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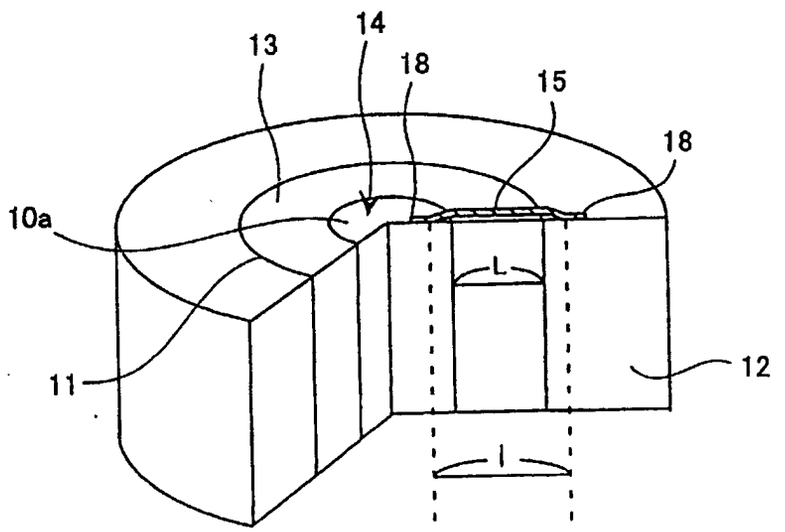
# (54) ELECTRIC INITIATOR AND INITIATOR ASSEMBLY USING IT

(57) The present invention provides an electric type initiator having a stable electric characteristic, and thereby provides an electric type initiator having better reliability and an initiator assembly using the same.

The present invention provides an electric type initiator comprising two electroconductive bodies, an insulating body provided between top portions of the electroconductive bodies, and an electric resistance wire spanned between the top portions of the electroconductive bodies which are exposed from an upper end portion of the insulating body, wherein a distance (L) of the electric insulating body between the top portions of the two electroconductive bodies is set to be not less than 0.8 times a horizontal distance (1) of a portion which determines the resistance value of the electric resistance wire between the electroconductive bodies.

Fig. 2

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## Description

Technical Field to which the Invention belongs

**[0001]** The present invention relates to an inflator for filling up an air bag for a vehicle or an inflatable article, and more particularly to an electric type initiator and initiator (an electric trigger device) assembly for igniting a propellant (that is, a gas generating agent) in the inflator.

Prior Art

**[0002]** An initiator for inflating an air bag for a vehicle or another inflatable article includes an initiator assembly for igniting a propellant (a gas generating agent) stored in a housing of an inflator. The inflator activates the propellant (the gas generating agent) upon activation of the initiator assembly to generate a gas for filling up the inflatable article. The initiator assembly generally includes an outer shape or a member for being connected to a support structure (for example, a structure in an inner tube of the initiator).

**[0003]** Conventionally, an initiator assembly having a collar member such as a metal casing for being coupled to the inflator housing has been well known. The collar member is disposed on an outer surface of an insulating body surrounding a electroconductive pin of the electric type initiator, and it constitutes the initiator assembly by a combination with the electric type initiator.

**[0004]** The electric type initiator is formed to have two electroconductive bodies and an insulating body is provided between the electroconductive bodies. And the electroconductive bodies are electrically connected to each other through an electric resistance wire. And when one electroconductive body receives an ignition signal, because of the other electroconductive body having a different electric potential therefrom, the electric resistance wire spanned between the both generates heat, so that a priming disposed in the vicinity of the resistance wire is ignited and burnt.

**[0005]** Also, when the electric type initiator is activated, an electric ignition signal is applied between two electroconductive bodies, but there may be a case in which a feeble electricity such as a static electricity is unintentionally applied therebetween in addition to this activating signal.

Disclosure of the Invention

**[0006]** The present invention is to provide an electric type initiator having a stable electric characteristic and thereby to provide an electric type initiator whose reliability is improved and an initiator assembly using the same.

**[0007]** According to the present invention, there is provided an electric type initiator comprising two electroconductive bodies, an insulating body provided between top portions of the electroconductive bodies, an electric resistance wire spanned between the top portions of the electroconductive bodies which are exposed from an upper end portion of the insulating body, and the top portions of the two electroconductive bodies which are disposed to be flush with an upper end surface of the electric insulating body, wherein a distance (L) of the electric insulating body between the top portions of the two electroconductive bodies is formed to be not less than 0.8 times, preferably not less than 0.83 times, further preferably not less than 0.9 times a horizontal distance (1) of a portion which determines a resistance value of the electric resistance wire between the electroconductive bodies.

**[0008]** Further, according to the present invention, there can be provided an electric type initiator further comprising a priming which is ignited and burnt by heat generation of the electric resistance wire, wherein a current applied between the two electroconductive bodies which is required for igniting the priming is set to be not more than 1.75 A, preferably not more than 1.2 A for application time of 2 milliseconds.

