(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
2 March 2006 (02.03.2006)

PCT

(10) International Publication Number
WO 2006/021491 A1

(51) International Patent Classification[7]: F42B 3/195

(21) International Application Number:
PCT/EP2005/053817

(22) International Filing Date: 3 August 2005 (03.08.2005)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
04 09173 27 August 2004 (27.08.2004) FR

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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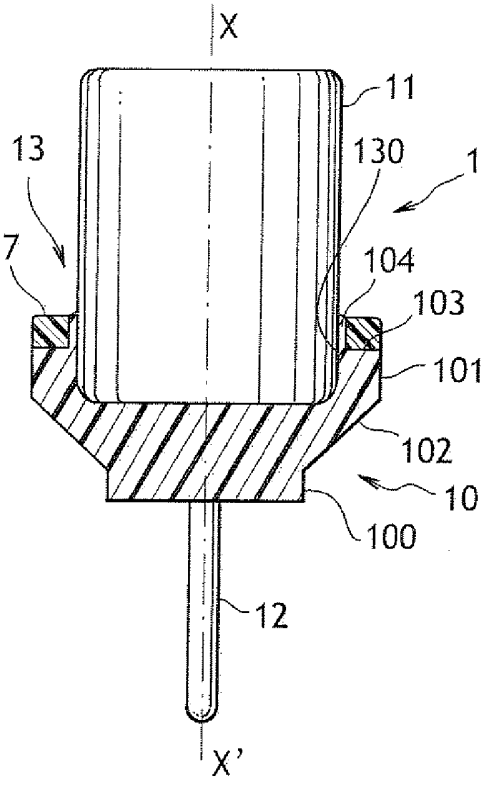
[Continued on next page]

(54) **Title:** AN INITIATOR BODY WITH A MOLDED GASKET, AN INITIATOR AND A GENERATOR PROVIDED THEREWITH, AND A METHOD OF MANUFACTURE



(57) **Abstract:** The present invention provides an electropyrotechnic initiator body which comprises a circularly-symmetrical space (10) of plastics material having electrodes (12) secured therein with bottom ends extending therefrom, while the top end is connected to a pyrotechnic initiator device, said base (10) being surrounded by a compressible peripheral gasket (7) , the body being characterized by the fact that said gasket (7) is integral with said base (10) .

WO 2006/021491 A1

HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SM, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG)

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- *of inventorship (Rule 4.17(iv)) for US only*

Published:

- *with international search report*

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AN INITIATOR BODY WITH A MOLDED GASKET, AN INITIATOR AND A GENERATOR PROVIDED THEREWITH, AND A METHOD OF MANUFACTURE

The present invention relates to an electro-pyrotechnic initiator body having a molded gasket, and also to an initiator and to a gas generator provided therewith.

The invention also relates to a method of manufacturing an initiator.

An electropyrotechnic initiator for a gas generator of the kind generally used in the field of automobile safety is shown in accompanying Figure 1.

It essentially comprises a body 10 and a fragmentable cover 11.

The body 10 is constituted by a projecting circularly-symmetrical base having electrodes 12 secured therein (only one electrode is visible in the figure) with their bottom ends extending therefrom, while their top ends are connected to a pyrotechnic initiator device (not visible).

This base is made of a plastics material, and preferably a thermoplastic material.

In the embodiment shown herein, the base comprises, going upwards: a cylindrical end portion 100 of constant radius, a flaring, first frustoconical flank 102, an intermediate portion 101 that is cylindrical and of constant radius greater than that of the portion 100, and a tapering, second frustoconical flank 103 at the top end, of conical shape inverted relative to the first.

The axis of revolution of the initiator is referenced X-X'.

In practice, the body 10 is overmolded onto the electrodes 12 and the fragmentable cover 11 containing a pyrotechnic composition, while also covering said initiator device.

Within a generator, the initiator is received in a support 4, an embodiment of which is shown in the bottom portion of Figure 1.

Naturally, the support is likewise a circularly-symmetrical part comprising a socket 4 in the form of a solid body pierced by an axial bore 40. The socket communicates via a transverse partition presenting a coaxial circular opening 60 with a thin-walled top sleeve 5. Its bore is referenced 50.

