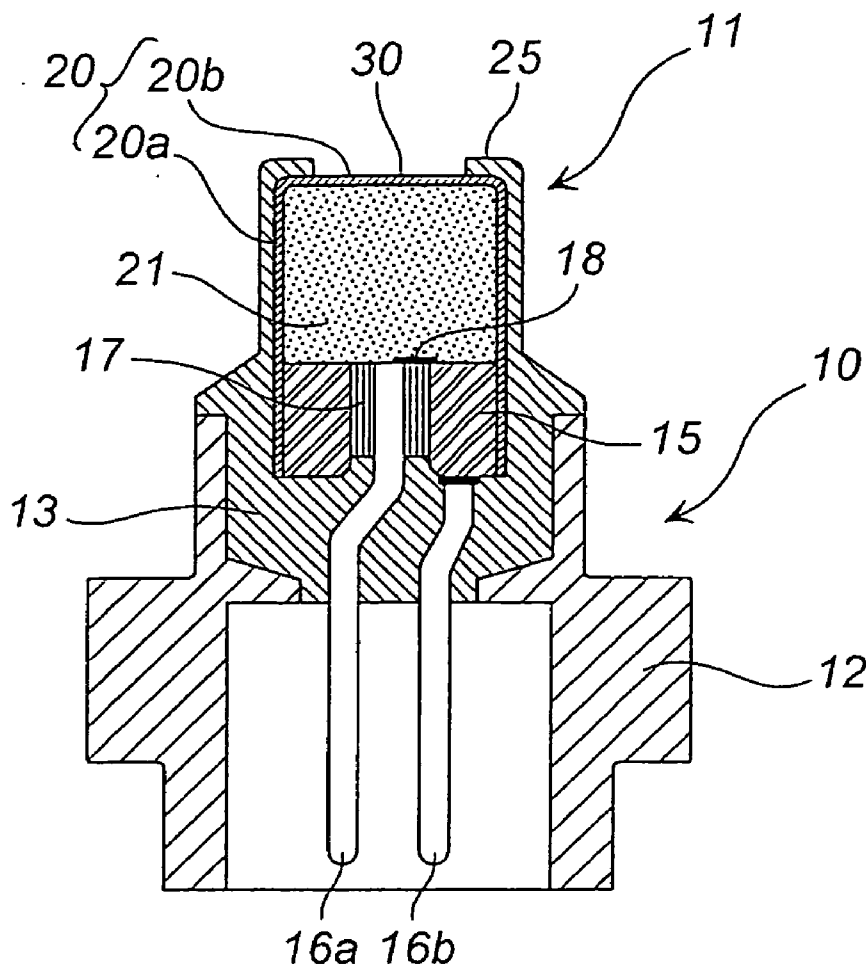


Fig .1