**[0009]** Furthermore, according to the present invention, there can be provided an electric type initiator wherein, the resistance value between the electroconductive bodies after a voltage of 25 kv is applied between two electroconductive pins more than five times in an electric circuit for conducting a test provided in MIL-STD-1512 METHOD 205 of MIL standard in which a charging capacity is 150 PF and a discharging resistance is 500 Ω is within 10%, preferably within 8% of the resistance value between the electroconductive bodies before application of the voltage.

**[0010]** According to the present invention, even when a feeble electric such as a static electric is applied to two electroconductive bodies without intention of activating, an electric type initiator having a stable electric characteristic can be provided. Thereby, an electric type initiator having better reliability and an initiator assembly using the same can be realized.

**[0011]** Also, the initiator assembly can be easily coupling with an inflator housing, and also it can reduce a size of an injection-molded portion (a resin portion) of a plastic material without any increase in a load and cost in manufacturing.

Brief Description of the Drawings

**[0012]**

Fig. 1 is a vertical cross sectional schematic view showing an embodiment of an electric type initiator according to the present invention.
Fig. 2 is an enlarged view of a main portion of the electric type initiator shown in Fig. 1.
Fig. 3 is a vertical cross sectional schematic view showing another embodiment of the electric type initiator according to the present invention.
Fig. 4 is an enlarged view of a main portion of the electric type initiator shown in Fig. 3.
Fig. 5 is an electric circuit diagram in the present invention.
Fig. 6 is an electric circuit diagram for conducting a test of MIL-STD-1512 METHOD 205.
Fig. 7 is an initiator assembly formed by using the electric type initiator shown in Fig. 1.
Fig. 8 is an initiator assembly formed by using the electric type initiator shown in Fig. 3.

Explanation of Reference Numerals

**[0013]**

1, 101 electric type initiator
10a, 110a first electroconductive pin
10b, 110b second electroconductive pin
11 hole portion
12 metallic eyelet
13 insulating body
15, 115 bridge wire
16, 116 cup member
17, 117 cavity
18, 118 priming
19, 119 metal collar
113 header portion

Preferred Embodiments of the Invention

**[0014]** An electric type initiator of the present invention will be described in detail with reference to the drawings.
**[0015]** Fig. 1 and Fig. 3 are vertical cross sectional views showing one embodiment of an electric type initiator of the present invention respectively, Fig. 2 and Fig. 4 are a partly enlarged perspective view of the electric type initiators shown in Fig. 1 and Fig. 3 respectively. Also, Fig. 5 is a circuit diagram for applying a predetermined voltage to the electric type initiator.

Embodiment 1

**[0016]** Fig. 1 shows an electric type initiator 1 particularly comprising a first electroconductive pin 10a, a metallic eyelet 12 having a hole 11 through which the electroconductive pin 10a passes and also electrically connected with a second electroconductive pin 10b, and an insulating body 13 which is filled in the hole 11 to insulate the first electroconductive pin 10a from the eyelet 12, wherein the first electroconductive pin 10a and the metallic eyelet 12 electrically connecting the second electroconductive pin 10b correspond to two electroconductive bodies.
**[0017]** The first electroconductive pin 10a is arranged to pass through the hole portion 11 of the metallic eyelet 12 and the insulating body 13 such as glass is filled between the both. Consequently, the first electroconductive pin 10a and the metallic eyelet 12 (and the second electroconductive pin 10b) are insulated from each other. Also, as shown in Fig. 1, it is preferable that an end surface 14 of the first electroconductive pin 10b, the insulating body 13 and the metallic eyelet 12 are formed to be flush with one another.
**[0018]** Further, a bridge wire 15 is spanned between the first electroconductive pin 10a and the metallic eyelet 12 as the electric resistance wire. As the bridge wire 15, one which converts an electric energy (that is, an electric signal) into a thermal energy is used. The bridge wire is provided to connect one electroconductive pin 10a and another conductive component (for example, the metallic eyelet 12 in Fig. 1) which is in a different electrical potential from the pin at the time of receiving an ignition signal. As the bridge wire 15, a wire having a melting point of 1000°C or higher, for example, a platinum wire (a melting point: 1870°C), a Nichrome wire (1400°C) or the like can be used. In many

cases, the bridge wire 15 can be electrically connected to the respective electroconductive body (10a, 12) by welding.

**[0019]** Also, a cavity is formed by a cup member 16 which is in a shape of a cylinder with a top and provided on the eyelet in the side of the bridge wire 15, and a priming 18 is charged inside the cavity 17 to contact the bridge wire 15. As the priming 18, one which is ignited and burnt by heat generation of the bridge wire 15 is used, and, for example, zirconium-potassium perchlorate can be used. Incidentally, as to the cup member 16 forming the cavity 17, a cylindrical portion constituting a peripheral wall and a circular portion constituting the top portion can be separately prepared, and the both members are combined to form the cup member after the priming 18 is filled in the cavity 17.

**[0020]** Fig. 2 is a partly enlarged perspective view showing a connection state of the bridge wire 15 in the electric type initiator shown in Fig. 1.

