SCHEMATIC DIAGRAM OF THE IMPLEMENTATION OF TECHNICAL MEANS FOR EXTINGUISHING THE FIRE OF ELECTRIC VEHICLES

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The automobile industry is confidently and irreversibly modernizing to produce vehicles that run on alternative fuels, the lion's share of which is occupied by electricity. The use of electric motors in vehicles requires sources of electricity where the best choice are lithium-ion batteries due to a number of advantages, specially: high specific energy consumption, specific power, and a sufficiently large resource compared to lead-acid, nickel-cadmium or sodium- metal-chloride batteries. However, this type of energy elements is capable of ignition or even exploding due to mechanical damage or recharging [1]. Lithium contained in batteries when interacting with water reacts with the release of hydrogen, which creates the risk of formation of a «rattlesnake» mixture. At a temperature above 180.5 °C, lithium melts and in a liquid state when interacting with water is capable of exploding [2]. In this way, electric cars are capable of ignition and may be fire hazardous.

For today, known fire extinguishers for vehicles are having wide variety, operating both in automatic and manual mode, patented by local and foreign agencies [3-5]. However, these security documents in the outlined area are aimed at protecting the engine compartment of vehicles that are used in internal combustion engines.

Figure 1 shows a general view of an electric vehicle fire extinguishing unit comprising a 1 – pyrometric temperature sensor, 2 – an electromagnetic valve, 3 – a compressed nitrogen balloon, 4 – a fire extinguishing powder cylinder,5 – a nozzle, 6 – a housing, 7 – electric vehicle battery , 8 – and a manual starting unit.

Automatic fire extinguishing system is activated both automatically and manually with the manual start unit. The fire detection efficiency is achieved by a pyrometric temperature sensor, and the extinguishing is provided by a fire extinguishing powder 6, which is made on the basis of fluxes and graphite with hydrophobizers [2]. The reliability of the installation is achieved due to the simplicity of the design with the minimum number of components included in its structure.

The pyrometric temperature sensor 1 uses a non-contact method for determining the temperature of the batteries 7 in the optical spectrum. The heat beam from the rechargeable batteries 7 enters the primary converter of the pyrometric temperature sensor 1, at the output of which an electrical signal is generated, proportional to the temperature that being measured. This allows you to control the temperature of the entire area of the battery pack 7 and to determine the temperature change in increments of 0.5 ºC. The balloon with fire extinguisher 4 is made using the air 9. This will allow to loosen the powder 10 in case of caking and to ensure its release from the balloon 4.

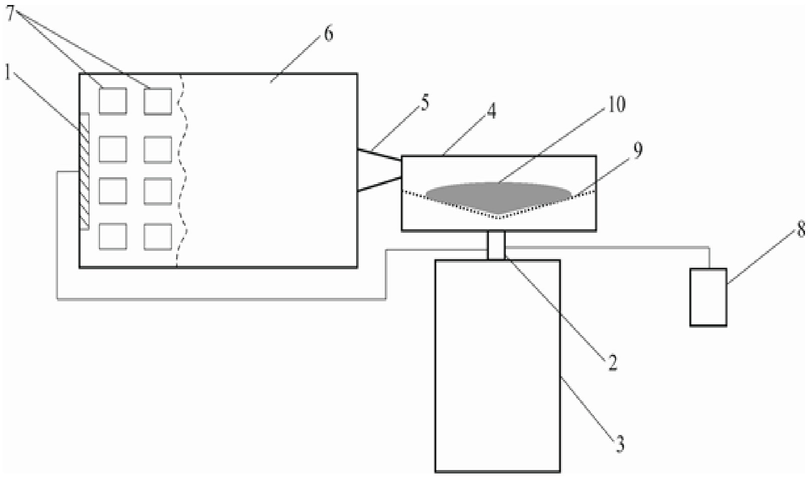

Figure 1. – General view of the firefighting unit for the electric vehicles

The proposed automatic installation of aerosol fire extinguishing for vehicles works this way: in case of reaching the maximum temperature of the batteries 7, the pyrometric temperature sensor 1 generates an electrical impulse and transmits it to the inlet of the solenoid valve 2. Under the effect of an electrical impulse, the solenoid valve 2 is opened and the discharge valve opens 3.

The nitrogen from the balloon 3 goes through the solenoid valve 2 then enters through the air 9 into the balloon 4 where there is a fire extinguishing powder 10. Thanks to the air balloon 9 is the release of fire extinguishing powder 10 which through the nozzle 5 enters the housing of the batteries 9, where they are extinguished.

In the case of manual start of the fire extinguishing installation, an electrical impulse to the inlet of the solenoid valve 2 comes from the output of the manual start unit 10, which is turn on by the user and is located on the instrument panel of the electric vehicle.

The use of the proposed automatic fire extinguishing system for electric vehicles will allow detection of an increasing temperature in a set of lithium-ion batteries and extinguishing of a possible fire, both in automatic and manual mode, which will ensure the safety of passengers and property preservation.

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DETERMINING RISK LEVEL OF A HAZARDOUS INDUSTRIAL OBJECT

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The concept of risk has lately been introduced in the mechanism of the state government with a view to guarantee the country safety and its steady development.The concept 'risk' is used in a number of laws and regulatory documents. The term 'risk' can be met in different documents and scientific articles which most likely reflect the complexity of the notion and the necessity of its further investigation.

And now let's concentrate our attention on the problem of the risk rate setting in the sphere of the Man's economic activities.

Risk rate setting alongside with the identification, assessment and prognosis is a component part of the procedure of risk analysis. At the same time the setting or fixing risk levels for individuals, social groups, society and the environment. Risk is a chance, multiparametric value.

In the West European countries, the activities concerning the assessment and setting of a man-made risk became more evident after a number of accidents in Great Britain (1974), the Netherlands (1975) and Italy (Sevezo, 1975). At that time well-known principles ALAPA (as low as practicably achievable) and ALARA (as low as reasonably achievable) were proposed. The analogous activities were carried out in Hong-Kong at the beginning of the 80-s of the last century and in Australia in the middle of the 80-s.

The quantitive assessment of different risks (individual, social, man-made, ecological and others) is the basis for making management decisions concerning the existing today and the perspective facilities, technologies, industrial objects and systems. The essential risk feature is its chance character, which can be seen only through the probabilistic realization of a number of events (accidents, catastrophes), their place, the time of their effect development and, besides, the form and the scale of the effects. In the majority of cases the setting of such indices as probability (rate) and scale are carried out. The problems of individual and social risk setting have been best investigated.

Conformably to individual risk (the death risk in the result of an accident at a technical object) the three levels are introduced:

- <u>the field of excessive risk</u>: any activity which is characterized by the risk level in this field as inadmissible or impossible for an individual even if it is profitable for the society as a whole;