

Improvised Incendiary Device Components

Mykhailo Kuzmenko *

* Kyiv Scientific Research Forensic Center, Kyiv, Ukraine,
ORCID: <https://orcid.org/0009-0006-9083-8262>, e-mail: mixa01@ukr.net

DOI: [10.32353/khrife.1.2025.15](https://doi.org/10.32353/khrife.1.2025.15) UDC 343.76:343.98

Received: 09.01.2025 / Reviewed: 13.01.2025 / Accepted for print: 26.03.2025 /
Available online: 31.03.2025



The paper highlights the lack of definition for improvised incendiary device components in current foreign and domestic methodologies and reference literature used by specialists to conduct forensic fire and technical examinations. The purpose is to distinguish between basic and complementary components of improvised incendiary devices for subsequent use in forensic fire and technical examinations. To fulfil the goal, the method of system and structural analysis has been employed. The lack of methodologies and methods for studying improvised incendiary devices complicates the determination of a specific source of ignition that has resulted in the ignition of a certain material (substance) or has sufficient energy to ignite a corresponding combustible medium at the seat of a fire (in the context of forensic fire and technical examinations), leading to a probable rather than a categorical, expert conclusion, and sometimes to the impossibility of determining the cause of a fire at all. Stemming from the results of conducted studies (expert experiments), the author outlines the structure, interconnection, and principle of operation of individual improvised incendiary device components. The potential for combustible substances to ignite from ignition devices has been determined. Expert experiments have been visualized. The components of improvised incendiary devices are differentiated into basic and complementary. This contributes to the development of techniques and methods for researching improvised incendiary devices in the context of forensic fire and technical investigations.

Keywords: fire; fire research; fire and technical examination; ignition source; improvised incendiary device; arson; fire investigation.

This article is translation of the original Ukrainian content, which source is available at the link: <https://khrife-journal.org/index.php/journal> (translated by Daryna Dukhnenko). The author acknowledges translation as corresponding to the original.

© 2025 The Author(s). Published by National Scientific Center «Hon. Prof. M. S. Bokarius Forensic Science Institute» & Yaroslav Mudryi National Law University.

This is an open access article distributed under Creative Commons Attribution License (CC_BY_4.0.0) allowing unlimited use, distribution and reproduction on any medium, subject to reference to the Author and original sources.

Research Problem Formulation

Amid martial law in Ukraine, the use of improvised incendiary devices to commit arson against the property of military servicemen, volunteers, and military units intended to confront the Russian occupiers has increased.

The analysis of current methods and reference literature that should be employed by specialists during forensic fire and technical examinations has revealed a lack of both methods for investigating improvised incendiary devices and a description of their components.

The description of the structure, interconnection, and principle of operation of both individual components of improvised incendiary devices and their overall operation will make it possible to begin work on methods of their research with further presentation in the corresponding methodology, which will subsequently help to identify specific sources of ignition, the mechanism of fire outbreaks, and, consequently, to solve crimes associated with arson.

Article Purpose

Identify basic and complementary components of improvised incendiary devices for further use in forensic fire and technical examinations.

In pursuit of this goal, it is essential to:

- analyze the presence of a definition for improvised incendiary device components with reference to the manuals for conducting forensic fire and technical examinations ¹

and other publications ² outlining the study of fires with signs of arson;

- analyze expert experiment results regarding the study of improvised incendiary devices;
- identify components of improvised incendiary devices;
- differentiate components of improvised incendiary devices into basic and complementary ones;
- systematize and visualize the division of improvised incendiary device components.

Research Methods

To fulfil the goal, the method of system and structural analysis has been applied.

Analysis of Essential Researches and Publications

The section of the Fire Research Reference Methodological Manual (hereinafter referred to as the *Manual*–1999), which includes the procedure for conducting research into the occurrence of combustion due to arson, only states that there are devices designed to ignite after some time. At that time the attacker can be in another place and provide himself/herself with an alibi (for example, unswitched heating devices and clock mechanisms) ³. However, the description of improvised incendiary device components is not provided in the 1999 Manual.

The glossary of some general and special terms from Appendix 2 of the *Fire Investigations and Forensic Examinations*

1 Степаненко С. Г., Білкун Д. Г., Яник Я. М., Тимошук Ю. Т. Дослідження пожеж : довідк.-метод. посіб. Київ, 1999. 224 с. ; Безвесільний В. Д., Дьяченко О. Ф. Розслідування та судові експертизи пожеж : довідк.-метод. посіб. Харків, 2007. 360 с.

