



STAND FOR DETERMINING PRESSURE VARIATIONS WHEN CHANGING THE PROPAGATION DIRECTION OF GASEOUS EXPLOSIONS IN INTERCONNECTED SPACES

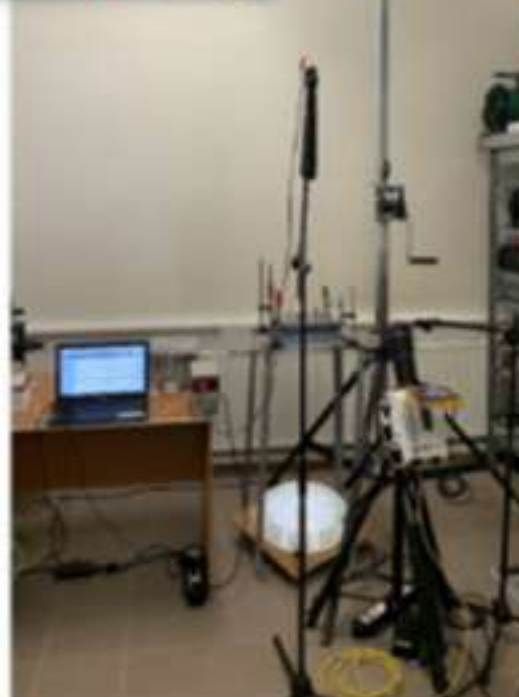
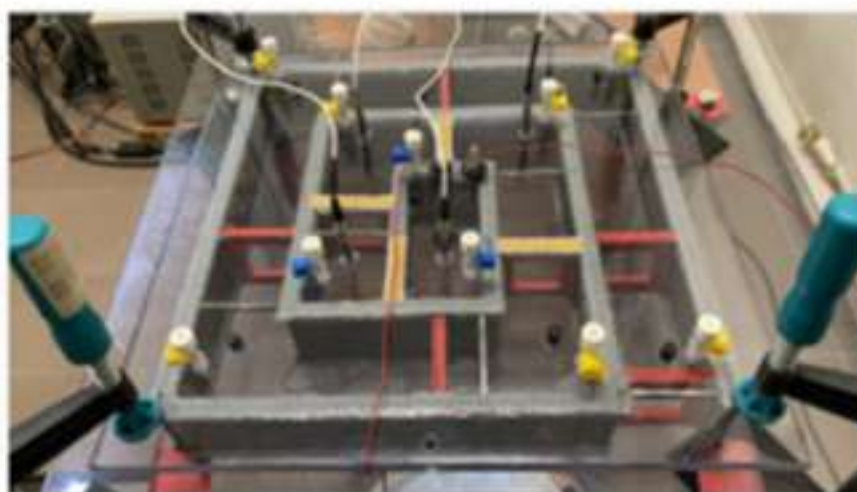
Patent/project number: CBI A 2022 00705

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The invention allows for the complex analysis of gas explosion-type phenomena on geometries with interconnected and volumetrically individualized spaces through different configurations of arrangement of obstacles with membraned openings, the analysis of pressure variations when changing the propagation direction of gas explosions and the research of chain explosions of atmospheres containing the same combustible gas or different combustible gases, at different concentrations, contributing to the understanding of the mechanisms and elucidation of the causes generating such events. At the same time, the results of physical experiments carried out on this type of stand, through the sets of values and video materials obtained, serve to calibrate computer simulations regarding the explosion of air-combustible gas mixtures.

The advantages of the system, according to the invention, are the following:

- allows the configuration of the volumes of the rectangular spiral by the number and location of the obstacles with membrane openings;
- allows the use of membrane obstacles with openings of different shapes (circular, square, rectangular, elliptical, etc.) and with membranes of different thicknesses;
- through Schlieren techniques, ensures the continuous monitoring and recording of the rapid combustion process, from the appearance of the efficient source of initiation of the explosive atmosphere, the evolution of the explosion process by consuming the fuel/oxidizer, to the withdrawal movement of the expanded gases, following their cooling;
- ensures a higher degree of precision in measuring local/global velocities and accelerations;
- ensures the recording of the pressure values in each interconnected space;
- allows the analysis of pressure variations when changing the propagation direction of the gas explosions and when penetrating obstacles with different resistance;
- allows the analysis of chain gas explosions;
- allows the use of several types of combustible gases/combustible vapors within the same physical experiment;
- allows the testing of explosion suppression curtains (using nitrogen, water, etc.);
- allows the location of the initiation source to be changed.