**[0021]** As shown in Fig. 2, the bridge wire 15 is spanned between the metallic eyelet 12 and the first electroconductive pin 10a passing through the hole portion 11 formed at the center of the eyelet 12. Respective end portions 18 of the bridge wire 15 are connected to the end portion 14 of the first electroconductive pin 10a and the metallic eyelet 12 by a welding, and a distance (L) of the electric insulating body between the top portions of two electroconductive bodies (10a, 12) is not less than 0.8 times a horizontal distance (1) of a portion which determines the resistance value of an electric resistance wire (in this embodiment, the bridge wire 15) between the electroconductive bodies (10a, 12). The portion which determines a resistance value of an electric resistance wire means a distance between the parts where the bridge wire 15 contacts two electroconductive bodies (in this embodiment, the first electroconductive pin 10a and the metallic eyelet 12) when the electric resistance wire is the bridge wire 15, and a horizontal distance therebetween corresponds to 1.

**[0022]** Also, the distance (L) of the electric insulating body means a distance of the electric insulating body portion between the top portions of two electroconductive bodies (10a, 12), that is, it is a distance between the surfaces to which the bridge wire 15 is connected.

**[0023]** As described above, by setting the distance (L) of the electric insulating body to be not less than 0.8 times the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire, an electric characteristic of the electric type initiator is made stable to improve the reliability of the electric type initiator. In a preferable aspect, the distance (L) of the electric insulating body is set to be not less than 0.83 times, more preferably not less than 0.9 times the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire.

**[0024]** As described above, by adjusting the distance (L) of the electric insulating body and the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire, the electric type initiator having a stable electric characteristic and better reliability can be realized even when an electricity other than an activating signal, for example, a feeble electricity such as a static electricity is applied between two electroconductive bodies (10a - 12) unintentionally.

**[0025]** In other words, the end portions of the electric resistance wire such as the bridge wire 15 spanned between two electroconductive bodies (10a - 12) are generally welded to the respective electroconductive bodies (10a, 12), and thereby, a portion (that is, 1 - L) of the electric resistance wire which is not welded to the electroconductive bodies is suspended. Further, the electric resistance wire is formed of an extremely thin wire, and thereby, when a current is applied to the electric resistance wire (15), the suspended portion touches either one or the both of the electroconductive bodies (10a or 12) to change the resistance value of the electric resistance wire (15).

**[0026]** Naturally, if the electric resistance wire (15) is provided to contact the end portions of the respective electroconductive bodies nearest to each other, the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire (15) does not change when an unintentional current is applied. However, in case of providing the electric resistance wire between the respective electroconductive bodies (10a and 12) by welding, it is necessary to take into account certain errors of the welded portions. When these errors are counted, the electric resistance wire (15) can be hardly provided to contact the end portions of the respective electroconductive bodies nearest to each other.

**[0027]** In view of the above, by adjusting the distance (L) of the electric insulating body 13 and the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire (15) as the present invention, the electric type initiator having a stable electric characteristic and better reliability can be realized even when an electricity other than an activating signal, such as a static electricity is applied.

**[0028]** Incidentally, as apparent from the drawing, the longest distance (L) of the electric insulating body 13 is equal to the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire 15 (that is, one time), and the distance (L) can never be longer than this.

**[0029]** Further, in the electric type initiator 1 shown in this embodiment, a current for igniting the priming 18 to be applied between the two electroconductive bodies (in this embodiment, the first electroconductive pin 10a and the metallic eyelet 12) is preferably not more than 1.75 A, more preferably not more than 1.2 A for an application time of 2 milliseconds.

**[0030]** Also, in the electric type initiator 1 shown in Fig. 1, the problem of the present invention can be solved by

setting a charging capacity to 150 PF and setting a discharging resistance to 500 Ω in an electric circuit for conducting a test provided in MIL-STD-1512 METHOD 205 of MIL standard, and setting the resistance value between the electroconductive bodies, obtained after a voltage of 25kv is applied between two electroconductive pins more than five times, to not more than 10% of the resistance value between the electroconductive bodies prior to application of the voltage, preferably not more than 8% thereof.

**[0031]** The test provided in MIL-STD-1512 METHOD 205 of MIL standard is a method for examining a safety of an electric explosion device in a situation such that an static electricity is applied thereto, and the test is conducted in the electric circuit shown in Fig. 6 in accordance with the following procedure.

(1) 30 sets of electric explosion devices are prepared.
(2) Products to be tested are adjusted in advance by implementing required environmental tests.
(3) Environmental state is adjusted for this test and the products are left as they are for a predetermined time.
(4) 25kv is discharged to a test point from a capacitor of 500 PF through a resistor of 5 kΩ. All possible modes such as pin to case, and pin to pin are examined. Fig. 6 shows a discharging test circuit of a static electricity provided in MIL-STD-1512 METHOD 205.
(5) Test is conducted statistically in accordance with Handbook 106.

