(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 3 000 964 A1**

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
30.03.2016 Bulletin 2016/13

(51) Int Cl.:
E21F 11/00 *(2006.01)* ***A62C 3/02*** *(2006.01)*
E21F 1/14 *(2006.01)* ***E21F 17/107*** *(2006.01)*

(21) Application number: **14186718.4**

(22) Date of filing: **27.09.2014**

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(71) Applicant: **INCD INSEMEX Petrosani**
332047 Petrosani (RO)

(72) Inventors:
- **Ghicioi, Emilian**
  332046 Petrosani (RO)
- **Gaman, George**
  332079 Petrosani (RO)
- **Cioclea, Doru**
  332030 Petrosani (RO)
- **Burian, Constantin**
  332040 Petrosani (RO)
- **Lupu, Constantin**
  332041 Petrosani (RO)
- **Paraian, Mihaela**
  332025 Petrosani (RO)
- **Prodan, Maria**
  332008 Petrosani (RO)
- **Ionescu, Jeana**
  332041 Petrosani (RO)
- **Toth, Ion**
  332026 Petrosani (RO)

(54) Ultrafast mining gallery insulation device

(57) The present invention refers to an ultrafast insulation device for mining galleries, operating automatically, for delimiting and securing fresh air circuits from areas contaminated by burned gases, toxic and/or explosive gases, produced as a result underground events such as explosions fires.

The ultrafast gallery insulation device is automatically triggered by an explosion overpressure sensor (6) or by an infrared radiation sensor (5), activating the pyrotechnic gas generator (4) which expels the shutter from the storage block (1) with subsequent inflation against the walls of the gallery. The shutter's central membrane (8) is provided with zipper (9) allowing the passage of workers.

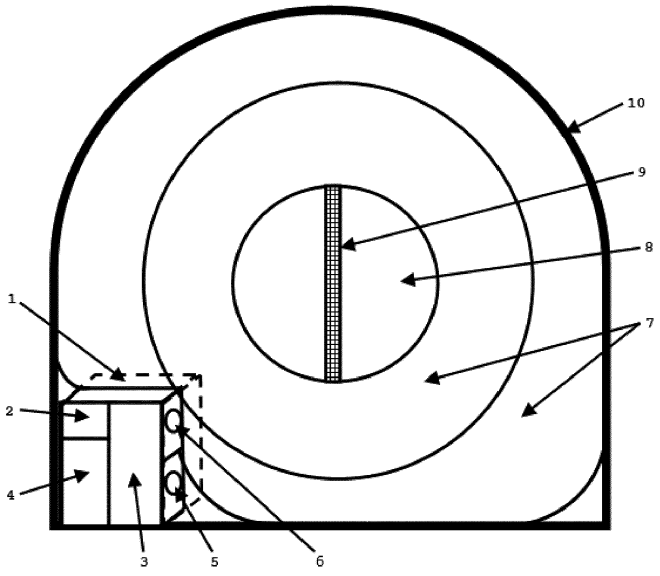

FIG. 1

EP 3 000 964 A1

Description

[0001] The present invention relates to an ultrafast insulation system for mining galleries, operating automatically, for delimiting and securing fresh-air circuits from areas contaminated by burned gases, toxic and/or explosive gases, produced as a result of underground events such as explosions fires.

[0002] Currently, there is known a solution for fast sealing underground mining works, for which there was filed a patent request at the State Office for Inventions and Trademarks - Romania no. A/00197 dated 05.03.2013, which involves the disposal and inflation of inflatable modules by human operators - mine rescuers, by performing a succession of laborious operations, lasting several tens of minutes, in order to prepare the locations for placing the modules in the gallery, using compressed air/nitrogen bottles or flexible hose assemblies connected to the compressed air network of the mine for inflating the cells of the system's modules.

[0003] The problem solved by the present invention consists in: ultrafast insulation of mining galleries by means of a device operating automatically, which enables in a very short period of time, several seconds, the delimiting and securing of fresh-air circuits, restricting the areas contaminated by burned gases, toxic and/or explosive gases, produced as a result of underground events such as explosions fires.

[0004] The ultrafast gallery insulation device, in accordance with the present invention, consists in a compact assembly of functional units, containing the autonomous power unit, infrared and pressure sensors, gas-pyrotechnical charge generator, combination valve (unidirectional and for overpressure), folding inflatable thorons with central membrane, fitted with zipper for passage.