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SMALL-SCALE EXPERIMENTAL STAND FOR RESEARCHING EXPLOSIONS OF FLAMMABLE GAS-IN-AIR MIXTURES

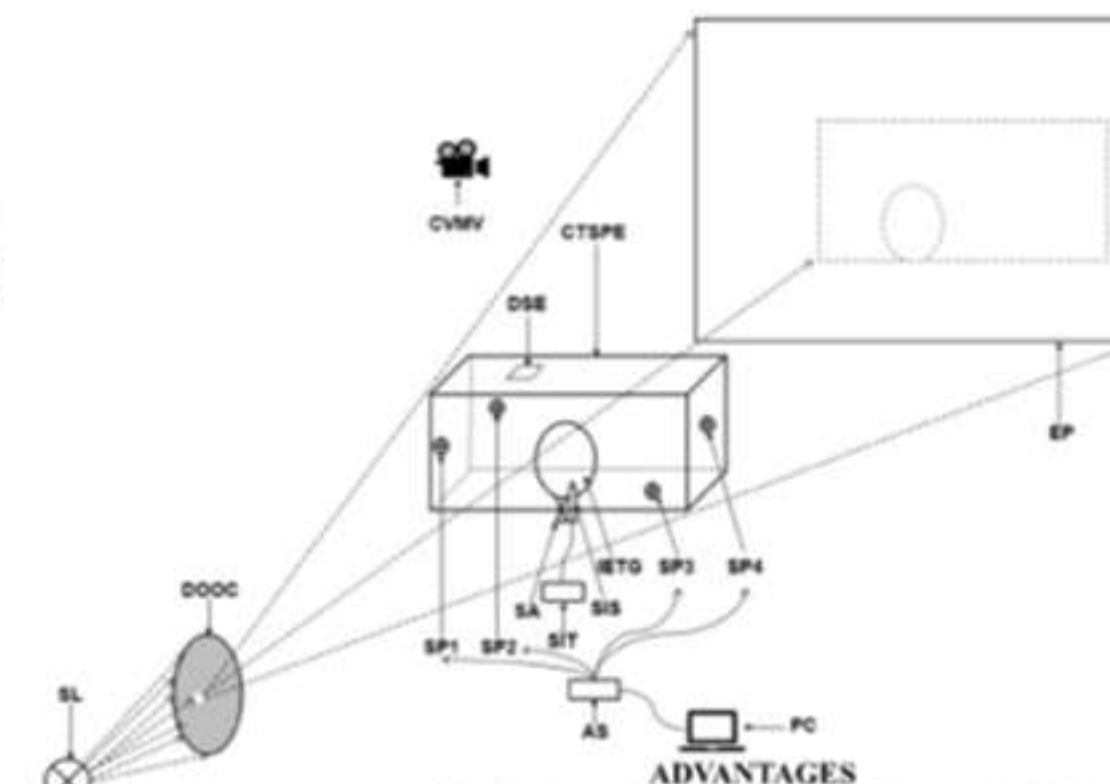
Patent/project number: CBI A 2022 00731

Author/s: Păsculescu Vlad Mihai, Ghicioi Emilian, Găman George Artur, Pupăzan Gheorghe Daniel, Vlasin Nicolae Ioan, Șuvar Marius Cornel, Prodan Maria, Șuvar Niculina Sonia, Florea Gheorghe Daniel, Tuhuț Ligia Ioana, Simon – Marinică Adrian Bogdan, Vass Zoltan

The invention refers to a small-scale experimental stand for researching explosions of flammable gas-in-air mixtures, consisting of a transparent, inflatable explosion chamber equipped with an intake valve for volumes of flammable gas-in-air mixtures at pre-established concentrations within the explosive range of the substance. It includes a spark ignition system, with the chamber enclosed inside a transparent case for studying explosion pressures and their propagation using shadowgraph techniques with a light source. An obturator disc with a central orifice allows the divergent conical light beam to pass through the transparent chamber for study, and the resulting projection is captured on a projection screen. The system is equipped with a recording system for the generated explosion pressure values.

