

Identification examination of cartridge cases fired from Glock 17 pistols with consecutive factory serial numbers

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Abstract

The article discusses the results of examinations concerning the identification of three Glock pistols from a single production run. The examinations involved obtaining reference material in the form of cartridge cases and analysing the marks reproduced on the case heads for their individuality.

Keywords: individual identification of firearms, pistol, cartridge case, marks.

Introduction

Since the beginnings of forensic firearms examination, the possibility of the individual identification of firearms has been of interest to forensic experts and, at the same time, a source of numerous discussions and doubts concerning the persistence and uniqueness of the marks imparted by the individual parts of firearm mechanisms.

One of the pioneers of forensic firearms examination in Poland was Deputy Inspector (podinspektor) Józef Piątkiewicz, head of the Technical Laboratory of the Investigation Service Headquarters (Centrala Służby Śledczej) in Warsaw, who conducted an experiment designed to demonstrate the uniqueness of the marks imparted by firearm mechanisms on ammunition components. He published the results of his examinations in 1928 in the article "Identyfikacja broni palnej" [Identification of firearms], which appeared in the periodical "Na Posterunku. Gazeta Policji Państwowej" [On Duty. State Police Gazette] (No. 28). Using three pairs of pistols with consecutive factory serial numbers, he carried out test-firing and subjected the bullets and cartridge cases obtained to comparative examination. As a result, he found that "cartridge cases and bullets fired from completely new weapons already possess distinctive characteristics which make it possible to carry out an absolute identification" [translated from Polish].

Several decades later, in 1986, Major Maciej Rozbiewski, MSc Eng., Senior Expert at the Firearms Examination Department of the Forensic Science Institute of the Citizens' Militia Headquarters, in the article "Kierunki Rozwoju Kryminalistycznych Badań Broni Palnej" [Directions of development of forensic firearms examination], published in the book "Kryminalistyka wczoraj – dziś – jutro" [Forensic science yesterday – today – tomorrow], drew attention to the impact of technological progress on the identification capabilities of forensic firearms examination. The author pointed out, among other things, the consequences of increasingly precise technologies for manufacturing firearm components:

"The coming years will confront forensic firearms examination with even more difficult problems. These will be qualitatively new tasks that do not fit within the concept of the methods and means used to date. [...] as a result of the continuous improvement of the technology for manufacturing small arms and ammunition, and in particular the increasingly precise machining of individual firearm components, the number of individual characteristics formed on them in the production process is decreasing." [translated from Polish]

The development of firearm component manufacturing technology, including the widespread use of CNC machine tools and the

increasing repeatability of production processes, means that the question posed years ago about the possibility of individually identifying firearms on the basis of the marks left on fired ammunition components remains relevant.

Almost one hundred years after the publication of the results of Józef Piątkiewicz's examinations, and in view of the rapid development of technologies for producing firearms and their components, the Firearms, Toolmark and Road Accident Examination Department of the Central Forensic Laboratory of the Police (CFLP) undertook to assess whether present-day pistols from the same production run and bearing consecutive serial numbers still leave on fired cartridge cases characteristics that allow their individual identification.

Course of the examinations

Brand-new Glock 17 pistols from the same production run and bearing consecutive serial numbers were delivered to the Firearms, Toolmark and Road Accident Examination Department of the CFLP. For the purposes of this study, the individual pistols were designated with the numbers 1, 2 and 3.

Three shots were fired from each pistol at the test station using brand-new cartridges of Czech manufacture. The cartridge cases obtained were marked with the number corresponding to the pistol from which they had been fired.

Microscopic examination

The first stage of the examinations comprised a preliminary assessment of the marks obtained on the cartridge cases using a Leica MZ6 stereomicroscope. The marks imparted by the parts of the firearm mechanism were analysed, including those of the firing pin, the breech face and the ejector. The assessment showed that the marks obtained were reproducible and suitable for further examination.

The next stage was to enter the cartridge cases into the BalScan automated ballistic identification system. The surfaces of the case heads were scanned with a laser beam, producing a three-dimensional image of their surfaces. The highest available image quality was selected for scanning. The 3D images obtained made further examination possible.



Fig. 1. Cartridge cases fired from three different Glock 17 pistols. From left: pistol No. 1, No. 2 and No. 3

The cartridge cases entered into the BalScan system were then examined to assess the reproducibility of the imparted marks. The examination showed that the marks imparted by the individual parts of the firearm mechanisms were sufficiently reproducible to

allow comparative examinations aimed at the individual identification of a specific firearm.