**[0032]** Then, in this invention, in the electric circuit shown in Fig. 6, which is used for conducting a test provided in MIL-STD-1512 METHOD 205 of the MIL standard, a voltage of 25kv is applied between two electroconductive pins more than five times by an electric circuit, such as shown in Fig. 5, in which a charging capacity is set to 150 PF and a discharging resistance is set to 500 Ω, and the resistance value between the electroconductive bodies after the voltage of 25kv is applied therebetween is made to be within 10% of the resistance value between the electroconductive bodies prior to application of the voltage, more preferably within 8% thereof. In Fig. 5, a charging capacitor is charged by a high voltage power source, and a voltage of 25kv is applied between electroconductive bodies such as electroconductive pins in an electric type initiator from the charged capacitor of 150 PF via the discharging resistor of 500 Ω.

**[0033]** For example, by setting the distance (L) of the electric insulating body 13 to be not less than 0.8 times the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire (15) in the above-described electric type initiator, the resistance value between the electroconductive bodies after this test can be made to be within 10% of the resistance value between the electroconductive bodies before the test.

**[0034]** Examples in which the electric type initiator 1 shown in Fig. 1 is used will follow the embodiments.

Embodiment 2

**[0035]** An electric type initiator 101 shown in Fig. 3 comprises two electroconductive bodies including a first electroconductive pin 110a and a second electroconductive pin 110b, and an insulating body in which the electroconductive bodies pass through, and it is formed without using the metallic eyelet 12 shown in Fig. 1.

**[0036]** In the electric type initiator 101 shown in this drawing, the two electroconductive pins 110a, 110b can be arranged to pass through a header member 113 made of an insulating material such as a resin, and a bridge wire 115 is used between top portions 114a, 114b of the two electroconductive pins 110a, 110b as an electric resistance wire like Fig. 1 and Fig. 2.

**[0037]** When the header member 113 holding the two electroconductive pins 110a, 110b is formed by using a resin, as the resin material, there can be used a polybutylene terephthalate (PBT) or a polyphenylene sulfide (PPS) containing a glass fiber or another inorganic filling material, a liquid crystal polymer (LCP) containing an inorganic filling material such as a mineral. When these resins are used, it is preferable that the polybutylene terephthalate (PBT) contains 20 to 80 weight% of a glass fiber, the polyphenylene sulfide (PPS) contains 20 to 80 weight% of a glass fiber, and the liquid crystal polymer (LCP) contains 20 to 80 weight% of a mineral. Particularly, in case of forming the header member by using a glass reinforced resin containing a glass fiber, it is preferable that the orientation of the glass fiber is adjusted to extend along the extending direction of the electroconductive pin inserted into the header. Also, it is further preferable that a content of the inorganic filling material in the each resin material is 30 to 50 weight%.

**[0038]** A cylindrical cup member with a top 116 is arranged on the header member 113 in the side of the bridge wire 115 to form a cavity 117 like the electric type initiator shown in Fig. 1 and Fig. 2, and a priming 118 is arranged inside the cavity 117.

**[0039]** Fig. 4 is a perspective view of a main portion showing a connection of the bridge wire 115 in the electric type initiator 101 shown in Fig. 3.

**[0040]** As shown in Fig. 4, also in the electric type initiator 101 of this aspect, the distance (L) of the electric insulating body between the top portion 114a of the first electroconductive pin 110a and the top portion 114b of the second electroconductive pin 110b is set to be not less than 0.8 times the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire (that is, the bridge wire 115) between the electroconductive bodies.

**[0041]** Accordingly, an electric type initiator having a stable electric characteristic can be realized.

Embodiment 3

**[0042]** The electric type initiator 1 shown in Embodiment 1 can be disposed in a metallic collar 19 in a substantially cylindrical shape as shown in Fig. 7, and integrated with the collar 19 by injecting a resin 20 between the initiator 1 and the collar 19, thereby forming an initiator assembly of the present invention. Alternatively, the both members can be integrated by crimping the metal collar 19, not integrating the both by injection-molding.

**[0043]** Also, the electric type initiator 101 shown in Embodiment 2 can be integrated with the metallic collar 119 in the same manner as the above, thereby forming the initiator assembly shown in Fig. 8. In the initiator assembly shown in Fig. 8, the electric type initiator 101 is fixed by crimping the receiving opening of the metallic collar 119.

**[0044]** Each of these initiator assemblies is accommodated in a housing having a gas discharging port together with a gas generating means activated upon activation of the initiator assembly to generate an operating gas for inflating an air bag, thereby forming a gas generator for an air bag. In the gas generator, there can be used a coolant/filter for cooling and purifying the operating gas, which is made of laminated wire mesh or the like as required.

Examples

**[0045]** First, the resistance value between the electroconductive bodies (10a and 12) is measured in the electric type initiator shown in Fig. 1.

**[0046]** Thereafter, a voltage of 25Kv is applied between electroconductive bodies (that is, between the first electroconductive pin 10a and the second electroconductive pin 10b) ten times by using the circuit shown in Fig. 5 in which the charging capacity is set to 150 PF and the discharging resistance is set to 500 Ω.