The problem that the invention solves consists of using shadowgraph visualization techniques for laboratory research of flammable gas-in-air mixture explosions, with the purpose of analyzing the shock wave and the flame front of the explosion, from the point of initiation in the inflatable transparent explosion chamber, the propagation in the transparent chamber for studying explosion pressures and their propagation, and up to the release into the atmosphere.

The recording of the pressures developed by the explosion provides data that are useful for understanding explosion phenomena in flammable gas-in-air mixtures, contributing to the elucidation of the causes that generate such events and to the development of measures to prevent the occurrence of similar gas explosion phenomena



- ADVANTAGES**
- Uses shadowgraph techniques for visualization and analysis of explosions.
 - The transparent, inflatable, and consumable chamber allows easy replacement after each test.
 - Accommodates flammable gas-in-air mixture volumes between 0.25 and 0.75 liters at preset concentrations.
 - The transparent chamber features a pressure relief valve for safety and repeatability.
 - The top part of the chamber is detachable for quick adjustments.
 - Pressures are monitored by 4 sensors, connected to a computer through a charge amplifier.

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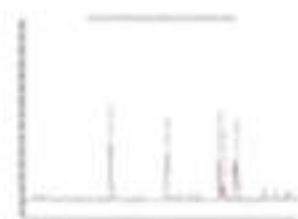
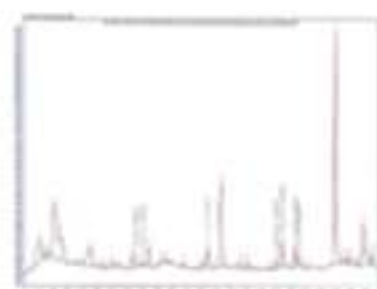
FIELD METHOD FOR ASSESSING THE IMPACT OF VOLATILE ORGANIC COMPOUNDS ON HUMAN HEALTH

Patent/project number: CBI A 2022 00606

Author/s: Găman Angelica Nicoleta, Găman George Artur, Ghiciei Emilian, Pupăzan Daniel, Toth Lorand, Prodan Maria, Kovacs Marius, Simion Sorin, Simion Alexandru, Șirvar Niculina Sonia

The mobile real-time measurement system of volatile organic compounds (BTEX) consists of applying a method to determine the concentration of benzene and organic compounds (BTEX) in the surrounding environment (emissions) using high-performance gas chromatography with FID detector in ambient air from areas classified as rural and urban zones, traffic locations, and locations influenced by industrial sources, through a mobile unit that allows continuous measurements during movement.

Understanding the concentrations of volatile organic compounds in a triaxial system of coordinates (concentrations / space / time) makes it possible to characterize / quantify the impact generated by BTEX pollutants on human health by measuring the pollution level, managing / processing data, and integrating them into an active mapping system using GIS computational environment.



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MOBILE TRAINING GROUND FOR THE PRACTICAL TRAINING OF INTERVENTION AND RESCUE PERSONNEL IN TOXIC / EXPLOSIVE / FLAMMABLE ENVIRONMENTS

Patent/project number: CBI A 2022 00640

Author/s: Nicolescu Cristian, Găman George Artur, Ghiciei Emilian, Pupăzan Daniel, Găman Angelica Nicoleta, Ilie Cosmin, Irimia Alin, Gireadă Andrei, Toth Lorand, Kovacs Marius

In order to carry out the activity of intervention and rescue personnel in toxic / explosive / flammable environments in conditions of safety and health at work, and for the efficiency of the actions taken, a good physical training of the rescuers is necessary, which can be achieved by using a modern training infrastructure (mobile polygon) that can be made available to any economic agent regardless of the place and nature of the activity they carry out.

The mobile training polygon of rescuers allows the realization of a training route of rescuers in closed spaces with different degrees of difficulty, high temperature, low visibility, high humidity, as well as the training of rescuers in the fitness equipment area with the monitoring of the physiological parameters of the rescuers. All these factors lead to the selection of rescuers in order to form rescue teams that can intervene in the event of fires / explosions / releases of toxic gases, etc.