2 Їх же. Дослідження пожеж з ознаками підпалу : монографія. Харків, 2006. 72 с.

3 Степаненко С. Г., Білкун Д. Г., Яник Я. М., Тимошук Ю. Т. Зазнач. твір.

Reference Manual (hereinafter referred to as the 2007 Manual) contains only the *means* concept (“a tool, an aid, a device by which action is performed”) and a note that the offenders can use, for example, an ignition source, such as a heated coil of an electric stove, etc., to commit arson ⁴.

However, the 2007 Manual as well as the 1999 Manual lack the outline of improvised incendiary device components.

To identify means used to commit arson, the *Fire Investigations with Signs of Arson Monograph* (hereinafter referred to as the Monograph) recommends paying attention to patterns ⁵.

As evidenced by practice, the investigator and forensic expert can notice multiple signs of ignition sources resulting from the action of various tools and/or devices: from the simplest (match flame) to complex technical means (with electric heating elements and special chemical composition). When identifying them, it is important to examine the residues of chemicals, objects, and products found at the seat of a fire in order to characterize ignition sources used to start the fire (violation of operating or maintenance conditions within a facility; presence of a source of thermal energy generated by a special device or equipment that has resulted in the ignition of a combustible medium). Electrical ignition sources include, in particular, artificially manufactured electrical devices for starting fires.

Recently, criminals have increasingly used modern achievements of science and technology during the manufacture of specialized technical aids for committing arson ⁶. Based on the response time, they are divided into the following means and devices:

- *instantaneous*, designed to ignite instantaneously and installed in such a way that they can be activated without having to enter a room;
- *delayed action*, intended to ignite after a certain period, allowing criminals to provide themselves with an alibi.

Depending on activation specifications, these are electrical, mechanical, firearms, explosives, chemical-reactive, complex-technical aids (devices), etc.

The analysis of cases investigating this category of fires has demonstrated that arson is most often committed using:

- 1) incendiary devices, components of which are capable of forming an ignition source object through interaction (fire, heated body, a spark, as well as heat accumulated by radiation or convection);
- 2) the simplest means widely used in everyday life (candles, matches, lighters, tobacco products, rags soaked in grease or impregnated with flammable or combustible liquids, etc.);
- 3) substances capable of spontaneous combustion and acceleration of the combustion reaction;
- 4) substances-intensifiers and related objects that promote the development of combustion during the occurrence or spread of a fire (residues of flammable liquid, combustible liquid).

Incendiary devices are primarily designed and used to ensure that ignition occurs with time delay, allowing the arsonist to flee the scene. For this purpose, many mechanical devices have been developed, primarily linked to basic combustion initi-

4 Степаненко С. Г., Білкун Д. Г., Яник Я. М., Тимошук Ю. Т. Зазнач. твір.

5 Безвесільний В. Д., Дьяченко О. Ф. Дослідження пожеж ...

6 Там само.

ators: lighters, matches, etc. Criminals employ devices that focus the sun's rays on the matches so that they ignite over some time. In the case of matches, a smoldering cigarette is also placed in the box to ensure the slow action of an incendiary device. Overall, matches are one of the most commonly used ignition devices since they contain phosphorus. The composition of the match head can be determined by chemical analysis.

Sometimes candles are used to start a fire. The burning time of a candle depends on its size. It helps to regulate the timing of a fire. Let us stress that molten wax or paraffin from a candle can get into the pores of wood and survive a fire even better than the wood itself: this will help to substantiate the arson version and identify the source.

Criminals frequently utilize devices with clockwork, electronic ignition, which ignite combustible substances using heat-

ed plates. In this case, the interval between switching on and ignition can be more than 12 hours. Various devices containing electric light bulbs, wires that heat up and come into contact with combustible material, etc., are also utilized. The ability to automatically turn on such devices enables to set the device's operating time and the period for igniting fire load materials in a wide range.

To facilitate the spread of combustion, paths made of spilled liquid on the floor, fibrous materials soaked in flammable liquid, etc., are commonly used.

At the same time, the Monograph⁷ fails to provide a description of improvised incendiary device components, as do the 2007 and 1999–Manuals.

Moreover, foreign information sources presenting research findings on fires and arson also do not mention the components of improvised incendiary devices⁸.