[0005] In accordance with the invention, the ultrafast gallery insulation device has the following technical, functional and safety advantages:

It is a compact assembly of reduced sizes, which contains all required elements for fulfilling the operational role of insulating a gallery

The device transportation is performed in complete work safety, being placed in the gallery, in the intended location, before the occurrence of an event such as explosion or fire;

It is operating automatically, no longer requiring the presence of the human operator - mine rescuer, thus increasing work safety, the device triggering being achieved either by the notification of explosion overpressure or by the notification of infrared radiation of an underground fire;

Insulating the gallery using this device is carried out ultrafast, the gas-pyrotechnical charge generator determines the inflation of the folding thorons with membrane in a few seconds and their moulding on the gallery's profile, maintaining and adjusting the pressure in the thorons being achieved automatically through the combination valve (unidirectional and for overpressure); The device presents required safety characteristics for protection to explosion, being used fireproof and antistatic materials for the thorons and membrane, and the electrical elements (power supply, pressure sensor, infrared sensor) being protected to explosion by Ex s type of protection (a combination of the types of protection: encapsulation, flameproof enclosure, intrinsic safety, increased safety);

It enables the passage of workers (miners/rescuers) through the zipper;

The activated device which insulated a gallery is delimiting and ensuring fresh-air circuits from functional galleries, hindering the entering of burned gases, toxic and/or explosive gases, generated by underground events such as explosions or fires;

[0006] An example of achieving the device is given further, in accordance with the present invention, referring to Fig. 1 which is the block diagram of the ultrafast gallery insulation device.

[0007] The ultrafast gallery insulation device, in accordance with the present invention and referring to Fig. 1, is achieved as follows: folding shutter storage block 1, combination valve block (unidirectional and for overpressure) 2, power supply source block 3, gas-pyrotechnical charge generator with controlled electrical device for initiation 4, sensor for detecting explosion pressure 5, sensor for detecting infrared radiation of a fire 6, inflatable shutter (made of two deformable thorons) 7, provided with central membrane 8, with zipper for staff passage 9, shutter which moulds on the gallery's profile 10.

[0008] The operation of the device and the organic connections between the component elements, in accordance with the present invention, are the following: after the placement in the gallery 10 in the intended location (operation which is performed during normal operation of the mine, before the occurrence of any event such as explosion or fire), at the occurrence of an explosion overpressure or a fire, the pressure sensor 5 or the infrared radiation sensor 6 by means of the power supply source 3 trigger the operation of the electrical device for initiating the pyrotechnical charge 4 of the gas generator, which, through the combination valve 2, determines the inflation and exit from the storage block 1 of the shutter 7, which expands and moulds on the profile of the gallery (pressure inside the shutter is automatically adjusted through the combination valve), thus achieving ultrafast insulation, the passage of staff being able to be performed through the central membrane 8, provided with zipper 9.

Claims

1. Ultrafast mining galleries insulation device, **characterised by** the fact that, after placing it in the gallery

(10) in the intended location, at the occurrence of an explosion overpressure or of a fire, the pressure sensor (5) or an infrared radiation sensor (6) through the power supply source (3) trigger the operation of the electrical device for initiating the pyrotechnical charge (4) of the gas generator, which, through the combination valve (2), determines the inflation and exit from the storage block (1) of the shutter (7), which expands and moulds on the profile of the gallery, thus achieving ultrafast insulation, the passage of staff being able to be performed through the central membrane (8), provided with zipper (9).