The initiator is received in the support in such a manner that its frustoconical flank 102 comes into abutment against the bottom of the bore 50, while the cylindrical portion 100 engages in the opening 60, with the electrodes 12 extending into the inside of the socket 4.

The inside diameters of the bore 50 and of the opening 60 are equal respectively to the outside diameters of the portions 101 and 100 of the base, ignoring clearance.

In order to improve sealing between the initiator 1 and the support 3, it is known to interpose a compressible gasket between them.

In the example shown here, the gasket is an O-ring 2, e.g. made of elastomer, which is engaged in the bottom of the sleeve 5, and against which the frustoconical flank 102 of the base comes to bear.

Other types of assembly are possible.

Thus, document EP-A-0 803 700 discloses an initiator in which the base presents a peripheral groove in which the gasket is engaged and which serves to hold it in position.

In all cases, the gasket constitutes a specific part, independent of the initiator and of the support, and it needs to be put into place during the assembly process.

It will readily be understood that this operation takes up time.

Furthermore, it is necessary to manage a stock of gaskets.

Finally, it constitutes a part that is small and awkward to handle, and liable to become mislaid.

A first object is to remedy those difficulties without going against the usual technique for manufacturing an initiator.

Returning again to Figure 1, it can be seen that the positioning of the initiator 1 in its support 3 is completely dependent on the suitability of the gasket 2 for deforming.

If it flattens properly, the portions 100 and 102 will bear accurately against the corresponding surfaces of the support. Consequently, the electrodes will occupy the ideal location that has been allocated to them.

If it does not flatten properly, then said portions will not bear accurately, and the electrodes will not be ideally positioned, at the risk of compromising firing of the initiator.

Another object is thus to propose an initiator body and an initiator which always engage in ideal manner in the support that is to receive them.

A first aspect of the invention thus provides an electropyrotechnic initiator body which comprises a circularly-symmetrical base of plastics material having electrodes secured therein with bottom ends extending therefrom, while their top ends are connected to a pyrotechnic initiator device, said base being surrounded by a compressible peripheral gasket.

According to the invention, said gasket is integral with said base, and is preferably molded thereon.

When the initiator body is one in which the face of the base opposite from the electrodes includes a circularly-symmetrical concentric cup for receiving a fragmentable cover containing a pyrotechnic composition and also covering said initiator device, and when a peripheral surface of the base extending parallel to its

axis of revolution is connected to the bore via an annular shoulder, then said gasket extends over said shoulder.

Thus, the gasket occupies a "high" position in the initiator body and support assembly. There is thus no influence on the relative positioning of these two parts. Furthermore, the gasket deforms in a direction that is essentially, or even exclusively, radial.

Advantageously, said shoulder extends perpendicularly to said peripheral surface.

In another embodiment, said shoulder presents a section that is frustoconical.

The present invention also provides an electro-pyrotechnic initiator fitted with a body in accordance with any of the above-specified characteristics.

The invention also provides a gas generator for a safety device mounted on a motor vehicle, such as an inflatable protective cushion or "airbag" or a safety-belt pretensioner, fitted with such an initiator.

In another aspect, the invention provides a method of manufacturing an electropyrotechnic initiator, the initiator comprising a circularly-symmetrical base of plastics material, within which there are secured electrodes having bottom ends extending therefrom, while their top ends are connected to a pyrotechnic initiator device, said base being surrounded by a compressible peripheral gasket, in which method said base is made by molding, the method being characterized by the fact that said gasket is likewise made by molding, on said base, in such a manner as to be integral therewith.

Thus, on manufacture, the gasket forms an integral portion of the initiator body. There is therefore no longer any additional part that needs to be put into place, or stock that needs to be managed, etc. In addition, the risk of losing the gasket is reduced to zero.

In particularly advantageous manner, the base and the gasket are molded simultaneously, using the dual-injection technique.

In another, likewise preferred implementation, the base and the gasket are molded at separate times, by overmolding the gasket onto the base.

Other characteristics and advantages of the present invention will appear on reading the following detailed description made with reference to the accompanying drawing, in which:

· Figure 1, described above, is a side view of a prior art initiator;

· Figure 2 is a side view of an initiator in accordance with the invention, its body being constituted essentially by a base which is shown in section;

· Figure 3 is a view analogous to Figure 2, showing the support on which the initiator is to be positioned, likewise shown in section; and

· Figure 4 is a view of the initiator and the support of Figure 3, after they have been assembled together.