**[0047]** Thereafter, the resistance value between the electroconductive bodies (10a and 10b) is measured again and the amount of change in the resistance value before and after application of the voltage is calculated.

**[0048]** Table 1 shows the measurement result of the electric type initiator obtained when the distance (L) of the electric insulating body 13 is set to not more than 0.8 times the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire (15), that is, L/1 is set to 0.73, and Table 2 shows the measurement result of the electric type initiator obtained when the distance (L) of the electric insulating body is set to not less than 0.8 times the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire, that is, L/1 is set to 0.85.

Table 1

| [L/1 =0.73] | | | |
|---|---|---|---|
| | before ESD application(Ω) | after ESD application(Ω) | amount of change (%) |
| 1 | 2.02 | 1.77 | 12.4 |
| 2 | 2.04 | 1.83 | 10.3 |
| 3 | 2.05 | 1.68 | 18.0 |
| 4 | 2.05 | 1.65 | 19.5 |
| 5 | 2.05 | 1.81 | 11.7 |
| 6 | 2.00 | 1.57 | 21.5 |
| 7 | 2.04 | 1.70 | 16.7 |
| 8 | 2.03 | 1.79 | 11.8 |

Table 2

| [L/1=0.85] | | | |
|---|---|---|---|
| | before ESD application(Ω) | after ESD application(Ω) | amount of change (%) |
| 1 | 1.98 | 1.98 | 0.0 |
| 2 | 2.13 | 1.96 | 8 |
| 3 | 2.10 | 1.93 | 8 |

Table 2 (continued)

| [L/1=0.85] | | | |
|---|---|---|---|
| | before ESD application(Ω) | after ESD application(Ω) | amount of change (%) |
| 4 | 2.05 | 1.95 | 4.9 |
| 5 | 1.98 | 1.93 | 2.5 |
| 6 | 2.01 | 1.89 | 6 |
| 7 | 2.15 | 1.99 | 7.4 |
| 8 | 2.08 | 1.92 | 7.8 |
| 9 | 2 | 1.85 | 7.5 |
| 10 | 1.98 | 1.86 | 5.1 |

**[0049]** As apparent from the above Tables, by setting the distance (L) of the electric insulating body to be not less than 0.8 times the horizontal distance (1) of the portion which determines the resistance value of the electric resistance wire, the change in the resistance value of the electric resistance wire (that is, the bridge wire) before and after application of the voltage between the electroconductive bodies can be made within 10%. The change in the resistance value can be made within 8%.

## Claims

1. An electric type initiator comprising two electroconductive bodies, an insulating body provided between top portions of the electroconductive bodies, and an electric resistance wire spanned between the top portions of the electroconductive bodies which are exposed from an upper end portion of the insulating body, and the top portions of the two electroconductive bodies arranged to be flush with an upper end surface of the electric insulating body,
wherein a distance (L) of the electric insulating body between the top portions of the two electroconductive bodies is set to be not less than 0.8 times a horizontal distance (1) of a portion which determines the resistance value of the electric resistance wire between the electroconductive bodies.

2. An electric type initiator according to claim 1,
wherein a distance (L) of the electric insulating body between the top portions of the two electroconductive bodies is set to be not less than 0.83 times the horizontal distance (1) of a portion which determines the resistance value of the electric resistance wire between the electroconductive bodies.

3. An electric type initiator according to claim 1,
wherein the distance (L) of the electric insulating body between the top portions of the two electroconductive bodies is set to be not less than 0.9 times the horizontal distance (1) of a portion which determines the resistance value of the electric resistance wire between the electroconductive bodies.

4. An electric type initiator according to any one of claims 1 to 3, comprising a priming which is ignited and burnt by heat generation of the electric resistance wire,
wherein a current applied between the two electroconductive bodies, which is required for igniting the priming, is set to be not more than 1.75 A for application time of 2 milliseconds.

5. An electric type initiator according to any one of claims 1 to 3, comprising the priming which is ignited and burnt by heat generation of the electric resistance wire,
wherein a current applied between the two electroconductive bodies, which is required for igniting the priming, is set to be not more than 1.2 A for application time of 2 milliseconds.

6. An electric type initiator according to any one of claims 1 to 5, wherein the resistance value between the electroconductive bodies after a voltage of 25 kv is applied between two electroconductive pins more than five times in an electric circuit for conducting a test provided in MIL-STD-1512 METHOD 205 of MIL standard in which a charging capacity is 150 PF and a discharging resistance is 500 Ω is within 10% of the resistance value between the electroconductive bodies before application of the voltage.

7. An electric type initiator according to any one of claims 1 to 5, wherein the resistance value between the electroconductive bodies after a voltage of 25 kv is applied between two electroconductive pins more than five times in an electric circuit for conducting a test provided in MIL-STD-1512 METHOD 205 of MIL standard in which a charging capacity is 150 PF and a discharging resistance is 500 Ω is within 8% of the resistance value between the electroconductive bodies before application of the voltage.