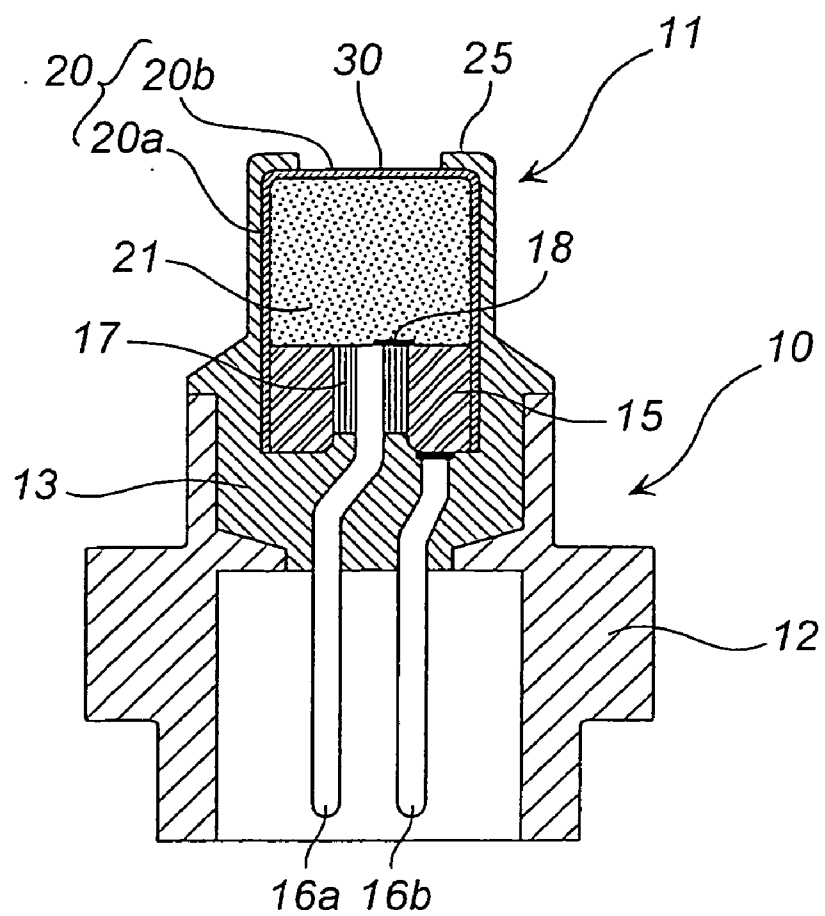
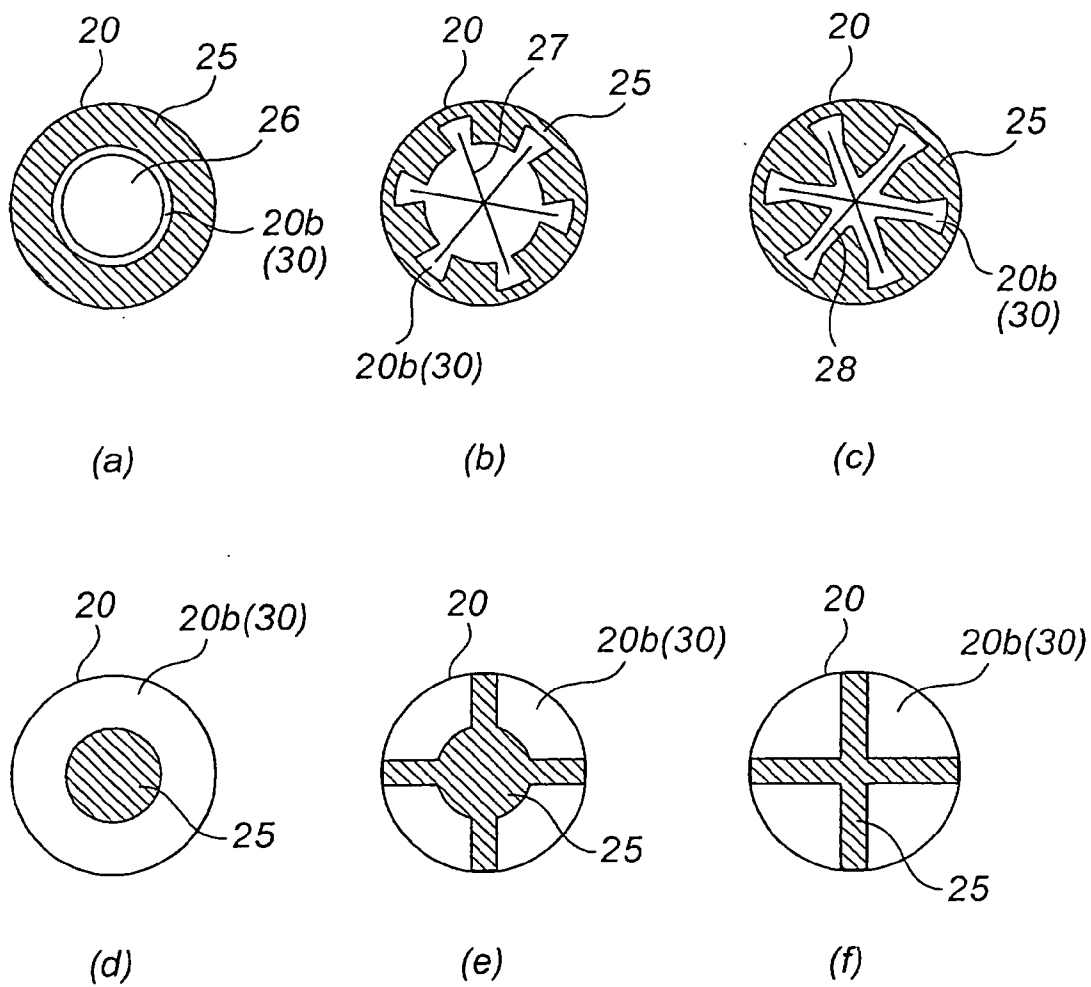