As mentioned above, an aspect of the invention relates to a method of manufacturing an electro-pyrotechnic initiator, the initiator comprising a circularly-symmetrical base of plastics material having secured therein electrodes with bottom ends that extend therefrom, while their top ends are connected to a pyrotechnic initiator device, the base being surrounded by a compressible peripheral gasket, and in which said base is made by molding.

In accordance with the invention, said gasket is also molded on said base, in such a manner as to be integral therewith.

By way of example, the base is made of a thermoplastic material while the gasket is made of any material that is compressible and moldable, such as an elastomer compatible with the material of the base.

It is possible to proceed simultaneously with molding the base and the gasket using the dual-injection technique. That method consists in molding parts made out of two different materials in a single molding cycle on a two-material injection press.

However, it is also possible to mold the base and the gasket at different times, by overmolding the gasket onto the base.

Figure 2 shows an initiator in accordance with the invention, obtained in accordance with the above-described method.

Its overall appearance is similar to that of initiators known in the prior art, such as those described with reference to Figure 1.

It should be observed that numerical references identical to those used when describing said first figure are used herein to designate elements that are identical or similar.

In Figure 2, the transverse face of the initiator body facing away from the face through which electrodes 12 pass is referenced 13. It may be referred to as the "high" face.

This face includes a circularly-symmetrical concentric cup 130 for receiving a fragmentable cover 11, containing a pyrotechnic composition and covering said initiator device contained in the base.

In practice, and as mentioned above, the body 10 is overmolded over the electrodes 12 and the fragmentable cover 11.

In the embodiment shown herein, the intermediate portion 101 of larger diameter has its surface that is parallel to the axis of revolution X-X' connected to the cup 130 via an annular shoulder 103.

More precisely, this annular shoulder whose surface extends transversely, perpendicularly to the above-mentioned axis X-X', communicates firstly with the

peripheral surface of the portion 101, and secondly with a narrow low wall 104 around the cup.

It is against this shoulder, i.e. bearing on said transverse surface and against the outside faces of the wall 104 that an annular gasket 7 is molded.

The gasket is shown in Figure 2 in its rest position, i.e. in a position where it is not subjected to any stress. In this situation, its outside diameter is substantially equal to the diameter of the portion 101 of the base. The reason for this is explained in the description below.

Nevertheless, in an embodiment that is not shown, this outside diameter could be greater than the diameter of the portion 101.

It presents a section of shape that is compatible with the specific structure of the initiator socket. This section may be toroidal, oval, etc. In any event, the person skilled in the art will know how to adapt it to the context.

In another embodiment that is not shown, the shoulder 103 could extend in a direction that is not strictly perpendicular to the axis X-X'.

Thus, said shoulder could be constituted by an oblique surface generating a frustoconical section analogous to the flanks 103 described with reference to Figure 1.

The initiator of Figure 2 is shown again in Figure 3 in a position prior to being put into place in a support 3.

The support is generally similar in shape to the support shown in Figure 1, in particular with respect to its socket 4.

Nevertheless, the bore 50 of the sleeve 5 has a particular shape that constitutes the essential difference relative to said support.

A cylindrical top channel 500 is constituted that communicates towards the socket with an annular region 501 of frustoconical section.

Ignoring clearance, their respective dimensions correspond to the dimensions of the flank 102 and the portion 101 of the initiator base.

As a result, as shown in Figure 4, it is possible to put the initiator 1 into place in the support by moving it in axial translation until the flank 102 and the portion 101 of the initiator base come accurately into contact with the channel 500 and the region 501.

The initiator 1 and the socket are then finally assembled together by crimping the top end 501 of the channel 500.

This ensures that the electrodes 12 are properly positioned so that it is guaranteed they will, in fact, be electrically powered on any occasion that power is applied.

This satisfies the requirements of the AK-BNA/ISO standards.

During crimping, the gasket 7 is subjected to a small amount of radially-directed peripheral compression. The gasket thus presses properly against the corresponding surface of the bore 50, thereby guaranteeing that the assembly is sealed.