7 Безвесільний В. Д., Дьяченко О. Ф. Дослідження пожеж ...

8 Eroglu Y. Text Mining Approach for Trend Tracking in Scientific Research: A Case Study on Forest Fire. *Fire*. 2023. 6(1):33. DOI: [10.3390/fire6010033](https://doi.org/10.3390/fire6010033) (дата звернення: 08.01.2025); Gales J., McNamee R. Fire research for timber structures. *Fire and Materials*. 2023. Vol. 47. Is. 4. Pp. 413–414. DOI: [10.1002/fam.3140](https://doi.org/10.1002/fam.3140) (дата звернення: 02.01.2025); Perry J. Innovative Fire Fighting Strategy / Advances in Forest Fire Research. Ed. D. X. Viegas, L. M. Ribeiro. Universidade de Coimbra, 2022. Pp. 1675–1681. DOI: [10.14195/978-989-26-2298-9_257](https://doi.org/10.14195/978-989-26-2298-9_257) (дата звернення: 23.12.2024); Yang Y., Du H., Yao G. A Scientometric Research on Applications and Advances of Fire Safety Evacuation in Buildings. *Fire*. 2023. 6(3):83. DOI: [10.3390/fire6030083](https://doi.org/10.3390/fire6030083) (дата звернення: 25.12.2024); Lim O. K. Bibliometric Analysis of Research Topics on Fire Safety. *Fire Science and Engineering*. 2023. Vol. 37. Is. 1. Pp. 129–137. DOI: [10.7731/KIFSE.6a32f1fd](https://doi.org/10.7731/KIFSE.6a32f1fd) (дата звернення: 31.12.2024); Christ S., Schwarz N., Sliuzas R. Measuring fire risk perception of residents before and after a fire / Advances in Forest ... Pp. 682–688. DOI: [10.14195/978-989-26-2298-9_104](https://doi.org/10.14195/978-989-26-2298-9_104) (дата звернення: 09.12.2024); Scribner C. F. A Is for Arson: A History of Vandalism in American Education. Ithaca, NY: Cornell University Press, 2023. 240 p. DOI: [10.1515/9781501770739](https://doi.org/10.1515/9781501770739) (дата звернення: 12.12.2024); Arson, n.¹. Arson, n.² / Oxford English Dictionary. 3rd ed. Oxford University Press, 2024. URL: <https://www.oed.com/search/dictionary/?scope=Entries&q=arson> (дата звернення: 25.11.2024); Woods R. Wildfire Arson Prevention Guide. 1st ed. CRC Press, 2023. 128 p. DOI: [10.4324/9781003353843](https://doi.org/10.4324/9781003353843) (дата звернення: 27.11.2024); Kwon H., Kim S., Seo J. The Typology of Korean Arson and Predictive Factor for Serial Arson. *Journal of The Korean Data Analysis Society*. 2020. Vol. 22. Is. 1. Pp. 387–401. DOI: [10.37727/jkdas.2020.22.1.387](https://doi.org/10.37727/jkdas.2020.22.1.387) (дата звернення: 19.11.2024); Noon R. K. Introduction to Forensic Engineering. 1st ed. CRC Press, 1992. 220 p.; Horsley F. K. New Perspectives on Arson and Firesetting: The Human-Fire Relationship. Taylor & Francis Group, 2021. 132 p. DOI: [10.4324/9780367808648](https://doi.org/10.4324/9780367808648) (дата звернення: 02.01.2025); Stanley J. R. Preventing rural arson / Rural Crime Prevention. Theory, Tactics and Techniques; Ed. by

Within forensic fire and technical examinations, it is hard to identify a specific ignition source that has resulted in the ignition of a particular material (substance) or has enough energy to ignite the corresponding combustible medium at the seat of a fire given the lack of methods and techniques for researching improvised incendiary devices. In turn, the fact that a specific ignition source cannot be identified leads to a probable, rather than a categorical, expert conclusion as to the actual cause of a fire, and sometimes proves that it is impossible to determine the cause of a fire at all.

Therefore, researching improvised incendiary devices is highly relevant. That is why the paper's purpose is to determine basic and complementary components of an improvised incendiary device for their subsequent use within forensic fire and technical examinations.