Fig. 2



. Fig. 3

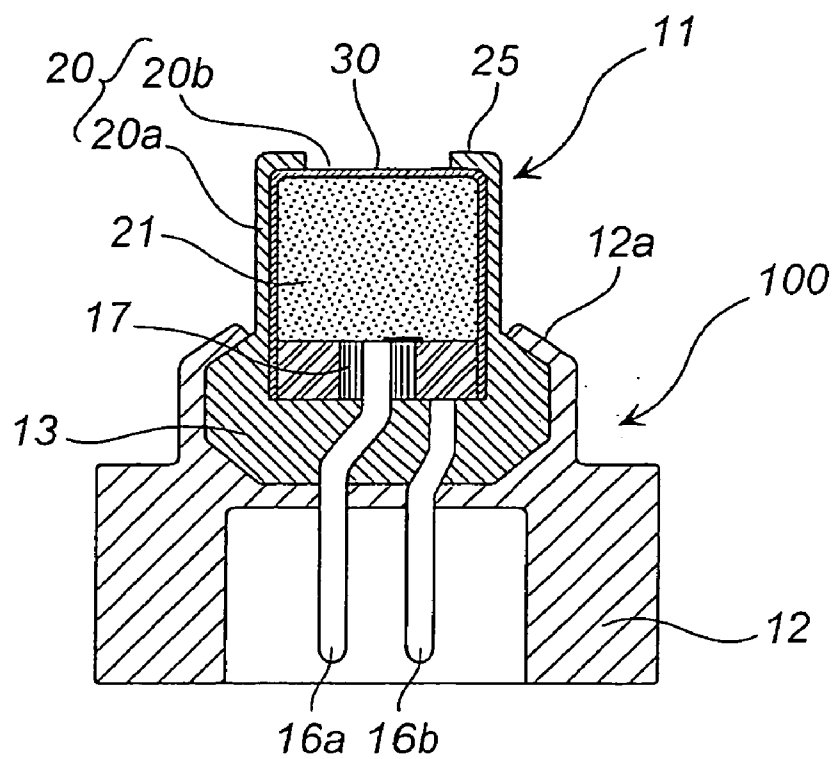


Fig .4

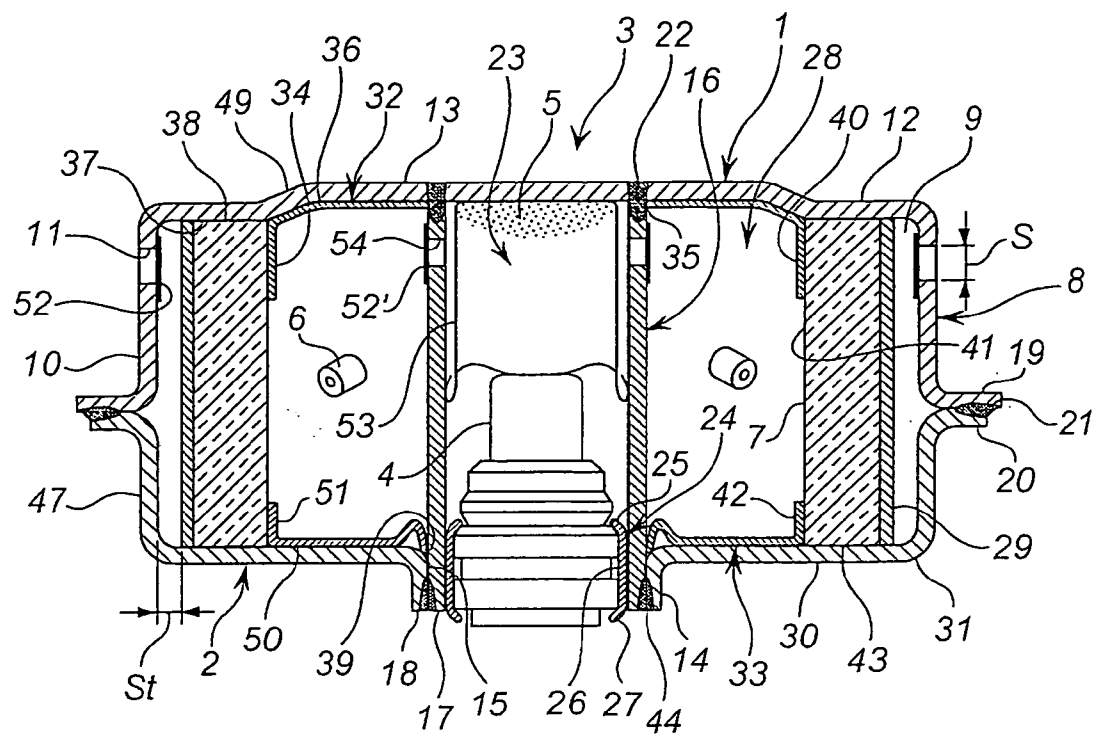


Fig. 5

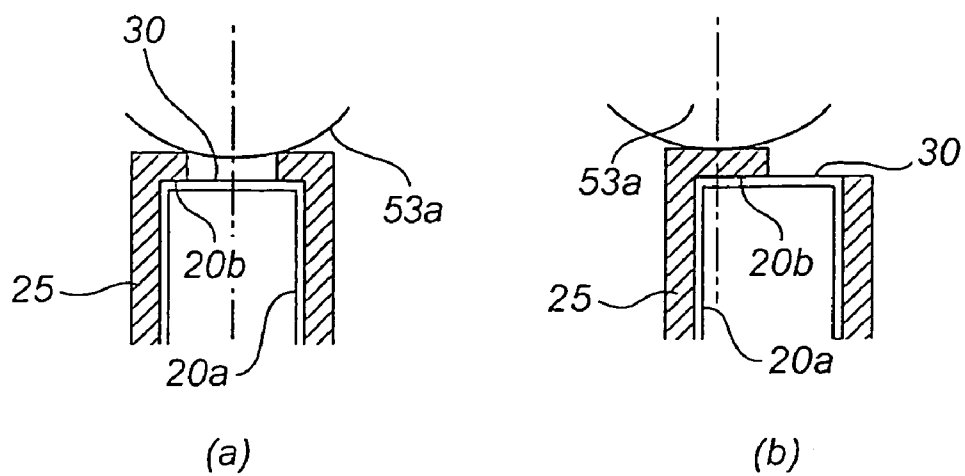


Fig. 6

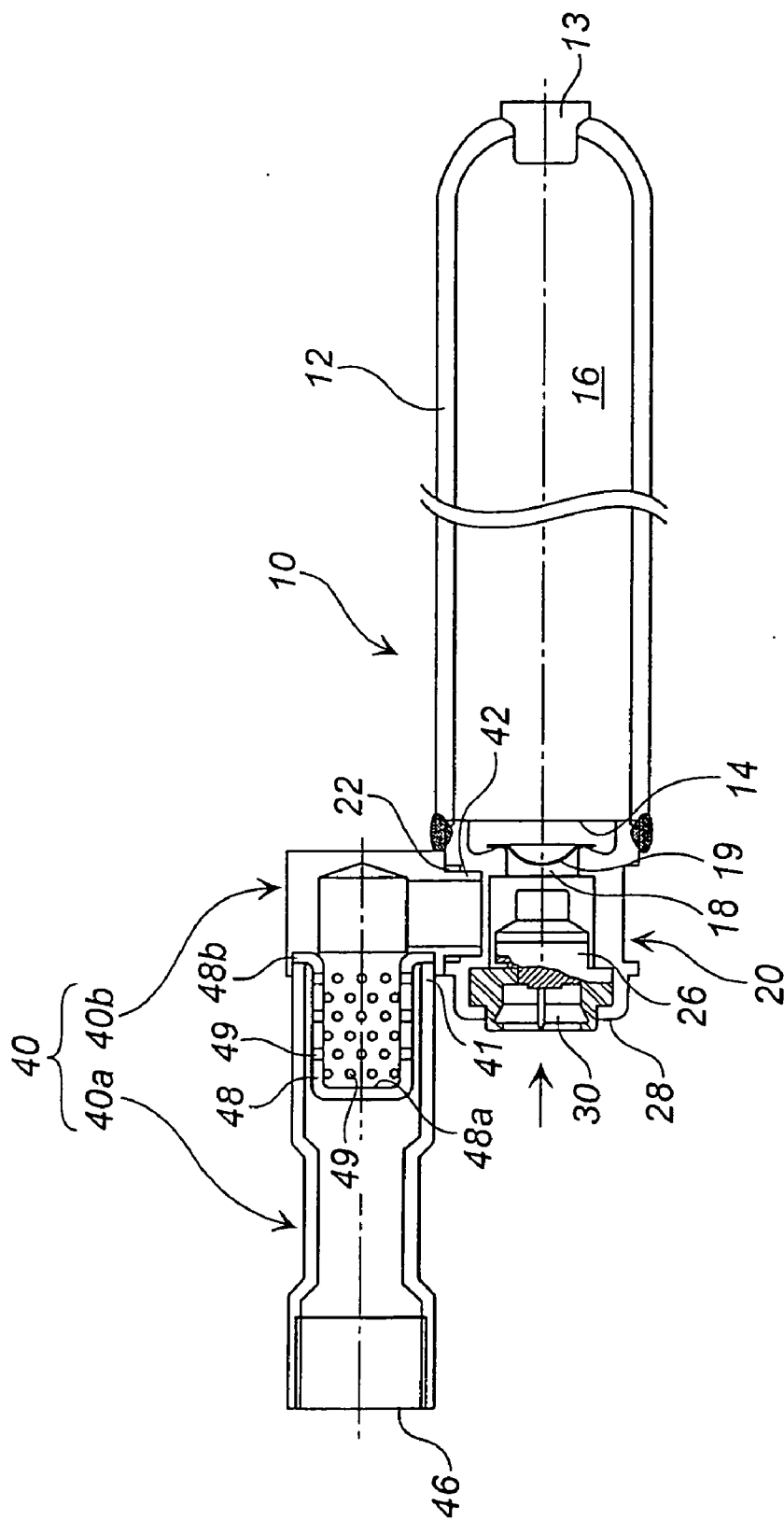
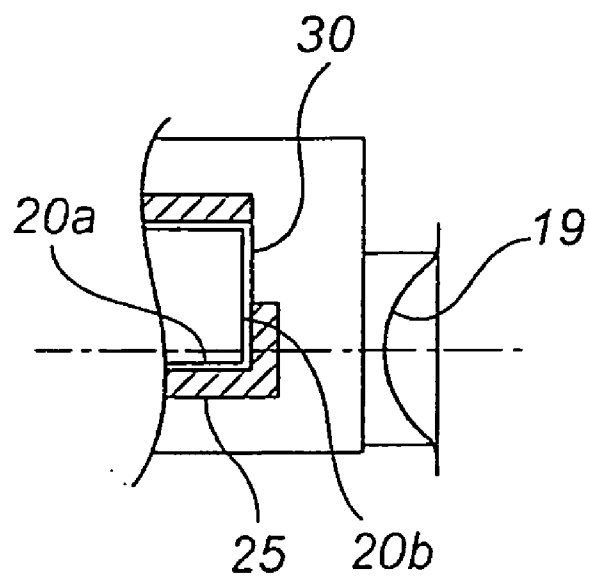


Fig. 7



IGNITER ASSEMBLY

[0001] This non-provisional application claims priority under 35 U.S.C. § 119(a) on Patent Application No. 2005-108612 filed in Japan on 5 Apr. 2005 and 35 U.S.C. § 119(c) on U.S. Provisional Application No. 60/669,886 filed on 11 Apr. 2005, which are incorporated by reference.

BACKGROUND OF THE INVENTION**[0002] 1. Field of the Invention**

[0003] The present invention relates to an igniter assembly that can be used in a human restraining apparatus for protecting passengers and pedestrians.

[0004] 2. Description of the Related Art

[0005] A known example of an electric igniter used in a human restraining apparatus or the like has a center pin (a conductive pin) attached to a metallic header via an insulating member and an earth pin (an other conductive pin) attached directly to the metallic header. A heat generating body is laid across a head portion of the conductive pin and the metallic header, a metallic cup for holding an ignition charge is mounted on the metallic header, and the metallic cup is electrically connected to the earth pin.

[0006] In this type of electric igniter, when the conductive pin is functioning as the earth pin and an electric current flows from the outside into the metallic cup, the electric current flows into the heat generating body, causing an incorrect operation of the igniter. To prevent such the incorrect operation, an insulation material is provided on an outer surface of the metallic cup and a means for ensuring that the conductive pin and earth pin are connected correctly is taken.

