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Case report

A simple method to compare firing pin marks using stereomicroscope and Microsoft office (Windows 8) tools

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ABSTRACT

Pertinent marks of fired cartridge cases such as firing pin, breech face, extractor, ejector, etc. are used for firearm identification. A non-standard semiautomatic pistol and four .22 rim fire cartridges (head stamp KF) is used for known source comparison study. Two test fired cartridge cases are examined under stereomicroscope. The characteristic marks are captured by digital camera and comparative analysis of striation marks is done by using different tools available in the Microsoft word (Windows 8) of a computer system. The similarities of striation marks thus obtained are highly convincing to identify the firearm. In this paper, an effort has been made to study and compare the striation marks of two fired cartridge cases using stereomicroscope, digital camera and computer system. Comparison microscope is not used in this study. The method described in this study is simple, cost effective, transport to field study and can be equipped in a crime scene vehicle to facilitate immediate on spot examination. The findings may be highly helpful to the forensic community, law enforcement agencies and students.

1. Brief case history

A case was received in the author's laboratory to examine the weapon so as to ascertain its serviceability with respect to legal provisions of law of the land in force. The items sent to the laboratory are (a) one improvised pistol with empty magazine and (b) four rim fire cartridges of .22 in. caliber (head stamp KF). From the constructional features (Figs. 1–4) of handgrip, action mechanism, barrel punching mark, unskilled barrel slide lock & magazine release, poor rifling pattern and absence of any visual identifiable characteristic feature of a factory made firearm, it has been concluded that it is a locally made pistol, generally referred to as "improvised" pistol. Two rounds were test fired in the laboratory successfully. So the pistol was found to be in working order and two rounds were live before test fire. The fired cartridge cases ejected out automatically and bullet passed out through the muzzle end of barrel during each test fire. These two test fired cartridge cases were used for studying the marks produced by the firearm. The base of four unfired .22 rim fire cartridges are shown in Fig. 5 and the base & mouth of two test fired .22 rim fire cartridge cases are shown in Figs. 6 and 7 respectively. For this study, a Stereozoom Trinocular Microscope, Model RSM-9 Series, supplied by a manufacturer in India has been used (refer Fig. 8). The various features of the stereomicroscope are given in Table 1.

2. Use of stereomicroscope

In certain circumstances, comparison microscope could not be used for examination such as (a) non-availability of the microscope for on-site examination, (b) not easily transportable due to bigger in dimension, space & platform (c) any other technical reason. In the author's laboratory, the comparison microscope is not available at present (soon it will be procured). However, stereomicroscope is available. The circumstances prompted the author that without comparison microscope, how better the stereomicroscope with the available resources can be used to conduct tool marks examination in firearm identification from a known source. Accordingly a stereomicroscope, a digital camera and a desktop computer are used to study the feasibility of comparison of markings on fired cartridge cases.

It is well known that stereomicroscope is the simple type of microscope with respect to its construction and use. The stereomicroscope consists of two compound microscopes aligned side by-side at the correct visual angle to facilitate a true stereoscopic view of the object under observation. The working distance (between the sample and objective lens), upright non reversed image and large field of view make the stereomicroscope

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Fig. 1. Firearm (improvisically made pistol, rimfire .22 in.).

of choice for preliminary examinations of evidence. Samples can be prepared for more detailed microscopic/instrumental analyses or comparisons. The extended working distance and incident light illumination (used in this case study) to the sample are added benefits. The sample or sample area is cleaned and just placed or mounted on the stage under the microscope and observation can be started. The magnification range of stereomicroscope is as low as 2.5× and can go up to 100× or more. Modern stereomicroscopes are coming up with some added features which increase the range of its applications and use. A choice of illuminators are also available to provide bright field and dark field reflected, fluorescence and transmitted light permit the examiner/analyst to observe the microscopic details of sample. Various attachments are readily available to use the microscope for viewing larger objects such as garments, dust & debris, serial numbers, design, striations, etc. Documentation of microscopic observations can be done by photography and videography by attaching suitable digital cameras for later reference or court demonstration purposes. Stereomicroscope can be used by any test scientist or laboratory staff with a little training and working knowledge.

Fig. 2. Constructional features of improvised pistol.

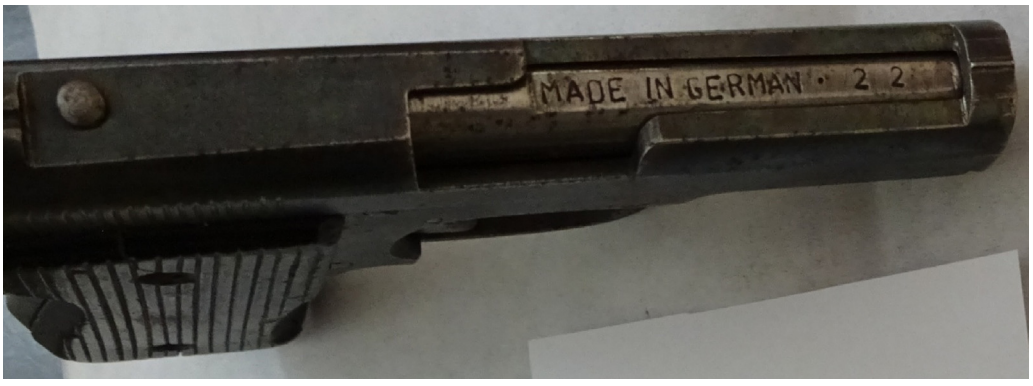

Fig. 3. Punching of "MADE IN GERMAN .2 2" on the top of barrel of pistol.