8. An electric type initiator comprising two electroconductive bodies, an insulating body provided between top portions of the electroconductive bodies, and an electric resistance wire spanned between the top portions of the electroconductive bodies which are exposed from an upper end portion of the insulating body, and the top portions of the electroconductive bodies arranged to be flush with an upper end surface of the electric insulating body,

wherein the resistance value between the electroconductive bodies after a voltage of 25 kv is applied between two electroconductive pins more than five times in an electric circuit for conducting a test provided in MIL-STD-1512 METHOD 205 of MIL standard in which a charging capacity is 150 PF and a discharging resistance is 500 Ω is within 10% of the resistance value between the electroconductive bodies before application of the voltage.

9. An electric type initiator according to claim 8,
wherein the resistance value between the electroconductive bodies after a voltage of 25 kv is applied between two electroconductive pins more than five times in an electric circuit for conducting a test provided in MIL-STD-1512 METHOD 205 of MIL standard in which a charging capacity is 150 PF and a discharging resistance is 500 Ω is within 8% of the resistance value between the electroconductive bodies before application of the voltage.

10. An electric type initiator according to any one of claims 1 to 9, wherein the electric type initiator comprises a first electroconductive pin, a metallic eyelet having a hole through which the electroconductive pin passes and electrically connected with a second electroconductive pin, and an insulating body filled in the hole to insulate the first electroconductive pin from the eyelet,

wherein the two electroconductive bodies are the first electroconductive pin and the metallic eyelet electrically connected to the second electroconductive pin.

11. An electric type initiator according to any one of claims 1 to 10, wherein the electric type initiator comprises two electroconductive bodies comprising the first electroconductive pin and the second electroconductive pin, and an insulating body in which the electroconductive body passes through.

12. An initiator assembly comprising the electric type initiator according to any one of claims 1 to 11 and a metal collar member which partially surrounds an outer periphery of the insulating body of the electric type initiator.

13. A gas generator for an air bag comprising, in a housing having a gas discharging port, an initiator assembly including an electric type initiator, a gas generating means activated upon an activation of the initiator assembly to generate an activating gas for inflating an air bag, wherein the initiator assembly is the initiator assembly according to claim 12.