Main Content Presentation

All improvised incendiary devices are distinguished by a particular set of design elements. Certain parts of these elements (intact or remnant ones) may be found at the fire scene. What is more, a person who manufactured such a device must possess appropriate skills and specific expertise, as well as use certain components, parts, equipment, substances, etc., to create this device. Improvised incendiary devices

or their remnants found at the scene of a fire should retain corresponding specifications. Identifying these specifications will enable to draw conclusions on their general structure, design elements, and principle of operation. Consequently, this will facilitate the comparison of improvised incendiary devices from a single source of origin during research.

In a previous study, we proposed the following definition: ***“Improvised incendiary device is a device in which at least one of the design elements is made in an improvised way or its non-industrial unregulated assembly is used, i.e., the structure of the device finally prepared for ignition of combustible substance or combustible medium is not determined by the relevant technical requirements for its manufacture, installation, use, etc.”***⁹. This definition stems from the previously formulated and widely employed concept of *improvised explosive device*¹⁰.

The analysis of current methodologies and reference literature that forensic experts should use when conducting forensic fire and technical examinations has revealed a lack of differentiation in the concept of *improvised incendiary device*. Therefore, there is a need to formulate the concept of *improvised incendiary device* using a system of signs and criteria that will help resolve the issue of whether any objects belong to this category.

From our perspective, the main signs determining whether objects under study

A. Harkness. 1st ed. London, 2020. Pp. 299—312. DOI: [10.4324/9780429460135-33](https://doi.org/10.4324/9780429460135-33) (дата звернення: 03.01.2025) ; Tao X. Research on Innovative Model of Fire Management in Universities — Take Fire Safety Education as an Example. *Frontiers in Educational Research*. 2021. Vol. 4. Is. 12. Pp. 40—43. DOI: [10.25236/FER.2021.041208](https://doi.org/10.25236/FER.2021.041208) (дата звернення: 08.01.2025) ; Fenoff R., Fish J. T., Miller L. S. et al. Arson and Explosives / R. Fenoff et al. Crime Scene Investigation. 4th ed. NY, 2022. Pp. 209—235. DOI: [10.4324/9780429261657-9](https://doi.org/10.4324/9780429261657-9) (дата звернення: 08.01.2025).

9 Кузьменко М. Саморобний запальний прилад: визначення поняття. *Теорія та практика судової експертизи і криміналістики*. 2024. Вип. 4 (37). С. 206. DOI: [10.32353/khrife.4.2024.12](https://doi.org/10.32353/khrife.4.2024.12) (дата звернення: 08.01.2025).

10 Прохоров-Лукін Г. В., Пащенко В. І., Биков В. І. та ін. Методика комплексного дослідження вибухових пристроїв, вибухових речовин і слідів вибуху. Київ, 2007. 218 с. : іл. URL: https://arm.naiu.kiev.ua/arm/arm_bmb_exp/idb/metod_wte.html (дата звернення: 08.01.2025).

belong to the category of improvised incendiary devices are as follows:

- presence of a combustible liquid or distinctive traces of its combustion, along with a device for triggering the ignition;
- ability to inflict damage;
- single use;
- use of thermal energy;
- special preparation of a device for ignition.

It should be borne in mind that the ability to cause damage, i.e., physical or thermal damage, is of paramount importance in determining whether an object is an improvised incendiary device (in addition to special preparation).

Special preparation of a device for ignition may be attributed to the fact that a certain action has not been fulfilled. For instance, a person who made an improvised incendiary device planned to use it in an arson attack, even though the attack may not have occurred (e.g., due to imperfect design, improper storage conditions, damage during transportation or installation, etc.). With regard to the ability to cause damage, it implies the necessary experimental verification of relevant damage parameters of an improvised incendiary device, which is a statement of fact, not of intent. Thus, such criteria for determining whether an object is an improvised incendiary device as special preparation for ignition and the ability to inflict damage need to be analyzed as a cohesive whole.

Single use refers to the idea that after use, an improvised incendiary device is destroyed and partially damaged because of thermal effects, the destructive action of design elements that are modified (destroyed, deformed, etc.) during a fire, actions of fire and rescue units, etc., which hinder reuse of a device. Presence of a thermal damage factor is a criterion in determining

whether an object is part of an improvised incendiary device.

Guided by the results of expert practice and research, we can single out the following components of improvised incendiary devices:

- combustible substance;
- ignition device;
- body;
- extra batteries;
- toggle switches, push button switches, target sensors, electronic units, etc.

Let us take a closer look at these components.