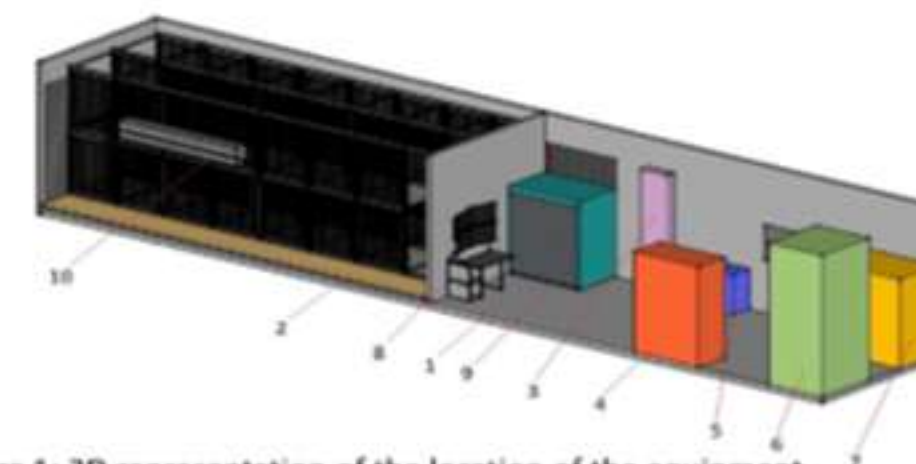


Figure 1: 3D representation of the location of the equipment in the mobile training ground

- 1- fitness equipment area with the monitoring of the rescuers' physiological parameters
- 2- the area of narrow spaces that make up a labyrinth that the rescuers go through
- 3- the scale of infinity
- 4- ergometer type bicycle
- 5- treadmill
- 6- impact device
- 7- stepper
- 8- computer control system with the necessary applications for training
- 9- cabinet for breathing protective devices
- 10- high temperature zone



Figure 2: Screenshot of monitored parameters



Figure 3: Control interface for activities in the narrow spaces area

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METHOD FOR QUANTITATIVE DETERMINATION OF AIR FLOW LOSSES THROUGH GOAFS

Patent/project number: BI 128646/29.04.2021

Author/s: Cioclea Doru, Constantin Lupu, Toth Ion, Ion Gherghe, Cristian Tomescu, Emeric Chiuzan

The method of quantitative determination of the flow of air lost through the goaf by using a diaphragm, is based on the use of a diaphragm for the quantitative determination of the flow of air through the goaf, by directly measuring the speed of the air current coming from a closed mining work with isolation dyke, and is discharged on one or more mining works.

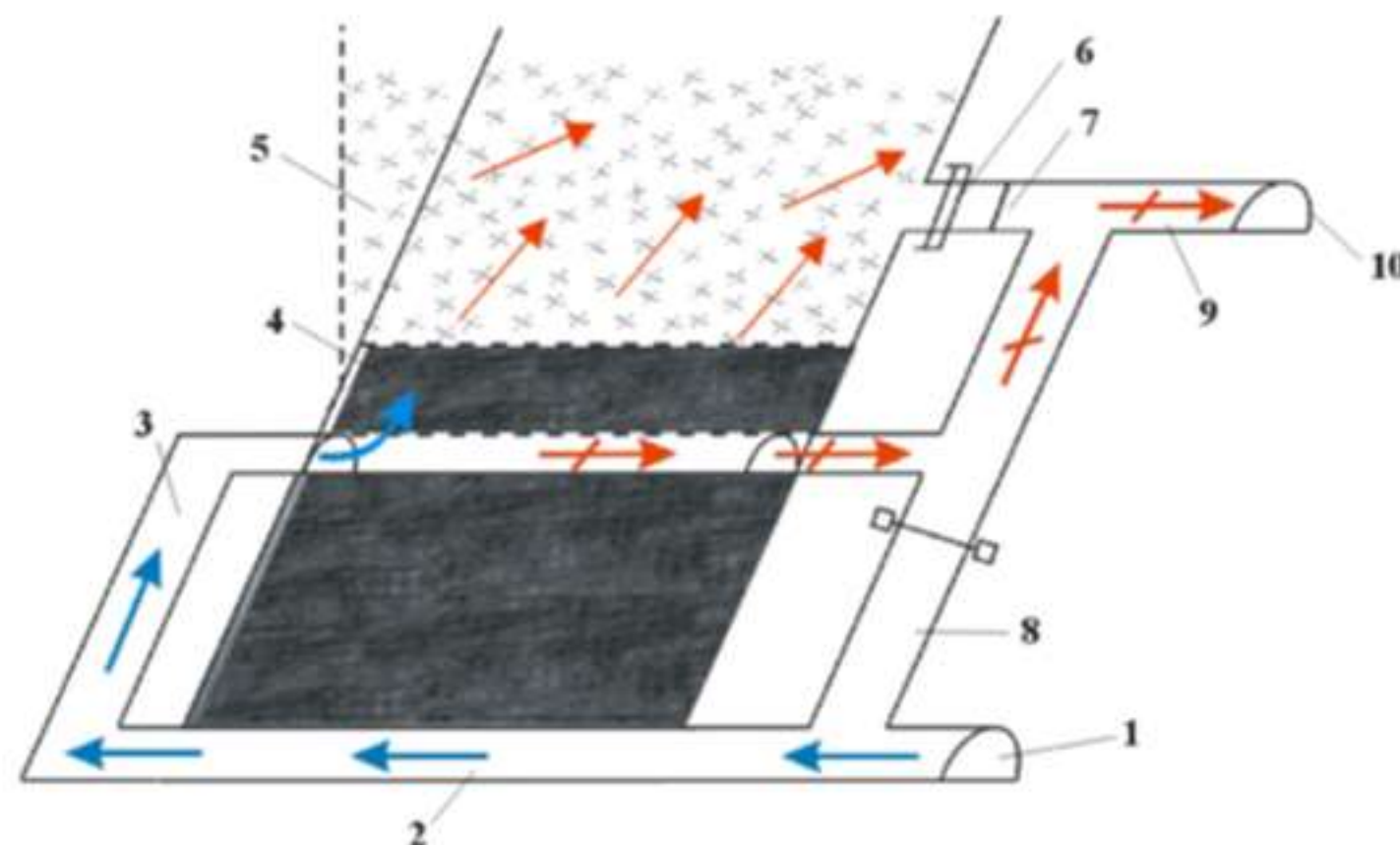
With the help of the speed of air circulation through the opening made in the diaphragm, the air flow rate lost through the goaf and entering the defective air stream penetrating the insulation construction is directly calculated.