Fig. 1

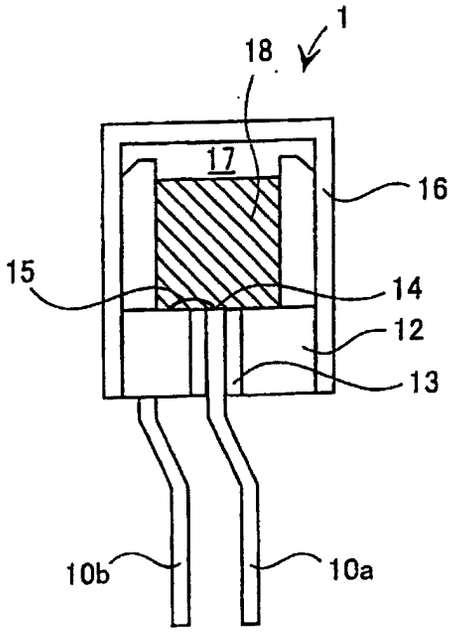



Fig. 2

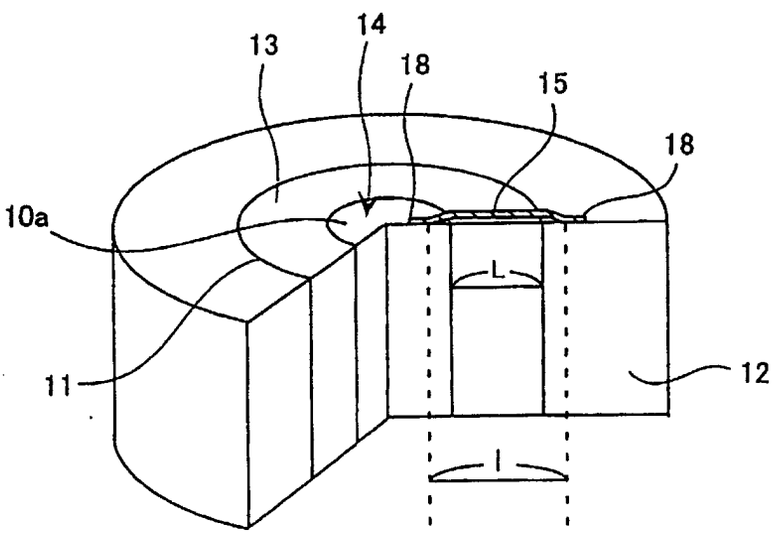


Fig. 3

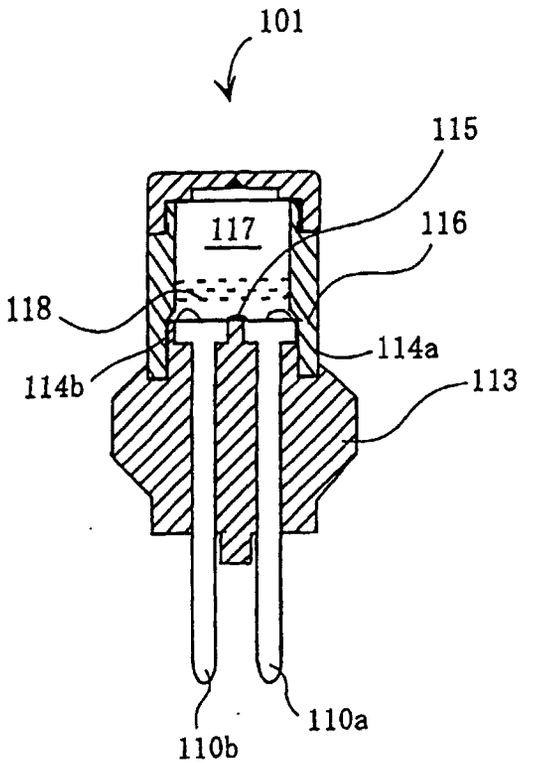

101
115
117
116
118
114a
114b
113
110a
110b

Fig. 4

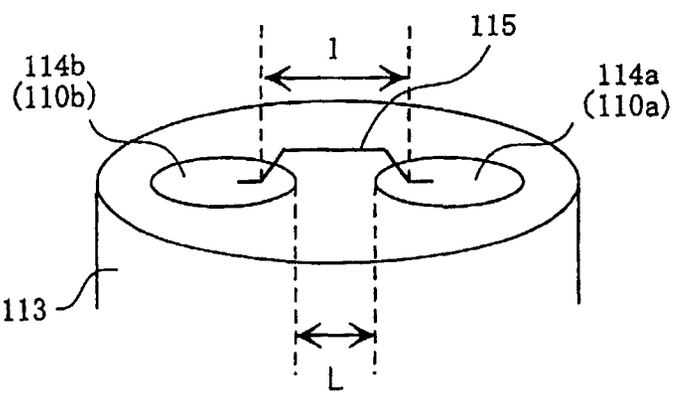

l
115
114b
(110b)
114a
(110a)
113
L

Fig. 5

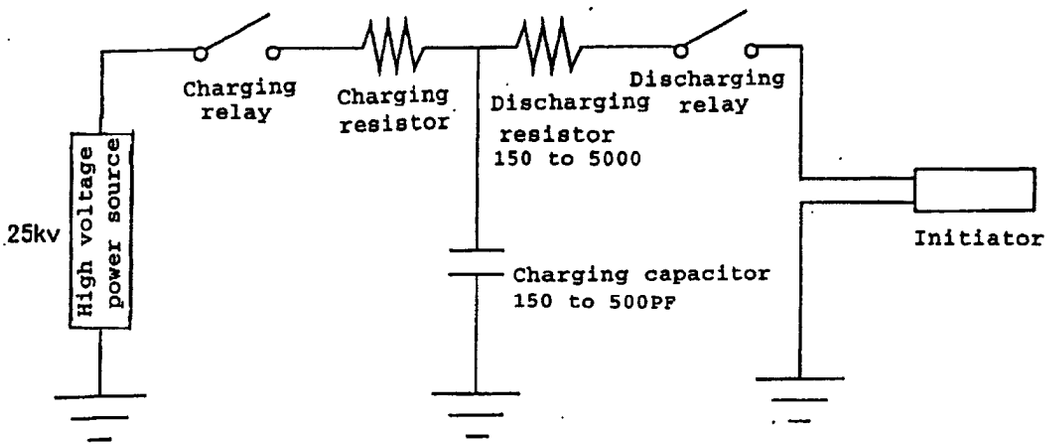

Charging relay
Charging resistor
Discharging resistor 150 to 5000
Discharging relay
25kv
High voltage power source
Charging capacitor 150 to 500PF
Initiator

Fig. 6

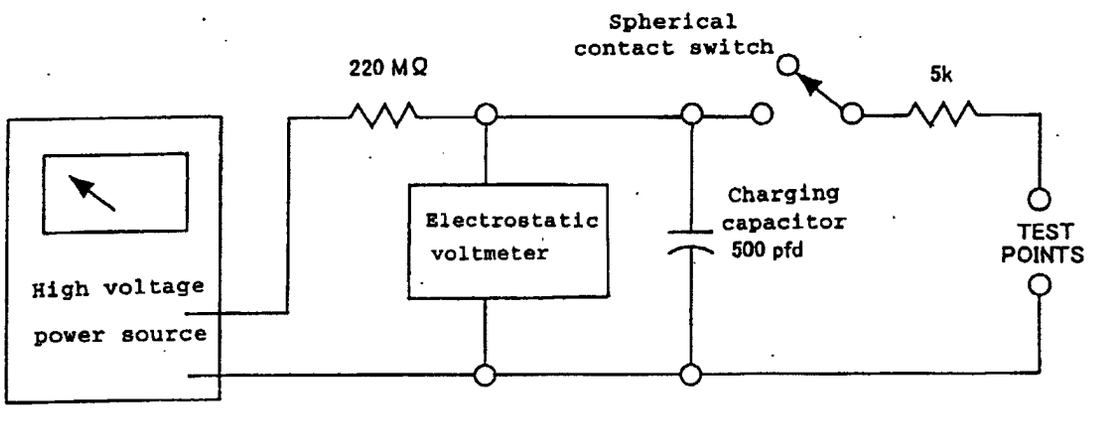

Spherical contact switch
220 MΩ
5k
Electrostatic voltmeter
Charging capacitor 500 pfd
TEST POINTS
High voltage power source