Combustible substances used by people who make improvised incendiary devices can be combined into two groups:

- *traditional* combustible substances (including various flammable and combustible liquids);
- *special* combustible substances containing flammable components.

By the method of ignition, combustible substances are split into two main classes:

- forced ignition;
- self-igniting.

Combustible substances of *forced ignition* include:

- flammable and combustible liquids;
- mixtures based on flammable and combustible liquids;
- pyrotechnic components;
- metallized mixtures derived from flammable and combustible liquids.

Self-igniting combustible substances comprise:

- chemically active substances;
- special pyrotechnic components.

The most common and accessible flammable and combustible liquids that are most commonly used as combustion intensifiers can be classified into the following groups:

- light oil products (gasoline, diesel fuel, kerosene, etc.);

- varnish and paint solvents;
- other flammable and combustible liquids (perfumes, colognes, hair-sprays, alcohols, ethers, glues based on organic solvents, fire starters, drying oil, antiseptics, some dry-cleaning products, etc.)¹¹.

Expert practice analysis has demonstrated that components of improvised incendiary devices consist of only combustibles of forced ignition while self-igniting combustible substances do not need the special components found in improvised incendiary devices. For example, attackers take advantage of the properties of acids by placing them in containers made of unstable materials, which, as a result of corrosion, cause these acids to come into contact with cellulose materials, which then ignite¹². Moreover, studies have shown that arsonists most frequently use various brands of gasoline and diesel fuel (as combustibles) to force ignition, given their availability.

Ignition devices utilized to make improvised incendiary devices usually combine improvised and industrially manufactured products (the latter are modified and/or altered by perpetrators).

The most widely used design elements of ignition devices are:

- mechanical and electronic clock-work and countdown timers;
- industrially manufactured electric heating and lighting devices, etc., capable of causing the ignition of a combustible substance after a fixed period;
- radio-controlled devices.

Research practice reveals that the ignition of a combustible substance in im-

proved incendiary devices is most often initiated by electricity. This initiation is widely functional due to the possibility of using various methods of actuation (such as remote control, countdown timer, clock chime, target sensor, etc.). What is more, electrical initiation allows a person who installed (planted) the improvised explosive device to be far from the scene, in safety.

For instance, we can provide the example of the following improvised incendiary device: a mobile, to which speaker contacts the ends of the electrical wires from a broken light bulb of an electric garland were soldered, and the spiral of the light bulb was immersed in powdered sulfur from match heads; the sulfur was wrapped in adhesive tape and stuck to a plastic bottle of gasoline with the same tape; there were forty-eight tablets of dry fuel (urotropine) and seven more gasoline bottles next to the bottle; all of the above were placed in a plastic bag.

In the course of the expert experiment, it was found that after the mobile alarm went off, the sulfur ignited. Afterward, we could observe a steady flaming burning of a dry fuel tablet (urotropine; *see Figs. 1–3*).

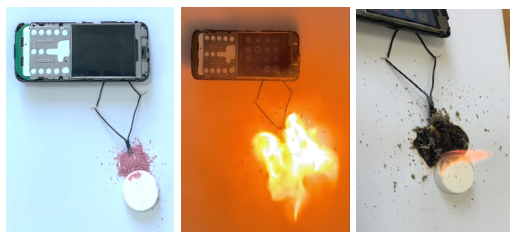


Fig. 1

Fig. 2

Fig. 3

As supported by reference literature, the flame temperature during dry fuel (urotropine) combustion is sufficient to ignite

11 Матіюк О. О., Сова С. А., Тимчук Р. Б. Виявлення та аналіз зовнішніх (візуальних) ознак застосування легкозаймистих і горючих рідин на місці (об'єкті) пожежі : інформ. лист. Київ, 2021. 48 с. : іл.

12 Степаненко С. Г., Білкун Д. Г., Яник Я. М., Тимошук Ю. Т. Зазнач. твір.

gasoline and melt plastic bottles containing it, which could cause gasoline to leak from them. Thus, the highest flame temperature for burning solids, not accompanied by smoldering, is 850–1050 °C¹³. Gasoline is a flammable, transparent liquid, a mixture of light hydrocarbons with an autoignition temperature ranging from 255 to 370 °C¹⁴. The maximum melting point of food-grade plastic is 170 °C¹⁵.

Here is another example of an improvised incendiary device: a mobile, a battery, a switch, an electronic unit, a connecting element, electrical wires, and a coil assembled into a single construction (see Fig. 4).