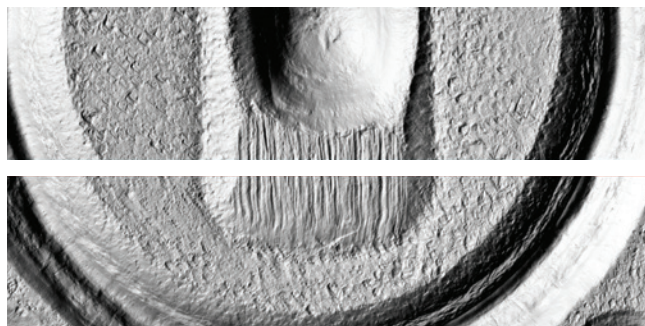


Fig. 2. Examples of side-by-side comparisons of features on cartridge cases from the pistol designated No. 1

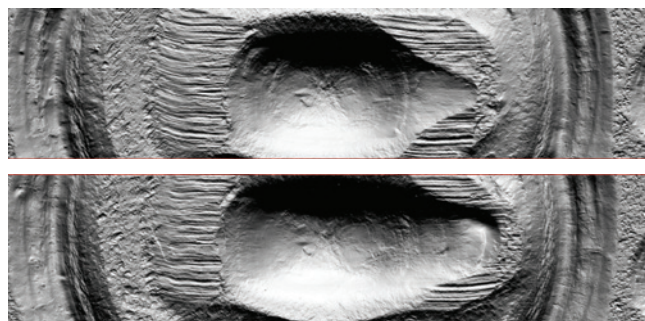
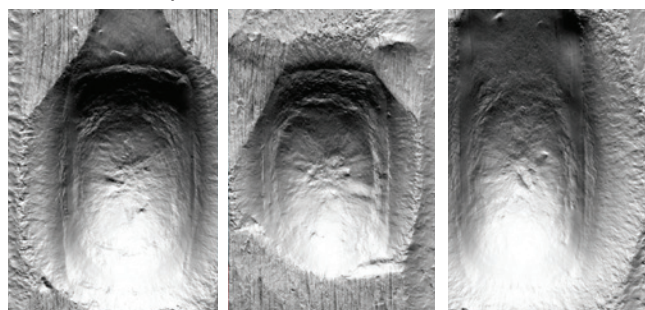


Fig. 3. Examples of side-by-side comparisons of features on cartridge cases from the pistol designated No. 1

Firing pin impressions

The firing pin impressions were compared first.

The firing pin is an interchangeable part fitted during the assembly of the firearm. In the case of the pistols analysed, the firing pin impressions did not show features allowing them to be identified with one another. The impressions examined differed between the individual pistols.



Fot. 4. Firing pin impressions of the firearms examined. From left – pistol No. 1, pistol No. 2, pistol No. 3

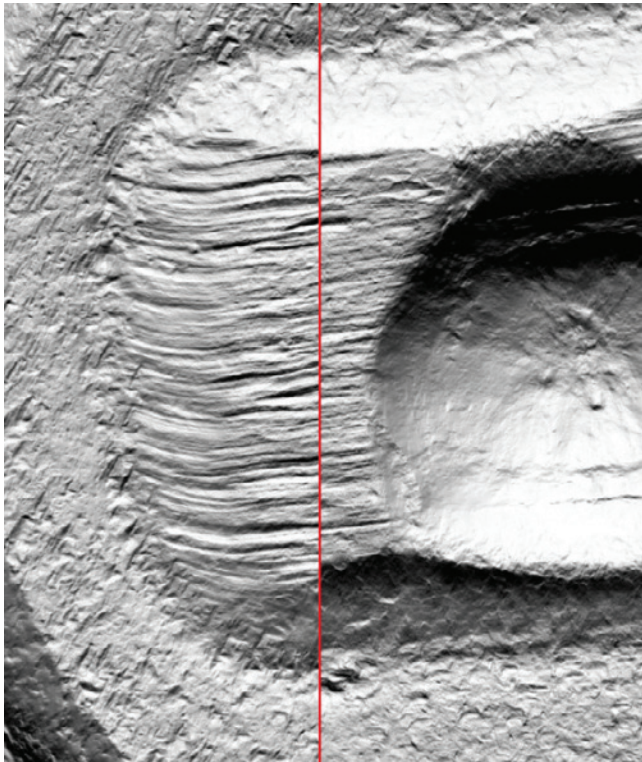
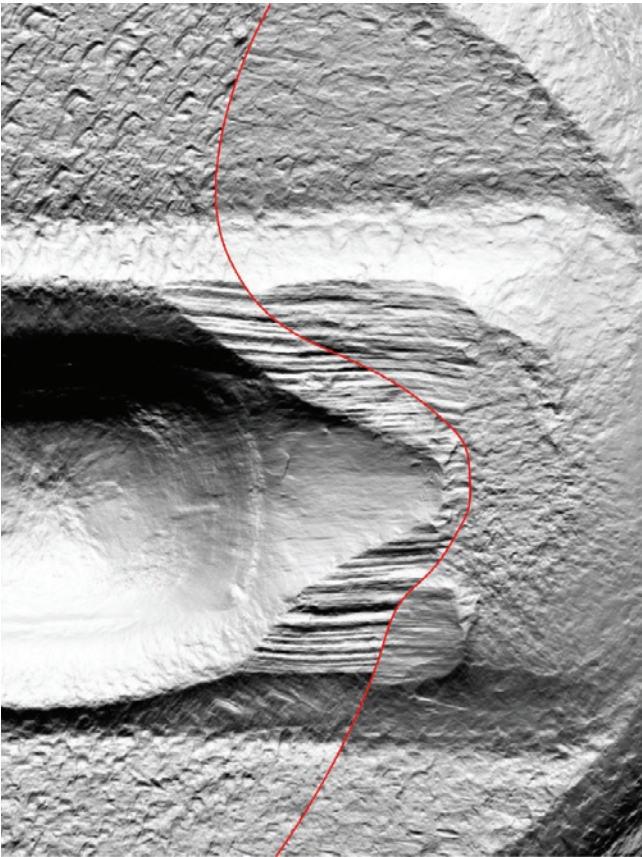
Breech face marks