The method of quantitative determination of the air flow lost through the goaf proposed by the invention lends itself to any underground mining of useful mineral substances.

The technical problem that the invention solves consists in the quantitative determination of air losses through the goaf.

The method of determining air losses by using a diaphragm offers the opportunity to determine directly, in real time, the air flows lost through the goaf.

By applying the method of quantitative determination of the air flow lost through the exploited space, the possibility of choosing and sizing the measures to prevent and combat spontaneous combustion phenomena is ensured.



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DYNAMICS DETERMINING OF EXPLOSIVE ATMOSPHERES FORMATION METHOD

Patent/project number: CBI A 2022 00534

Author/s: Cioclea Doru, Găman George Artur, Ghicioi Emilian, Gherghe Ion, Ianc Nicolae, Rădoi Gheorghe Florin, Boantă Corneliu Dănuț, Chiuzan Emeric, Tomescu Cristian, Matei Adrian, Drăgoescu Răzvan, Cămărășescu Alexandru, Vlasin Nicolae, Șimon Marinică Adrian Bogdan

The method is based on the analysis of the dispersion dynamics in the accumulation phase, as well as the reaction capacity of the ventilation system in the dilution and evacuation phase, by choosing the closed enclosure, determining the volume of the closed enclosure, placing the methane introduction and control system, connects the system for continuous determination of gas concentrations, the gradient of dispersion and progressive dilution of the gas at the level of the closed enclosure is determined, which determines the dynamics of the formation of the explosive atmosphere. The method for determining the dynamics of the formation of explosive atmospheres can be applied to any closed, semi-closed or open industrial premises where there is a risk of explosive atmospheres. The method can be used for any combustible gas with explosive properties and for any enclosure. The method of determining the dynamics of the method of forming explosive atmospheres was tested with good results in the closed premises of the experimental laboratory, regarding the study of industrial ventilation systems.

