

Methods of Technical Protection of Goods and Packaging from Counterfeiting, as well as the Issue of Professional Errors in the Investigation of Physical Evidence

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Abstract

This article discusses the technical issue of protecting goods and packaging from counterfeiting. And the issue of professional and forensic errors during the research of material evidence is investigated.

Key words: determine the type of hologram, identify security level of the hologram, errors, operational, gnoseological, errors of procedural character.

Introduction Identification of holograms establishes: compliance of the hologram with its description - specifications, datasheet; holograms are replicated from the matrix supplied or from another matrix; compliance of the provided photo templates and layouts of the logo elements reproduced by the hologram; matching the original primary hologram to the rainbow hologram; compliance of the provided software with the synthesizing program. Classification studies: determine the type of hologram; identify security level of the hologram.

The diagnostic study of holograms involves identification of the hologram production scheme. In our opinion, the hologram forensics should consist of several stages. First of all, a visual rapid test of the hologram shall be performed. Then the hologram type is established and the sequence of examinations depending on the possible method of forgery is determined [1].

A hologram is examined by comparing it with a reference sample. In this case the attention should be paid to: matching of the color scheme of the test hologram and the reference sample at the same illumination angles; presence of the holographic 'noise'; accuracy of the logo recovery; type of the HSE attachment to the protected object (self-adhesive, hot stamping); the number of image planes (mostly two or three planes, more of them are rarely used, because of the limitations on the depth and sharpness of the rainbow hologram); image depth (e.g. a 15×15mm hologram has a depth of 3 to 5 mm); presence of defects in the holographic image that may occur during the holographic copying of the original.

In addition, lesions, tears, cracks in the hologram are not allowed. Attention is also paid to the thickness of the hologram, the accuracy of its placement on the protected object, the structure of the material it is made of [2].

After that, the parameters are studied using laboratory methods. The following parameters are identified together with the reference sample: number of angles of the hologram (e.g., a complex hologram generally contains from 20 to 200 views, their number depends on the protected object, size of holographic images, color separations, materials used for recording; the playback quality of the microtext, nano text and small parts of the image; HSE's diffraction grating modulus consists of a set of reflection gratings. The grating modulus spectrum determines how effectively the reflected light is decomposed into the spectrum. If viewed through a microscope with a magnification of 300 times, the holographic image will have the appearance of dark and light stripes. The diffraction grating modulus is the total width of the light and dark strips of the HSE; the width and relative position of the slits for a multi-frequency

rainbow hologram; the distance from the image of the slits to the hologram when the wave front is set to the specified curvature.

If encoded or hidden information is used in a hologram, it is decoded, identified, and analyzed to match the sample [3].

If necessary, additional studies of the hologram can be carried out, such as material control (glue/adhesives are selected so that the destruction of the hologram – complete or partial – occurs when peeling, heating and solvents are used; this renders it impossible to reuse or copy the HSE, optical study of the diffraction structure of the hologram. The study of holographic security marks by means of laboratory methods is conducted using standard optical devices (microscopes, photometers, spectrometers, etc.), special laser equipment, which identifies a complex image of the HSE and reads the latent image. A complex and latent image can not only be visually observed but also entered a computer for further comparison with the reference sample. In this case, the image is examined on such crucial parameters as resolution, presence of three-dimensional images (for example, flat two-dimensional image only, simultaneous coincidence of the foreground and background of 2D and 3D images, a fully three-dimensional image), the presence of color gamut, presence of mobility, available ink numbering on the surface of the hologram or laser numbering in the hologram, as well as a number of other parameters [4].

The requirement for the stability of the HSE's protective properties is recognized as the possibility of changing the appearance of the mark for at least one characteristic feature in case of unauthorized violation of its operating conditions. For example, when separating a security mark from a plastic card, it becomes completely or partially destroyed, exhibiting a decrease in resolution, violation of the color gamut, microtexts or micro-optical details in the image of the mark, non-reflection of the latent image, which is detected by a magnifying glass, microscope, laser device used for identifying holograms, and so on.