The breech face marks were the next element subjected to comparative examination.

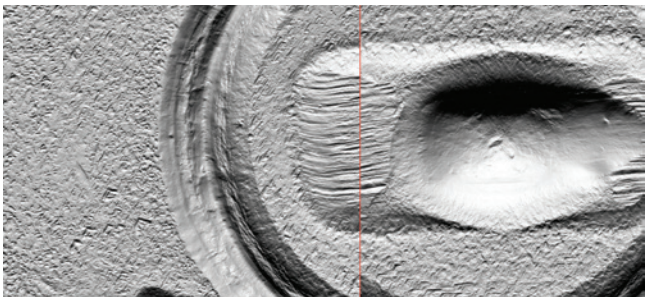
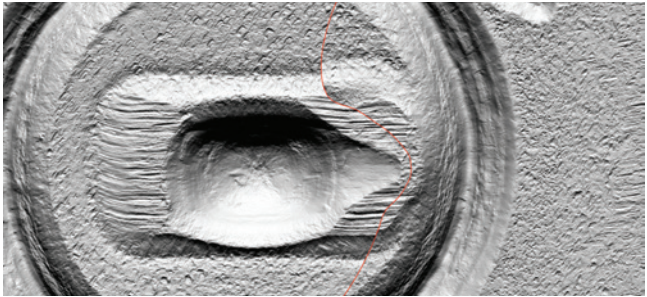
Present-day firearm components are to a large extent manufactured using CNC machine tools. The production process may involve a series of successive machining operations in which the same tool may be used to make many components. The tool used in machining leaves characteristic micro-irregularities on

the machined surface. In the case of the breech face, these may then be reproduced on the cartridge case head, in particular on the surface of the primer cup.

Since the pistols examined came from the same production run and bore consecutive serial numbers, it could be hypothesised that they had been manufactured at about the same time using the same technological



Figs. 5, 6. Side-by-side comparison of the breech face marks of pistol No. 1 (left) and pistol No. 2



Figs. 7, 8. Side-by-side comparison of the breech face marks of pistol No. 1 (left) and pistol No. 3

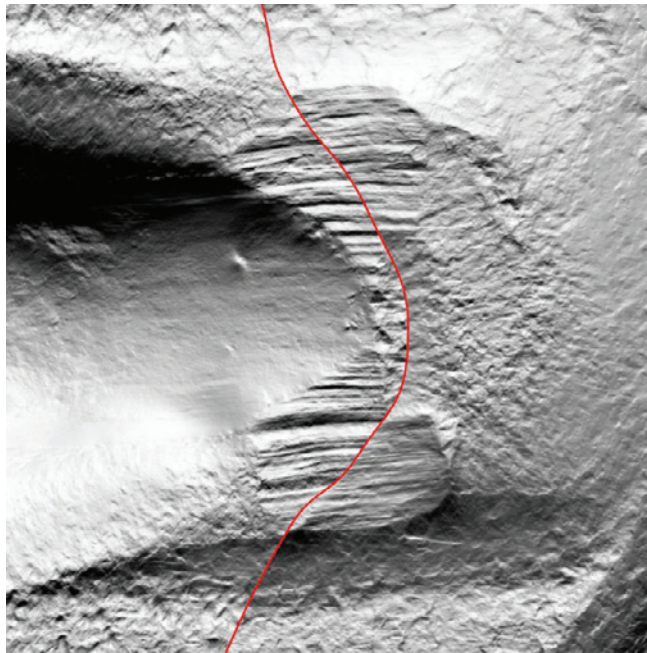


Fig. 9. Side-by-side comparison of the breech face marks of pistol No. 2 (left) and pistol No. 3

processes and potentially also the same machining tools. For this reason, particular attention was paid to assessing whether common features occurred in the breech face marks of the individual pistols.