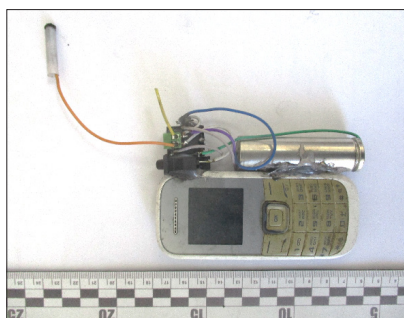


Fig. 4

Research has shown that sulfur can ignite from an ignition source such as a heated coil. Given the contact between the substances in the previous example, we know that sulfur can ignite dry fuel (urotropine), which in turn can ignite gasoline and/or melt plastic bottles containing it, causing gasoline to leak and then catch fire.

The coil was placed in a white polymer tube, fixed with a brown solid substance (sulfur). When this tube was dismantled, a black substance (gunpowder) was identified within it.

The device was attached to a plastic gasoline bottle with rubber bands. The bottle was wrapped in paper which held the gunpowder in place.

To prepare for the expert experiment, a fragment of the brown substance (sulfur) was attached to the coil, a fragment of the black substance (gunpowder) and a small quantity of liquid (gasoline) from a plastic container were placed in a metal lid. Then the coil with the brown substance was pressed against the black substance (gunpowder; see Figs. 5–7).

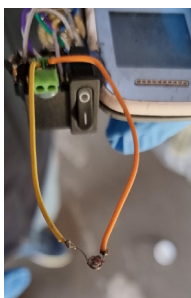


Fig. 5



Fig. 6



Fig. 7

The mobile alarm clock was set to vibrate (see Figure 8). After the alarm went off, the brown substance (sulfur) ignited first, followed by the black substance (gunpowder) and the liquid (gasoline; see Fig. 9).



Fig. 8



Fig. 9

13 Степаненко С. Г., Білкун Д. Г., Яник Я. М., Тимошук Ю. Т. Зазнач. твір.

14 Бензини автомобільні / НВФ Інтеллект. URL: <http://surl.li/eyltlm> (дата звернення: 08.01.2025).

15 Харчовий пластик: PP та HDPE / АДМІРЕЛЬ. 16.11.2020. URL: <https://admirel.com.ua/ua/interesno-znat-2/13-stati-2/88-kharchovij-plastik-pp-ta-hdpe> (дата звернення: 08.01.2025).

Drawing upon the research findings, it has been concluded that the brown substance (sulfur) can be ignited by the action of an ignition source in the form of a heated coil provided for the study of the incendiary device. In view of the previously established contact between substances and liquids, it has been determined that the black substance (gunpowder) and the liquid (gasoline) are capable of being ignited by the flame during the burning of the brown substance (sulfur).

Regarding the body as a component of improvised incendiary devices: combustible substances are often placed inside it, although there are instances where the body may not be present.

Thus, basic components of improvised incendiary devices are a combustible substance and an ignition device, and complementary components are the body; additional batteries; toggle switches, push buttons, target sensors, electronic units, etc. (see Diagram).

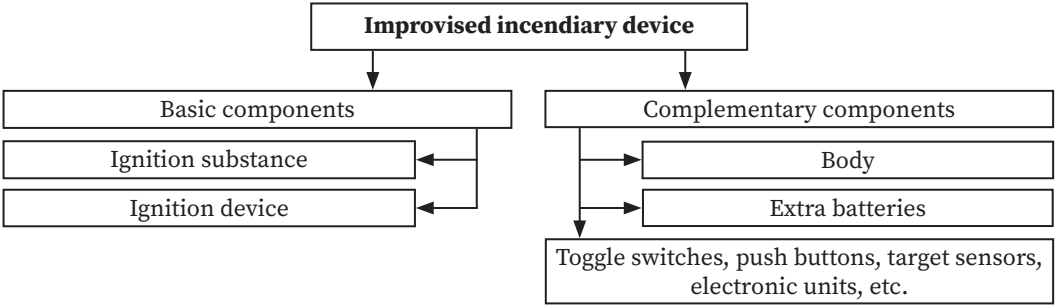


Diagram. Improvised incendiary device components

Conclusions

The article reveals that manuals for conducting forensic fire and technical examinations, as well as research papers researching arson signs, do not outline improvised incendiary device components. The author defines the problems caused by the lack of such information, along with the absence of procedures and methods for conducting research on improvised incendiary devices or their remnants found and seized at the scene of a fire or at facilities of vital human activity. It has been proven that today the development of methods for studying the overall structure, design elements, and operating principle of improvised incendiary devices is relevant for the successful conduct of forensic fire and technical examinations.