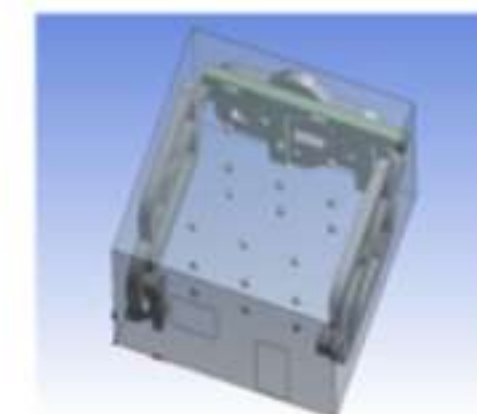


Fig. no. 1. Establishment of closed premises

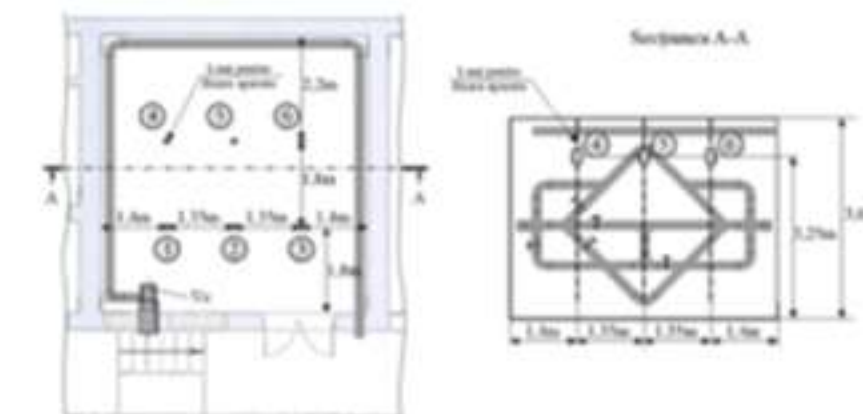


Fig. no. 2. Establishing measurement points at the level of the closed enclosure

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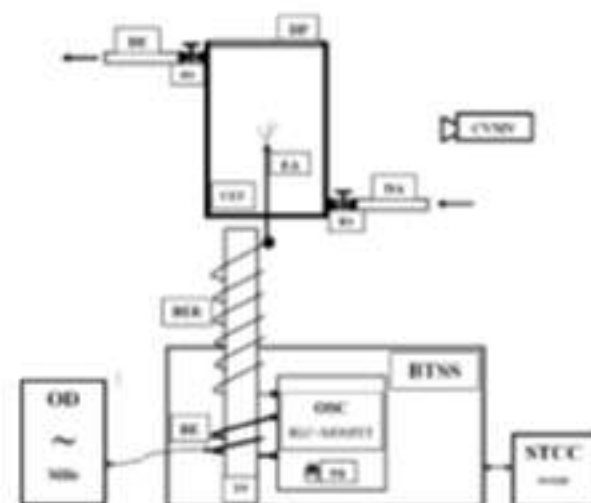
Salonul Internațional al Cercetării Științifice, Inovării și Inventicii –
PRO INVENT 15 – 17 Octombrie 2025