Fig. 7

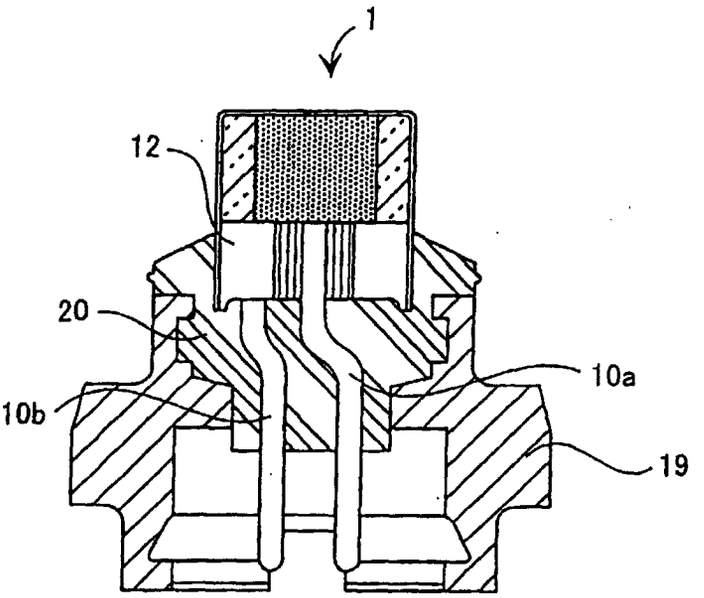
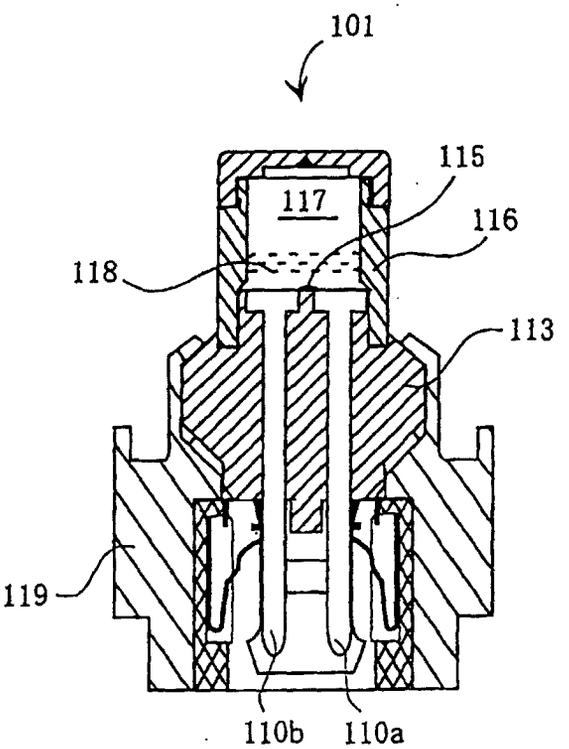



Fig. 8



# INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP01/06867

A. CLASSIFICATION OF SUBJECT MATTER
Int.Cl[7] F42B3/12, B60R21/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
Int.Cl[7] F42B3/12

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1926-1996 Toroku Jitsuyo Shinan Koho 1994-2001
Kokai Jitsuyo Shinan Koho 1971-2001 Jitsuyo Shinan Toroku Koho 1996-2001

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| Y | JP 11-194000 A (Uchihashi Estec Co., Ltd.), 21 July, 1999 (21.07.99), Full text; Figs. 1 to 10 (Family: none) | 1-13 |
| Y | JP 10-47892 A (Uchihashi Estec Co., Ltd.), 20 February, 1998 (20.02.98), Full text; Figs. 1 to 4 (Family: none) | 1-13 |
| Y | JP 3064725 U (Kokubobu Nakayama Kagaku Kenkyuin), 29 September, 1999 (29.09.99), Full text; Fig. 1 (Family: none) | 1-13 |

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:
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"E" earlier document but published on or after the international filing date
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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

| Date of the actual completion of the international search | Date of mailing of the international search report |
|---|---|
| 06 November, 2001 (06.11.01) | 20 November, 2001 (20.11.01) |
| Name and mailing address of the ISA/ Japanese Patent Office | Authorized officer |
| Facsimile No. | Telephone No. |

Form PCT/ISA/210 (second sheet) (July 1992)