The comparative examination showed a similarity in the general character of the striations reproduced on the primer cup surfaces of the cartridge cases examined from pistols No. 1 and No. 3. However, the features identified showed only a low degree of mutual agreement.

Micro-irregularities reproduced on the surface of a cartridge case are of significant importance in the process of individual identification. The examination must take into account the dynamic nature of the mark formation process, as a result of which the degree and

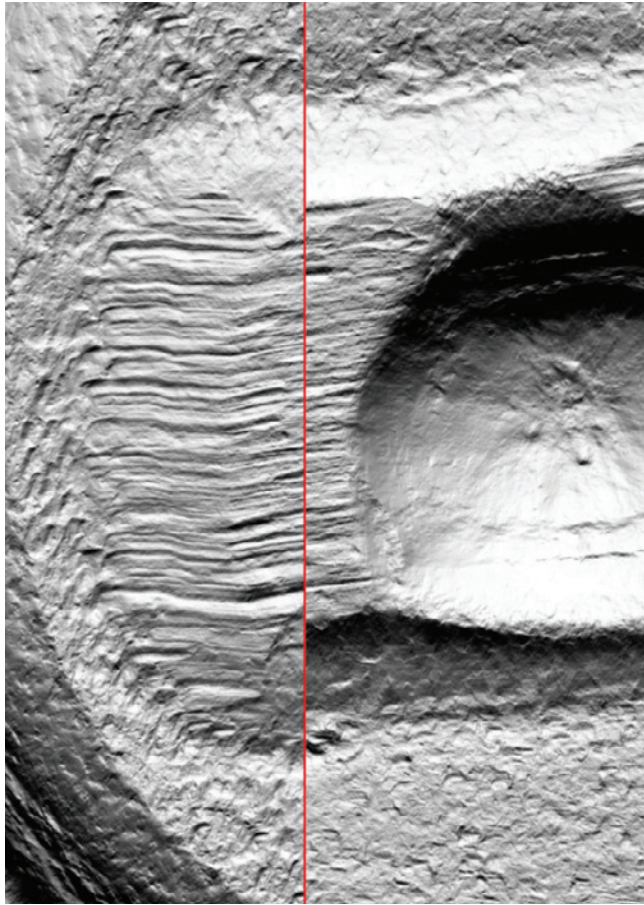


Fig. 10. Side-by-side comparison of the breech face marks of pistol No. 2 (left) and pistol No. 3

extent to which particular irregularities are reproduced may vary between successive shots; identification examinations should therefore allow for the possibility of incomplete reproducibility of the marks.

Ejector marks

The ejector marks were the next element subjected to comparative examination.

Like the firing pin, the ejector is an interchangeable part. In the pistols examined, the ejector marks did not show a similarity that would allow their identification. The differences between the marks were a further feature distinguishing the pistols examined.

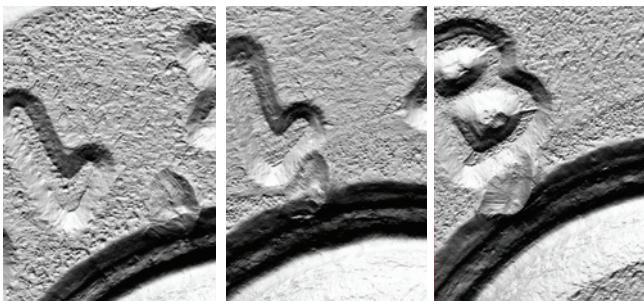


Fig. 11. Ejector marks: from left – pistol No. 1, pistol No. 2, pistol No. 3

Conclusions

In the material examined, originating from pistols with consecutive factory serial numbers, the breech face marks showed characteristics that individualised each of the pistols. Despite the similarity of the marks on the cartridge cases from pistols No. 1 and No. 3, it was possible to establish differences between them. These results indicate that a high repeatability of the manufacturing process need not lead to the complete elimination of marks that can be used in individual identification.

At the same time, identification examinations should not be limited to breech face marks alone. Marks imparted by interchangeable parts, such as the firing pin, the ejector or the extractor claw, remain an important complement to the examination. Taking them into account together may increase the identification value, particularly where the marks are highly similar.

On the basis of the material examined, it can be concluded that the individual identification of present-day firearms on the basis of marks reproduced on fired cartridge cases is still possible, but requires increased caution in evaluating the marks. Technological evolution results in less distinct marks and, consequently, increasingly advanced equipment is needed to examine them.

Figures: author's own

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