Expert experiment results on the study of improvised incendiary devices have been analyzed. Improvised incendiary device components have been identified and differentiated. The author has provided a diagram for dividing components of improvised incendiary devices into basic and complementary.

**Складові саморобного
запального приладу
Михайло Кузьменко**

Зауважено відсутність визначення складових саморобного запального приладу в чинних іноземних і вітчизняних методиках та довідковій літературі, якими фахівці послуговуються для проведення судових пожежно-технічних експертиз. Мета — визначити основні й додаткові складові саморобного за-

пального приладу для їх подальшого застосування в межах проведення судових пожежно-технічних експертиз. Для досягнення поставленої мети послуговувалися методом системно-структурного аналізу. Брак методик і методів дослідження саморобних запальних приладів дуже ускладнює визначення конкретного джерела запалювання, яке спричинило займання певного матеріалу (речовини) або має достатньо енергії для запалювання відповідного горючого середовища в осередку пожежі (у межах проведення судових пожежно-технічних досліджень), що своєю чергою призводить до складання ймовірного, а не категоричного висновку експерта, а інколи й до неможливості з'ясувати причину пожежі. За результатами проведених досліджень (експертних експериментів) визначено будову, взаємне поєднання та принцип дії окремих складових саморобних запальних приладів. З'ясовано можливість займання горючих речовин від приладів для запалення. Візуалізовано проведення експертних експериментів. Складові саморобних запальних приладів диференційовано як основні й додаткові, що сприятиме розробленню відповідних методик і методів дослідження саморобних запальних приладів у межах проведення судових пожежно-технічних експертиз.

Ключові слова: пожежа; дослідження пожеж; пожежно-технічна експертиза; джерело запалювання; саморобний запальний прилад; підпал; розслідування пожеж.

Financing

This research did not receive any specific grant from funding institutions in the public, commercial or non-commercial sectors.

Disclaimer

Founders had no role in the research design, data collection and analysis, decision to publish or manuscript preparation.

Participants

The author has contributed solely to intellectual discussion underlying this document, case law research, writing and editing, and assumes responsibility for its content and interpretation.

Declaration of Competing Interest

The author declares no conflict of interest.

References

- Arson n.¹. Arson n.² (2024) / *Oxford English Dictionary*. 3rd ed. Oxford University Press. URL: <https://www.oed.com/search/dictionary/?scope=Entries&q=arson>.
- Benzyny avtomobilni [Automobile gasolines] / NVF Intelkt. URL: <http://surl.li/eylttm> [in Ukrainian].
- Bezvesilnyi, V. D., Diachenko, O. F. (2006). *Doslidzhennia pozhezh z oznakamy pidpalu* [Fire investigations with signs of arson] : monohrafiia. Kharkiv. [in Ukrainian].
- Bezvesilnyi, V. D., Diachenko, O. F. (2007). *Rozsliduvannia ta sudovi ekspertyzy pozhezh* [Fire Investigations and Forensic Examinations] : dovidk.-metod. posib. Kharkiv [in Ukrainian].
- Christ, S., Schwarz, N., Sliuzas, R. (2022). *Measuring fire risk perception of residents before and after a fire* / *Advances in Forest Fire Research*. Ed. D. X. Viegas, L. M. Ribeiro. Universidade de Coimbra. DOI: 10.14195/978-989-26-2298-9_104.
- Eroglu, Y. (2023). Text Mining Approach for Trend Tracking in Scientific Research: A Case Study on Forest Fire. *Fire*. 6(1):33. DOI: 10.3390/fire6010033.
- Fenoff, R., Fish, J. T., Miller, L. S., Wallace, E. W. (2022). *Arson and Explosives* / R. Fenoff et al. *Crime Scene Investigation*. 4th ed. NY. DOI: 10.4324/9780429261657-9.
- Gales, J., McNamee, R. (2023). Fire research for timber structures. *Fire and Materials*. Vol. 47. Is. 4. DOI: 10.1002/fam.3140.
- Horsley, F. K. (2021). *New Perspectives on Arson and Firesetting: The Human-Fire*