[0007] U.S. 2002/0069783 A1 discloses a header assembly 20 including an eyelet 60 and a can 65 surrounding the outside of the eyelet 60, having an ignition charge in an accommodating chamber formed in the can, and attached to the eyelet 60 by welding 61. A whole of the igniter is covered with the insulation material by molding. The whole outside surface of the metallic cup is covered with a resin as the insulating member.

[0008] The igniter main body is held in a shaping die by gripping the conductive pin tightly in order to prevent the igniter main body from moving under the pressure applied during injection. As a result, the conductive pin is easily damaged, and this damage may cause the conductive pin to rust. When rust occurs, the conduction performance is adversely affected.

[0009] In such the igniter assembly, the resin also has a fragile portion in which the thickness is reduced so that the metallic cup can be broken easily upon an activation of the igniter assembly. However, it is difficult to produce the resin with a process for partially reducing the thickness of the resin as the insulating member, and that leads to a lack of quality stability of the ignition assembly. The ignition assembly has also have a demand of reducing a manufacturing cost.

SUMMARY OF THE INVENTION

[0010] The present invention is to provide an igniter assembly enabling improved ignition performance, improved quality stability, and reduced manufacturing cost.

[0011] The present invention relates to an igniter assembly comprising:

[0012] an igniter main body comprising

[0013] a metallic header,

[0014] a conductive pin fixed to the metallic header,

[0015] a heat generating body provided on the metallic header and electrically connected to the conductive pin,

[0016] a metallic cup having an upper surface of the metallic cup and a side surface on an exterior of the metallic cup,

[0017] an ignition charge charged into the metallic cup,

[0018] the metallic cup being placed over the metallic header and

[0019] an ignition charge being in contact with the heat generating body,

[0020] a collar supporting the igniter main body and

[0021] a resin covering a part of the upper surface of the metallic cup and the side surface of the metallic cup,

[0022] an other portion than the part of the upper surface of the metallic cup being exposed.

[0023] When the collar comprises a metal material, the resin is located between the igniter main body and the collar as an insulation material, and the igniter main body and the collar are fixed together by the resin.

[0024] In the igniter assembly of the present invention, the whole of the cylindrical side surface and a part of the upper surface of the metallic cup are covered with a resin that is an insulation material, and the metallic surface of the metallic cup is exposed at the remainder of the part of the upper surface covered with the resin. By providing these constitutional elements, the object described above can be achieved, and the ignition assembly has functions and effects described below in (A) and (B) are exhibited.

[0025] (A) When manufacturing the igniter assembly by fixing the igniter main body to the collar with a method of fixing the igniter main body to the collar by injecting the resin of an insulation material between the collar and igniter main body that are held in a shaping die, the igniter main body can be supported by contacting the shaping die with the surface of the metallic cup that is not covered with the resin instead of by gripping the conductive pin.

[0026] (B) When the upper surface of the metallic cup is partially covered with the resin, the amount of used resin per unit is reduced, and the reduction of the amount of used resin during mass production of the ignition assembly becomes extremely large, and then manufacturing costs of the ignition assembly can be reduced. This is also advantageous from the viewpoint of resource conservation.

[0027] The igniter assembly is used when incorporated into a gas generator for an air bag or the like. When the metallic cup of the igniter assembly contacts a housing or other metallic member of the gas generator, the part of the upper surface of the metallic cup is insulated in accordance with the internal structure of the gas generator.

[0028] A shape of the upper surface of the metallic cup covered with the resin (a pattern of the resin covering the

upper surface of the metallic cup) and an area of the upper surface of the metallic cup exposing the surface of the metallic cup are not limited.

[0029] The metallic surface of the metallic cup may be exposed in the remainder of the upper surface, uncovered with the resin.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] The present invention will become more fully understood from the detailed description given herein below and the accompanying drawings which are given by way of illustration only, and thus are not limitative of the present invention and wherein:

[0031] **FIG. 1** shows a longitudinal sectional view of an igniter assembly according to the present invention;

[0032] **FIG. 2** shows a view showing patterns of a resin that covers a part of an upper surface of a metallic cup according to the present invention;

[0033] **FIG. 3** shows a longitudinal sectional view of an igniter assembly according to another embodiment of the present invention;

[0034] **FIG. 4** shows an axial sectional view of a conventional gas generator;

[0035] **FIG. 5** shows a partial sectional view showing the igniter assembly according to the present invention and incorporated into **FIG. 4**;

[0036] **FIG. 6** shows an axial sectional view of a conventional inflator; and

[0037] **FIG. 7** shows a partial sectional view showing the igniter assembly according to the present invention and incorporated into **FIG. 6**.

DETAILED DESCRIPTION OF THE INVENTION

[0038] The present invention further relates to the igniter assembly, wherein a peripheral edge portion of the upper surface of the metallic cup is covered with the resin of an electric insulation resin, and a central portion of the upper surface is exposed in the surface of the metallic cup. In so doing, the functions and the effects of (A) and (B) are obtained.

[0039] The present invention further relates to an igniter assembly, wherein a part of the upper surface of the metallic cup including the central portion of the upper surface may be covered with the resin of the electric insulation resin and then a part of the peripheral edge portion of the upper surface may be exposed in the surface of the metallic cup. In so doing, the functions and the effects of (A) and (B) are obtained.

[0040] The present invention further relates to the igniter assembly, wherein a fragile portion is provided in a part of the upper surface of the metallic cup being exposed.