The stability of the protective properties of the HSE is ensured by the technology of manufacturing the mark in the form of a self-adhesive label. Hot stamping method, which in both cases ensures the destruction of the mark when trying to separate it [5].

In our opinion, in order to establish the authenticity of the hologram, it is advisable to put the following questions to the expert: whether a tag on the provided object is a holographic security mark; if so, what type (type) of HSE belongs to (hologram, kinegram, pixel gram etc.);

whether the test holographic sample meets the established standard; method of attaching the HSE to the protected object; whether the holographic security mark was exposed to unauthorized influence; if so, in what way; if a tag on the provided object is not a holographic security mark, then how is it made, what means were used to produce it; whether the equipment provided for the study was used to make the tag?

For hologram forensics special laboratories have been created in the country's expert institutions. Research methods are developed and the possibilities of procedural permissibility of using lasers in court proceedings are considered. Familiarization with the practice of such laboratories has shown that they mainly conduct research on holograms that protect individual products from forgery and are used as seals for office equipment. Such research is conducted annually in the expert laboratories of the Security Service of Ukraine, dedicated expert institutions of the Ministry of justice in Ukraine [6].

Holographic security systems are based on the discoveries and achievements of modern optics and materials science. A hologram is a complex microstructure that comprises the visual perception of three-dimensionality of an image. Holographic information is recorded during the laser interference shooting. This technology makes it possible to obtain holographic elements with bright and high-quality images. Volume, iridescent color play, a large number of optical effects determines its significance.

Quality indicators of expert investigation are closely related to efficiency indicators of expert investigation. Quantity indicators of efficiency 'quality' in an expert's activities include:

A. Indicator of achieved objective of establishing evidence. It represents the ratio between the number of questions posed and resolved. Those questions are regarded as resolved to which answers have been given in a categorical (positive or negative) form, since such answers always contain actual data of evidentiary value. Resolved questions should also include those the answers to which have been given in conditionally categorical, alternative or probabilistic forms, since conclusions containing such findings may be used to develop investigative leads. Only those questions should be regarded as unresolved the answers to which contain the wording 'resolving this question was not possible.'

B. Number of forensic errors made by an expert. This indicator is derived by comparing findings of initial and repeat examinations, forensic examinations, and case files of concluded proceedings, as well as by reviewing the supervised proceedings, and by monitoring outgoing

expert opinions arranged at an expert institution. Here, high quality implies minimising expert's errors or their complete elimination.

The analysis of expert practice allows revealing and classifying errors which are allowed at carrying out the judicial-ballistic examinations. By the nature they are not homogeneous and can be related to such kinds of errors: the operational; the gnoseological; the procedural.

Operational - connected with infringement of the established requirements to the sequence of actions of the expert and to conclusion arranging. They are characteristic almost for all investigation phases, in greater deal are met in practice of beginning experts. The essence of the given sort of errors of the expert in practice is characterised by the following factors: wrong instructions in the text of conclusions of materials receipt or the decision-making dates, file number, etc.; absence of results of research on one of the questions.

Gnoseological errors - connected with the solution of problems by the expert, their occurrence depends on many reasons: from theoretical and practical preparation of the expert, his experience, especially while carrying out the complicated judicial-ballistic research which are seldom met in expert practice; from a scientific development of separate positions of judicial-ballistic examination and, eventually, from mental abilities of the expert. In their turn, gnoseological errors can be subdivided into logic and actual [7].

Logic ones are "the errors connected with infringement in substantial intellectual acts of laws and rules of logics, and also with incorrect application of logic methods and operations".

Actual, or subject, errors – the deformed idea of the relation between subjects of the objective world.

In practical activity of the expert gnoseological errors appear in such factors: In a wrong estimation in unified system of coincidence significance, and the character of divergences; In a wrong estimation of informativeness of the revealed indications which coincide.

The given kind of errors is the most typical for identification judicial-ballistic examinations. It is explained by the complexity of the trace-making mechanism and the process of revealing and considerable subjectivity of an estimation of the common general and personal signs of traces of the weapon on the shot shells and sleeves.