Under such conditions, any influence of the assembly process on the sealing of the device is considerably reduced.

Finally, for visual purposes, in particular to avoid wrong connection, the molded gasket may be of a color that contrasts with that of the initiator.

CLAIMS

1. An electropyrotechnic initiator body which comprises a circularly-symmetrical base (10) of plastics material having electrodes (12) secured therein with bottom ends extending therefrom, while their top ends are connected to a pyrotechnic initiator device, said base (10) being surrounded by a compressible peripheral gasket (7), the body being characterized by the fact that said gasket (7) is integral with said base (10).

2. An initiator body according to claim 1, characterized by the fact that said gasket (7) is molded on said base (10).

3. An initiator body according to claim 1 or claim 2, in which the face (13) of the base (10) facing away from the electrodes (12) includes a circularly-symmetrical concentric cup (130) for receiving a fragmentable cover containing a pyrotechnic composition and covering said initiator device, a peripheral surface (101) of the base (10) parallel to its axis of revolution (X-X') being connected to the cup (130) via an annular shoulder (103), the body being characterized by the fact that said gasket (7) extends over said shoulder (103).

4. An initiator body according to claim 3, characterized by the fact that said shoulder (103) extends perpendicularly to said peripheral surface (101).

5. An initiator body according to claim 3, characterized by the fact that said shoulder (103) presents a section that is frustoconical.

6. An electropyrotechnic initiator fitted with a body in accordance with any one of claims 1 to 5.

7. A gas generator for a safety device mounted in a motor vehicle, such as an airbag or a safety belt pretensioner, and fitted with an initiator according to claim 6.

8. A method of manufacturing an electropyrotechnic initiator (1), the initiator comprising a circularly-symmetrical base (10) of plastics material, within which there are secured electrodes (12) having bottom ends extending therefrom, while their top ends are connected to a pyrotechnic initiator device, said base being surrounded by a compressible peripheral gasket (7), in which method said base (10) is made by molding, the method being characterized by the fact that said gasket (7) is likewise made by molding, on said base (10), in such a manner as to be integral therewith.

9. A method according to claim 8, characterized by the fact that the base (10) and the gasket (7) are molded simultaneously using the dual-injection technique.

10. A method according to claim 8, characterized by the fact that the base (10) and the gasket (7) are molded at different times, by overmolding the gasket onto the base (10).