[0041] The fragile portion may be formed by applying a method of reducing the thickness of the appropriate part or a method of forming notches in a cross shape, radial shape, or similar.

[0042] The present invention further relates to the igniter assembly, wherein the collar comprises a metal material, the resin is further located between the igniter main body and the collar as an insulation material, and the igniter main body and the collar are fixed together by the resin.

[0043] The igniter main body and the collar may be fixed together at the same time as the igniter main body is covered with the resin in a single resin injection process.

[0044] The igniter assembly may be applied to an inflator using a gas generating agent as a gas source, an inflator using a pressurized gas as a gas source, or an inflator using both the gas generating agent and the pressurized gas. Furthermore, the igniter assembly is capable of exhibiting an equally favorable ignition performance when incorporated into the inflators having various different internal structures.

[0045] In the igniter assembly, a part of the upper surface of the metallic cup charged with an ignition charge is covered with resin, and the remainder of the part of the upper surface of the metallic cup is exposed in the surface of the metallic cup. As a result, the functions and the effects of (A) and (B) can be exhibited.

[0046] A thickness of the resin may be set within the range of 0.3 to 1.5 mm, and preferably 0.5 to 1.2 mm, in order to secure electric insulation of the metallic cup.

[0047] In order to cover a desired positions of the part of the upper surface of the metallic cup with the resin, a method may be applied in which the upper surface of the metallic cup is pressed against a predetermined shaping die which is molded in advance such that the resin covering can be performed in the desired shape (the pattern desired), whereupon the resin is injected.

[0048] The upper surface of the metallic cup pressed against the shaping die is not covered with resin, and as a result a part of the surface of the metallic cup is exposed.

EMBODIMENTS OF THE INVENTION

[0049] (1) Igniter Assembly of **FIG. 1**

[0050] **FIG. 1** is a longitudinal sectional view of an igniter assembly **10**.

[0051] The igniter assembly **10** includes an igniter main body **11** and a metallic igniter collar **12** that are fixed together integrally by a resin **13**. The resin **13** may be charged using an injection molding method.

[0052] A center pin **16a** (conductive pin) and an earth pin **16b** (other conductive pin) are fixed to a metallic header **15**. The earth pin **16b** may be fixed on the metallic header **15** by welding as **FIG. 1** shows in block line.

[0053] A part of a periphery portion of the center pin **16a** is surrounded by an insulating member **17** (glass or the like), such that the center pin **16a** does not contact the metallic header **15** directly. The earth pin **16b** is electrically connected to the metallic header **15**. An upper end face of the center pin **16a**, an insulating body **17**, and a surface of the metallic header **15** are formed to be flush with each other. Both the center pin **16a** and the earth pin **16b** may be attached to the metallic header via an insulating member.

[0054] A bridge wire **18** is laid across the center pin **16a** and the metallic header **15** as an electric resistance wire (a

heat generating body). The bridge wire 18 is used to convert electric energy (in other words, an electric signal) into a thermal energy. A platinum wire (having melting point 1870° C.), a nichrome wire (having melting point 1400° C.), or similar may be used as the bridge wire 18. The bridge wire 18 may be connected to the center pin 16a and the metallic header by welding.

[0055] A metallic cup 20 is placed on the metallic header 15, and an ignition charge 21 is charged into the interior space thereof (a space of accommodating an ignition charge) so as to contact the bridge wire 18. A material of the ignition charge 21 which is ignited and burned by the heat generated by the bridge wire 18, such as zirconium potassium perchlorate, may be used as the ignition charge 21.

[0056] The metallic cup 20 is fixed to the surface of the metallic header 15 at an opening portion side the metallic cup by welding such that the metallic cup 20 and metallic header 15 contact each other.

[0057] The metallic cup 20 has a cylindrical side surface 20a and an upper surface 20b. The whole of the cylindrical side surface 20a and a part of the upper surface 20b are covered with a resin 25 that is an electric insulating resin. The remainder of the part of the upper surface 20b is not covered with the resin 25, and hence a surface of the metallic cup 20 (a part of the upper surface 20b) is exposed (the exposed part of the upper surface 20b will be referred to hereafter as an "exposed surface 30"). A fragile portion of the metallic cup may be provided in a part of the exposed surface 30 by reducing the thickness thereof or forming a cross-shaped notch therein. When the igniter assembly 10 is activated, the metallic cup 20 is broken at the exposed surface 30 (or at the fragile portion when the fragile portion is provided).

[0058] The pattern in which the resin 25 covers the upper surface 20b of the metallic cup 20 is adjusted within a range enabling the aforementioned functions and effects of (A) and (B) to be exhibited.

[0059] FIGS. 2(a) to 2(f) shows examples of a pattern of the resin covering the part of the upper surface of the metallic cup.

[0060] In FIG. 2(a), a peripheral edge portion of the upper surface 20b of the metallic cup 20 is covered by the resin 25 in annular form, and the surface of the metallic cup is exposed in a central portion of the upper surface. A circular fragile portion 26 of the central portion of the metallic cup having a reduced thickness is provided on the exposed surface 30. The resin 25 may be formed in the pattern shown in FIG. 2(a) in the following manner, for example.