Errors of procedural character – consist in infringement by the expert of a procedural mode and procedure of expert investigation. They include: Expert's going out the limits of his competence, in particular, his intrusion into sphere of legal character; Giving conclusions on

the questions the decision of which does not demand special knowledge; Unreasonable, not enough motivated conclusions or conclusions' substantiations reached not by results of research, but by the criminal case materials; Discrepancy of the size of the carried out research and answers of the expert to the questions put to it; Non-observance of the rules of the expert conclusion arranging established by the law, in particular absence of necessary requisites in a conclusion; Giving the preventive offers which are based on unreasonable special knowledge of the expert [8].

Conclusions A self-adhesive label (application) is a holographic element that is applied to any object as a regular stick-on label, but when you try to remove it from the object, it is destroyed. Labels can be applied manually or using special tools. Hot stamping foil. Hot stamping foil consists of a polyester base on which a layer of protective varnish is applied, a metallized layer with a holographic pattern, an adhesive layer after pressing such HSE on the document, a thin (5 to 10 microns) layer of metallized varnish bearing holographic pattern is retained. Such a security element cannot be separated from the base and transferred to another document without compromising its integrity. Lamination film. The holographic pattern is located on a transparent film that can be used for laminating documents. Conventional laminators can be used to apply such a film. Holograms are used to: protect payment cards, letterhead papers against forgery; protect manufacturers' trademarks; certify the authenticity of products; control access to premises and facilities; give a bright look to advertising products.

It should be noted in summary that, in our opinion, setting up a system of reliable legal protection for a forensic expert as a participant in legal proceedings and a source of expert opinion would preclude any potential physical or psychological pressure and would have a correspondent impact on the quality of investigation and validity of its findings.

References

1. Avdieieva H.K., 2006. Forensic examination of counterfeit audiovisual products (based on criminal case files). Monograph, ed. Professor V. Yu. Shepitko. Kharkiv: *Pravo*, available at <http://dspace.nlu.edu.ua/bitstream/123456789/648/1/AvdeevaMono.pdf>
2. The Law of Ukraine “On Distribution of Copies of Audiovisual Works, Phonograms, Videogames, Computer Software, Databases”, available at <https://zakon.rada.gov.ua/laws/show/1587-14>

3. Lelotko Yu. I. The official web portal of the Verkhovna Rada of Ukraine. Available at http://elar.naiu.kiev.ua/jspui/bitstream/123456789/9057/1/%D0%A1%D0%A3%D0%94%D0%9E%D0%92%D0%9E-%D0%95%D0%9A%D0%A1%D0%9F%D0%95%D0%A0%D0%A2%D0%9D%D0%90_p218-220.pdf
4. The Order No. 591 of the Ministry of Internal Affairs of Ukraine dated 17/07/2017. The official web portal of the Verkhovna Rada of Ukraine. Available at <https://zakon.rada.gov.ua/laws/show/z1024-17>
5. The draft Law of Ukraine “On Amendments to Certain Legislative Acts of Ukraine”, registration No. 2565 of 10/12/2019. The official web portal of the Verkhovna Rada of Ukraine. Available at http://w1.c1.rada.gov.ua/pls/zweb2/webproc4_1?pf3511=67591
6. Chvankin V.A. *Osobennosti otdel'nyh kriminalisticheskikh issledovanij produkcii, obladajushhej priznakami kontrafaktnosti* [Features of individual forensic studies of products with signs of counterfeiting.]: posob. / V.A. Chvankin, A.L. Poskreblo. – Minsk, 2005.
7. Forensics research of firearms, bullets and gunshot marks (forensic ballistics). Available at <http://elar.naiu.kiev.ua/jspui/handle/123456789/10710>
8. "Lost Opportunities" of previous studies in the current Criminal Procedure Code of Ukraine. Available at <http://elar.naiu.kiev.ua/jspui/handle/123456789/9567>