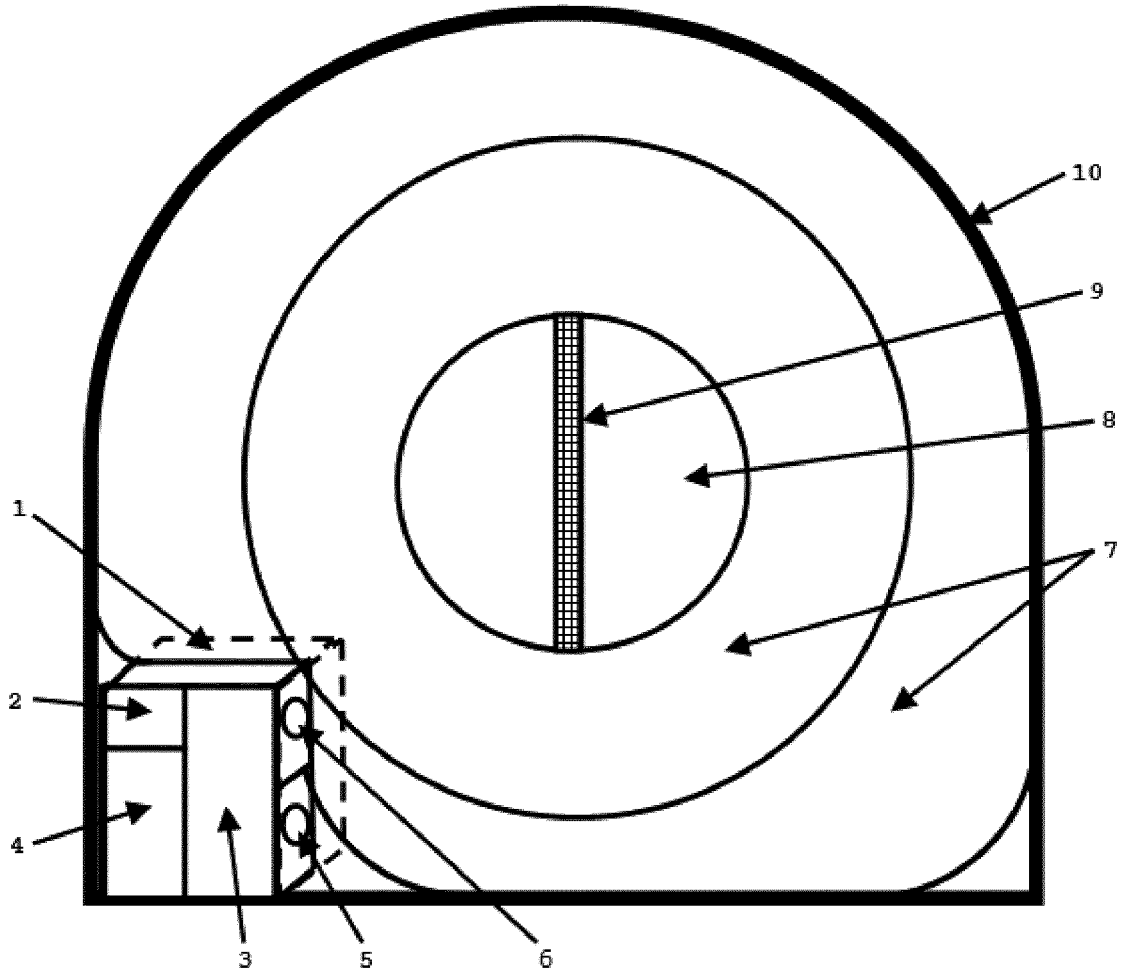

FIG. 1

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 14 18 6718

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
Y	US 4 023 372 A (PRESLER ET AL.) 17 May 1977 (1977-05-17) * the whole document *	1	INV. E21F11/00 A62C3/02 E21F1/14
Y	US 2007/218825 A1 (HOWERY) 20 September 2007 (2007-09-20) * the whole document *	1	E21F17/107
Y	DE 102 36 726 A1 (BECKER ET AL.) 19 February 2004 (2004-02-19) * the whole document *	1	
Y	DE 698 02 684 T2 (S.E.I.B.) 22 August 2002 (2002-08-22) * the whole document *	1	
Y	DE 197 18 271 A1 (DIEHL GMBH) 22 January 1998 (1998-01-22) * the whole document *	1	
Y	CH 706 242 A1 (VOSER) 13 September 2013 (2013-09-13) * the whole document *	1	TECHNICAL FIELDS SEARCHED (IPC) E21F
Y	WO 91/10803 A1 (HILL) 25 July 1991 (1991-07-25) * the whole document *	1	
E,D	RO 129 843 A2 (PETROSANI) 30 October 2014 (2014-10-30) * the whole document *	1	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	27 February 2015	Rampelmann, Klaus

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 14 18 6718

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

27-02-2015

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4023372 A	17-05-1977	NONE	
US 2007218825 A1	20-09-2007	US 2007218825 A1	20-09-2007
		US 2015011147 A1	08-01-2015
DE 10236726 A1	19-02-2004	AU 2003227621 A1	11-03-2004
		DE 10236726 A1	19-02-2004
		WO 2004018802 A1	04-03-2004
DE 69802684 T2	22-08-2002	AT 209765 T	15-12-2001
		AU 8114098 A	30-12-1998
		CA 2294827 A1	17-12-1998
		DE 69802684 D1	10-01-2002
		DE 69802684 T2	22-08-2002
		DK 0988489 T3	25-03-2002
		EP 0988489 A1	29-03-2000
		ES 2168770 T3	16-06-2002
		FR 2764672 A1	18-12-1998
		JP 2002506412 A	26-02-2002
		NO 996096 A	01-02-2000
		PT 988489 E	31-05-2002
		WO 9857093 A1	17-12-1998
DE 19718271 A1	22-01-1998	NONE	
CH 706242 A1	13-09-2013	NONE	
WO 9110803 A1	25-07-1991	AU 7055491 A	05-08-1991
		WO 9110803 A1	25-07-1991
RO 129843 A2	30-10-2014	NONE	

EPO FORM P0459

For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- RO A00197 **[0002]**