[0061] The igniter main body 11 and the igniter collar 12 are disposed in a shaping die (an upper die and a lower die) such that a predetermined space is provided therebetween. At this time, the igniter collar 12 is fixed (gripped) between the lower die and the upper side. As for the igniter main body 11, the center pin 16a and earth pin 16b are inserted into a hole of the shaping die, provided in the lower die, for example, and a part of the upper surface 20b of the metallic cup 20 corresponding to the exposed surface 30 is pressed against a predetermined site of the upper die. Thus the igniter main body 11 is supported by the center pin 16a and earth pin 16b, which are inserted into the hole in the lower die, and the exposed surface 30 pressed against the upper

die. When the resin is then charged into an internal space portion of the shaping die, the part of the upper surface 20b of the metallic cup 20 contacting the upper die is not covered with the resin. As a result, the igniter assembly 10 having the exposed surface 30 shown in FIGS. 1 and 2(a) is obtained.

[0062] In FIG. 2(b), the peripheral edge portion of the upper surface 20b of the metallic cup 20 is covered by the resin 25 in the pattern shown in the drawing such that the surface of the metallic cup 20 is exposed in the central portion of the upper surface 20b. A radial notched fragile portion 27 is provided on the exposed surface 30 as shown in the drawing.

[0063] In FIG. 2(c), the peripheral edge portion of the upper surface 20b of the metallic cup 20 is covered by the resin 25 in the pattern shown in the drawing such that the surface of the metallic cup 20 is exposed in the central portion of the upper surface 20b. A radial notched fragile portion 28 is provided on the exposed surface 30 as shown in the drawing.

[0064] In FIG. 2(d), the central portion of the upper surface 20b of the metallic cup 20 is covered by the resin 25 in a circular shape, and the surface of the metallic cup 20 is exposed in the peripheral edge portion of the upper surface 20b. A fragile portion of the metallic cup 20 may be provided similarly on the exposed surface 30.

[0065] In FIG. 2(e), a part of the upper surface 20b of the metallic cup 20 including the central portion of the metallic cup 20 is covered by the resin 25 in the pattern shown in the drawing (in which the resin 25 covering the cylindrical side surface 20a and the resin 25 covering the upper surface 20b are connected), and the surface of the metallic cup is exposed in the four parts of the peripheral edge portion of the upper surface 20b. The fragile portion may be provided similarly on the exposed surface 30.

[0066] In FIG. 2(f), a part of the upper surface 20b of the metallic cup 20 including the central portion of the upper surface is covered by the resin 25 in a cross shape (such that the resin 13 covering the cylindrical side surface 20a and the resin 25 covering the upper surface 20b are connected), and the surface of the metallic cup 20 is exposed in the four fan-shaped portions. A fragile portion of the metallic cup may be provided similarly on the exposed surface 30.

[0067] In FIGS. 1 and 2, except of FIG. 2(d), the resin 25 and the resin 13 are formed simultaneously by a single injection when the igniter main body 11 and collar 12 are to be integrated.

[0068] The upper surface 20b of the metallic cup of the igniter main body 11 is covered by the resin 25 in the pattern shown in FIG. 2(a), and when the ignition charge 21 is ignited and burned upon activation of the igniter assembly 10, thereby generating an ignition energy which breaks the exposed surface 30 (the fragile portion 26). The ignition energy is then discharged through a ruptured portion of the exposed surface 30. The exposed surface 30 is a trace formed when the igniter main body 11 is in contact with the shaping die, and hence the functions and effects of (A) can be exhibited. Furthermore, an amount of the resin can be reduced in accordance with the exposed surface 30, which leads to a huge overall reduction when the igniter assembly 10 is manufactured in units of several million, for example, and hence the functions and effects of (B) can also be exhibited.

[0069] (2) Igniter Assembly of FIG. 3

[0070] FIG. 3 is a longitudinal sectional view of an igniter assembly 100 according to another embodiment of the present invention. Identical reference numerals to those used in FIG. 1 denote identical elements.

[0071] In the igniter assembly 100, the igniter main body 11 is manufactured first, whereupon the igniter main body 11 and the metallic collar 12 are fixed integrally by caulking an annular protrusion 12a of the metallic collar 12. The pattern in which the resin 25 covers the upper surface 20b of the metallic cup 20 may be selected from those shown in FIGS. 2(a) to 2(f).

[0072] (3) Gas Generator Incorporating Igniter Assembly 10 of FIG. 1 (Using a Gas Generating Agent as a Gas Source)

[0073] FIG. 4 shows a gas generator for an air bag as same as one illustrated in FIG. 1 of JP-A No. 10-95302. In FIG. 1 of JP-A No. 10-95302, 4 denotes an igniter, and hence the igniter 4 and a collar part integrated therewith are replaced by the igniter assembly 10 shown in FIG. 1 of the present invention.

[0074] In the gas generator shown in FIG. 4, a transfer charge container 53 accommodating a transfer charge 5 is disposed in an ignition device accommodating a chamber 23. The transfer charge container 53 is generally formed from a conductive material such as aluminum.

[0075] As shown in FIG. 5(a), at the upper surface 20b of the metallic cup (having the resin covering pattern of FIG. 2(a)) of the igniter assembly 10, the resin 25 covering a part of the peripheral edge portion of the upper surface contacts a base surface 53a of the transfer charge container 53, and the exposed surface 30 does not contact the base surface 53a.

[0076] Hence, even when an electric current flows into a housing 1 of the air bag gas generator, the electric current does not flow into the metallic cup 20 and metallic header 15, and therefore malfunctions of the igniter main body 11 do not occur.