STAND FOR STUDYING THE IGNITION OF EXPLOSIVE GASEOUS MIXTURES BY THE CORONA EFFECT

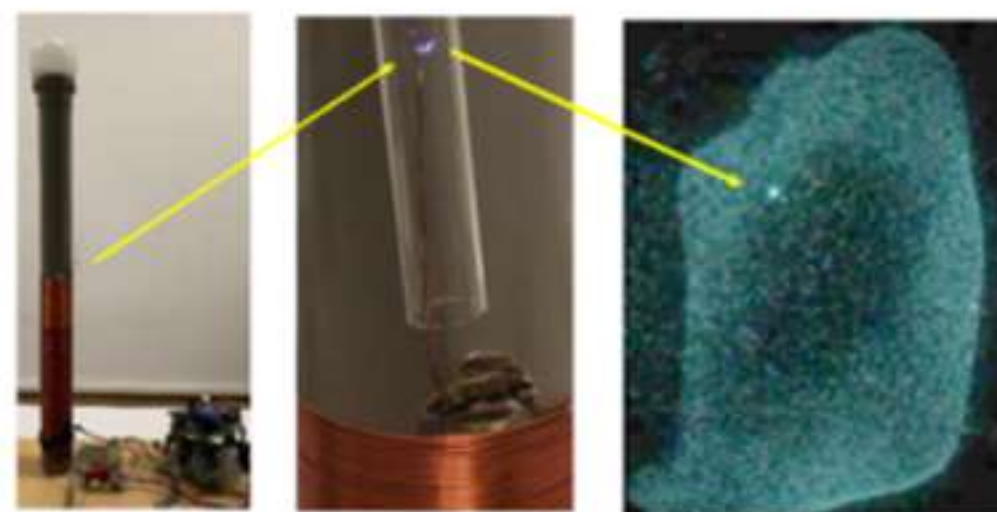
Patent/project number: CBI A 2022 00706

Author/s: Emilian Ghicioi, Irina Nalboc, Artur George Gaman, Daniel Pupăzan, Maria Prodan, Nicolae Vlasin, Doru Cioclea, Sorin Burian, Robert Laszlo, Cristian Nicolescu, Daniel Florea, Adrian Jurca, Adrian Simon-Marinica, Dan Gabor, Vlad Pasculescu, Sonia Suvar, Andrei Szollosi, Florin Manea, Ligia Tuhut, Cosmin Colda, Marius Survar, Emeric Chiușan, Zoltan Vass

This invention presents a stand for investigating the ignition of explosive gas mixtures using the corona effect. It features a transparent explosion chamber with a single sharp electrode, connected to a solid-state Tesla coil, for generating the corona effect. Equipped with gas inlet/outlet nozzles, a pressure relief membrane, and a high-speed camera, the stand captures critical data such as ION channel formation, ignition induction time, and flame front propagation. The results are vital for assessing explosion risks in industries handling flammable gases.



The stand for studying the ignition of explosive gas mixtures by the corona effect is characterized by consisting of a transparent explosion chamber, into which a single sharp electrode is introduced. This electrode generates the ION channel, the corona effect and is connected to the free end of the resonant-excited coil, of the solid-state Tesla coil assembly. The transparent explosion chamber is also equipped with an intake nozzle with a separation valve for introducing the pre-mixed flammable gas at concentrations within the explosive range, an exhaust nozzle with separation valve for evacuating the reaction products, as well as for pre-purging with a gaseous mixture. It also features a pressure-relief membrane for explosion overpressure, and a high-speed camera to record the physical and chemical phenomena, and for obtaining specific information about the explosive mixture: the formation of the ION channel, the introduction time for ignition, and the propagation of the flame front through the unburnt mixture.



Less common in unwanted gas explosion events, this phenomenon must nevertheless be considered as an effective source of ignition of combustible mixtures. The data obtained using the stand, are useful in evaluating the hazards and explosion risk posed by industrial installations where flammable gases are processed, stored, or used under pressure. This information can be used to develop preventive measures against corona effect ignitions in case of accidental gas leaks.

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NEUTRALIZATION DEVICE WITH LIQUID JET OF IMPROVISED EXPLOSIVE DEVICE (DNJLDEI)

Patent/project number: CBI A 2023 00178

Author/s: Emilian Ghicioi, Artur George Găman, Daniel Pupăzan, Robert Laszlo, Sorin Burian, Adrian Jurca, Dan Gabor, Angelica Nicoleta Găman, Alexandru Simion, Alin Irimia, Doru Cioclea, Maria Prodan Emeric Chiușan, Irina Vasilica Nalboc, Andrei Szollosi, Sonia Șuvar, Edward Jan Gheorghiosu, Gabriel Dragoș Vasilescu, Attila Kovacs, Daniela Carmen Rus, Cristian Rădeanu, Ilie- Ciprian Jitea, Vlad Păsculescu, Marius Șuvar, Nicolae Vlasin, Bușoi Bogdan Garaltu, Daniel Florea, Adrian Șimon Bogdan, Ligia Tuhut

The invention relates to a neutralization device with liquid jet of improvised explosive device (DNJLDEI), by propelling a quantity of liquid at high speeds, over 500 m/s, in the direction of the target, DEI explosive device with the help of low-explosive charges, detonated remotely. The device, consists of an assembly consisting of a reinforced metal base (mortar), provided with a carrying handle, a base that has an adjustable frame, with perforated arms and fixing screws to various degrees of inclination (from horizontal to vertical working position), having a centrally positioned cylindrical plug (reinforced around the perimeter and at the bottom) for mounting the specially shaped plastic container (cylinder equipped with legs and fixing disc with both flat closing surfaces or with one flat end and one hemispherical end), removable container, with a threaded cap, in which there is a volume of liquid, as well as a reduced charge of plastic explosive, moulded on the lower surface of the dry compartment intended for it, into which an electric detonating staple is inserted for initiation, connected to a detonator operated by an operator from a safe distance.



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