FIG.1

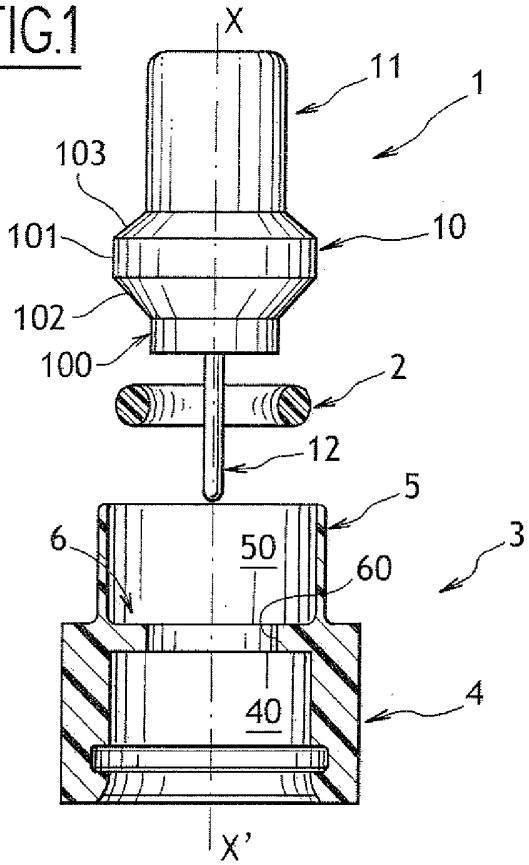


FIG.2

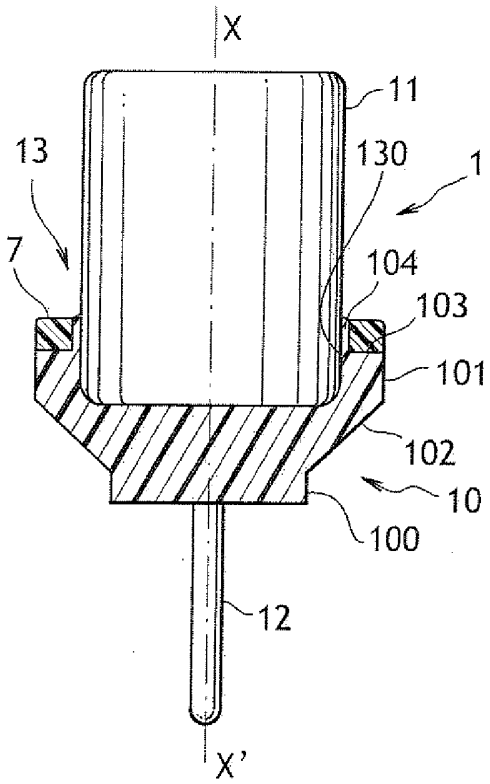


FIG.3

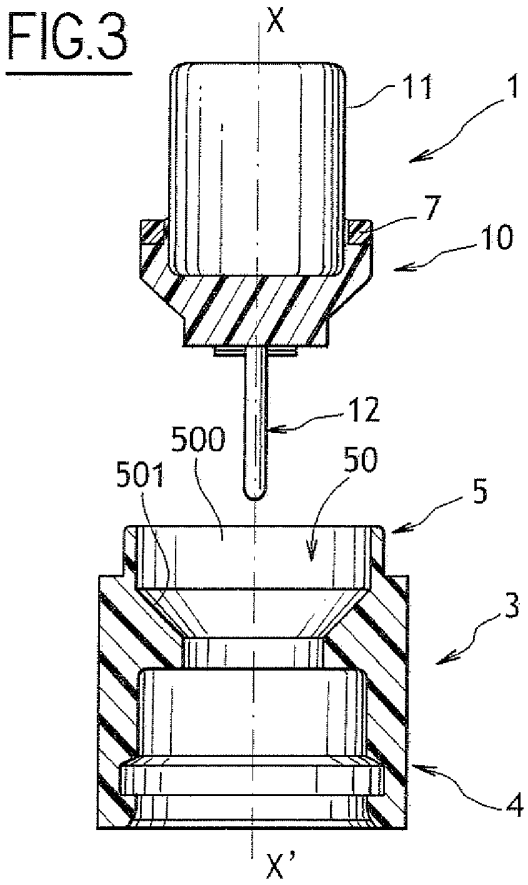
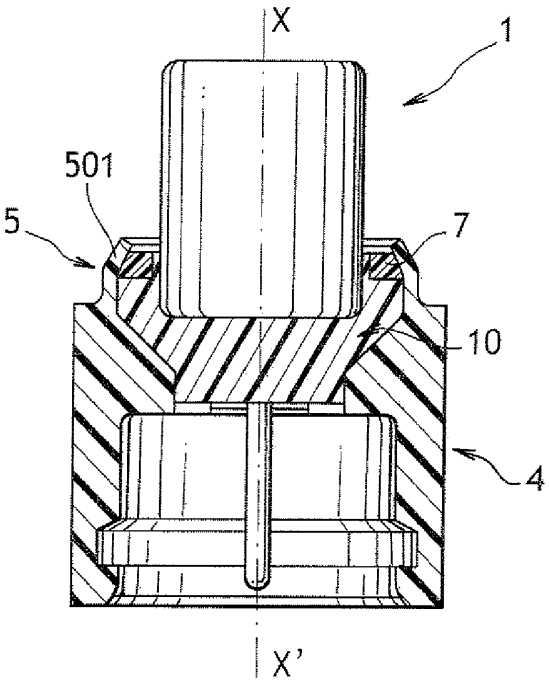


FIG.4



INTERNATIONAL SEARCH REPORT

International Application No
PCT/EP2005/053817

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 F42B3/195

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)
IPC 7 F42B B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 252 923 A (NIPPON KAYAKU KABUSHIKI KAISHA) 30 October 2002 (2002-10-30) column 8, lines 6-19; figures 1-6 column 9, lines 39-50	1,8

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
11 October 2005	24/10/2005

Name and mailing address of the ISA	Authorized officer
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/EP2005/053817

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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