[0077] In FIGS. 4 and 5(a), the igniter 4 (the igniter assembly 10 when replaced) and the igniter transfer charge container 53 have matching central axes in the axial direction (shown by the dot-dash line in the drawing), but depending on the internal structure of the gas generator, the igniter 4 and the transfer charge container 53 may have non-matching central axes in the axial direction (for example, the igniter 4 in FIG. 4 may be disposed slightly to the left side).

[0078] As shown in FIG. 5(b), in such a case, only the part of the upper surface 20b of the metallic cup in close proximity to, or in contact with, the transfer charge container 53a needs to be covered with the resin 25.

[0079] (4) Inflator Incorporated with Igniter Assembly 10 of FIG. 1 (Using a Pressurized Gas as a Gas Source)

[0080] FIG. 6 shows an inflator as same as illustrated in FIG. 1 of JP-A No. 2003-25951. In FIG. 1 of this publication, 26 denotes an igniter, and hence the igniter 26 and a collar part integrated therewith are replaced by the igniter assembly 10 shown in FIG. 1 of the present invention.

[0081] When the igniter assembly 10 is incorporated into FIG. 6, a gap exists between the upper surface 20b of the metallic cup and a rupturable plate 19, but depending on an internal structure of the inflator, the upper surface 20b of the metallic cup and the rupturable plate 19 may be disposed in closer proximity. However, even in such a case, the upper surface 20b of the metallic cup and the rupturable plate 19 may be set in a similar state of contacting between the upper surface 20b of the metallic cup and base surface 53a shown in FIG. 5(a), and therefore an incorrect operation (malfunctions) do not occur.

[0082] Further, in FIG. 6 the igniter 26 (the igniter assembly 10 when replaced) and the rupturable plate 19 have matching central axes in the axial direction, but depending on the internal structure of the inflator, the igniter 26 (the igniter assembly 10 when replaced) and the rupturable plate 19 may have non-matching central axes in the axial direction (for example, the igniter 26 in FIG. 6 may be disposed slightly toward the lower side).

[0083] In this case, as shown in FIG. 7, a lower half of the upper surface 20b of the metallic cup is covered by the resin 25 and an upper half of the upper surface 20b is set as the exposed surface 30. In so doing, it is possible to cover only a portion of the upper surface of the metallic cup that is closest to the rupturable plate 19 with the resin 25.

[0084] As described above, the igniter assembly of the present invention may be applied to gas generators having various well-known internal structures and using various well-known gas sources, and is capable of exhibiting a similar ignition performance regardless of the gas generator in which it is incorporated.

[0085] The invention thus described, it will be obvious that the same may be varied in many ways. Such variations are not to be regarded as a departure from the spirit and scope of the invention, and all such modification as would be obvious to one skilled in the art are intended to be included within the scope of the following claims.

1. An igniter assembly, comprising:

an igniter main body comprising

a metallic header,

a conductive pin fixed to the metallic header,

a heat generating body provided on the metallic header and electrically connected to the conductive pin,

a metallic cup having an upper surface of the metallic cup and a side surface on an exterior of the metallic cup and

an ignition charge being in contact with the heat generating body;

a collar supporting the igniter main body and

a resin covering a part of the upper surface of the metallic cup and the side surface of the metallic cup,

an other portion than the part of the upper surface of the metallic cup being exposed.

2. The igniter assembly according to claim 1, wherein the upper surface of the metallic cup has an edge portion of the upper surface and a central portion of the upper surface, the resin covers at least a part of the edge portion of the upper

surface, and the central portion of the upper surface is exposed in the surface of the metallic cup.

3. The igniter assembly according to claim 1, wherein the upper surface of the metallic cup has an edge portion of the upper surface and a central portion of the upper surface, the resin covers the part of the upper surface including the central portion of the upper surface, and a part of the edge portion of the upper surface is exposed in the surface of the metallic cup.

4. The igniter assembly according to claim 1, wherein the metallic cup has a fragile portion provided at the upper surface exposing the surface of the metallic cup.

5. The igniter assembly according to claim 2, wherein the metallic cup has a fragile portion provided at the upper surface exposing the surface of the metallic cup.

6. The igniter assembly according to claim 3, wherein the metallic cup has a fragile portion provided at the upper surface exposing the surface of the metallic cup.

7. The igniter assembly according to claim 1, wherein the collar comprises a metal material, the resin is further located between the igniter main body and the collar as a insulation material, and the igniter main body and the collar are fixed together by the resin.

8. The igniter assembly according to claim 2, wherein the collar comprises a metal material, the resin is further located

between the igniter main body and the collar as a insulation material, and the igniter main body and the collar are fixed together by the resin.

9. The igniter assembly according to claim 3, wherein the collar comprises a metal material, the resin is further located between the igniter main body and the collar as a insulation material, and the igniter main body and the collar are fixed together by the resin.

10. The igniter assembly according to claim 4, wherein the collar comprises a metal material, the resin is further located between the igniter main body and the collar as a insulation material, and the igniter main body and the collar are fixed together by the resin.

11. The igniter assembly according to claim 5, wherein the collar comprises a metal material, the resin is further located between the igniter main body and the collar as a insulation material, and the igniter main body and the collar are fixed together by the resin.

12. The igniter assembly according to claim 6, wherein the collar comprises a metal material, the resin is further located between the igniter main body and the collar as a insulation material, and the igniter main body and the collar are fixed together by the resin.

* * * * *