- Relationship*. Taylor & Francis Group. DOI: [10.4324/9780367808648](https://doi.org/10.4324/9780367808648).
- Kharchovyi plastyk: PP ta HDPE [Food grade plastic: PP and HDPE] (2020) / ADMIREL. URL: <https://admirel.com.ua/ua/intereso-znat-2/13-stati-2/88-kharchovij-plastik-pp-ta-hdpe> [in Ukrainian].
- Kuzmenko, M. (2024). Improved Incendiary Device: Concept Definition. *Theory and Practice of Forensic Science and Criminalistics*. Is. 4 (37). Pp. 192—208. DOI: [10.32353/khrife.4.2024.12](https://doi.org/10.32353/khrife.4.2024.12).
- Kwon, H., Kim, S., Seo, J. (2020). The Typology of Korean Arson and Predictive Factor for Serial Arson. *Journal of The Korean Data Analysis Society*. Vol. 22. Is. 1. DOI: [10.37727/jkdas.2020.22.1.387](https://doi.org/10.37727/jkdas.2020.22.1.387).
- Lim, O. K. (2023). Bibliometric Analysis of Research Topics on Fire Safety. *Fire Science and Engineering*. Vol. 37. Is. 1. DOI: [10.7731/KIFSE.6a32f1fd](https://doi.org/10.7731/KIFSE.6a32f1fd).
- Matiuk, O. O., Sova, S. A., Tymchuk, R. B. (2021). *Vyavlennia ta analiz zovnishnikh (vizualnykh) oznak zastosuvannia lekozaimystykh i horiuchykh ridyn na misti (ob'iekti) pozhezh* [Detection and analysis of external (visual) signs of the use of flammable and combustible liquids at the fire scene (site)] : inform. lyst. Kyiv [in Ukrainian].
- Noon, R. K. (1992). *Introduction to Forensic Engineering*. 1st ed. CRC Press.
- Perry, J. (2022). *Innovative Fire Fighting Strategy / Advances in Forest Fire Research*. Ed. D. X. Viegas, L. M. Ribeiro. Universidade de Coimbra. DOI: [10.14195/978-989-26-2298-9_257](https://doi.org/10.14195/978-989-26-2298-9_257).
- Prokhorov-Lukin, H. V., Pashchenko, V. I., Bykov, V. I. ta in. (2007). *Metodyka kompleksnoho doslidzhennia vybukhovyykh prystroiv, vybukhovyykh rechovyh i slidiv vybukhu* [Methodology for multidisciplinary examination of explosive devices, explosives, and explosion traces]. Kyiv. URL: https://arm.naiu.kiev.ua/arm/arm_bmb_exp/idb/metod_wte.html [in Ukrainian].
- Scribner, C. F. (2023). *A Is for Arson: A History of Vandalism in American Education*. Ithaca, NY : Cornell University Press. DOI: [10.1515/9781501770739](https://doi.org/10.1515/9781501770739).
- Stanley, J. R. (2020). Preventing rural arson / *Rural Crime Prevention. Theory, Tactics and Techniques* ; Ed. by A. Harkness. 1st ed. London. DOI: [10.4324/9780429460135-33](https://doi.org/10.4324/9780429460135-33).
- Stepanenko, S. H., Bilkun, D. H., Yanyk, Ya. M., Tymoshchuk, Yu. T. (1999). *Doslidzhennia pozhezh* [Fire Research] : dovidk.-metod. posib. Kyiv [in Ukrainian].
- Tao, X. (2021). Research on Innovative Model of Fire Management in Universities — Take Fire Safety Education as an Example. *Frontiers in Educational Research*. Vol. 4. Is. 12. DOI: [10.25236/FER.2021.041208](https://doi.org/10.25236/FER.2021.041208).
- Woods, R. (2023). *Wildfire Arson Prevention Guide*. 1st ed. CRC Press. DOI: [10.4324/9781003353843](https://doi.org/10.4324/9781003353843).
- Yang, Y., Du, H., Yao, G. (2023). A Scientometric Research on Applications and Advances of Fire Safety Evacuation in Buildings. *Fire*. 6(3):83. DOI: [10.3390/fire6030083](https://doi.org/10.3390/fire6030083).

Kuzmenko, M. (2025). Improved Incendiary Device Components. *Theory and Practice of Forensic Science and Criminalistics*. Issue 1 (38). P. 242—252. DOI: [10.32353/khrife.1.2025.15](https://doi.org/10.32353/khrife.1.2025.15).