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IDENTIFYING BALL PENS BY THE BURR STRIATIONS

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EDITOR.

It would often be useful in document examination to be able to identify two different writings or two different portions of the same handwritten document as having been written with the same ball pen. An example is a problem where it is charged that a handwritten entry has been added to at a later date after a lawsuit arose. A project recently completed indicates that such identification may well be possible in a certain percentage of cases.

For quite some number of years document examiners have noticed that some ball pen writings contain minute blank streaks or striations in their strokes which seemed to be individualized. These appeared to be distinct from the familiar grosser, more obvious longitudinal blank streaks which occur in a greater number of ball pen writings as a class characteristic. The latter are caused by failure of the ink to fully cover the ball in its rotation in

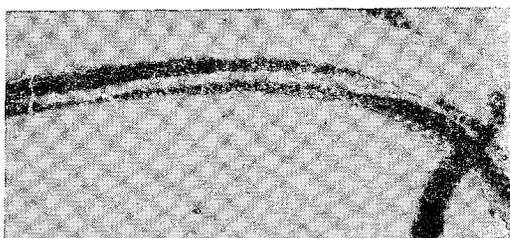


FIGURE 2

“Non-burr” striation, or typical gross blank streak not caused by machining process but by failure of ink to fully cover ball in its rotation in housing. Such a streak is not individually distinctive but is a class characteristic.

the housing of the pen. The former however appear to be caused by some individualized mechanical condition of individual ball pens.

A project was undertaken to examine into the nature and possible utility of these minute striations. As a consequence it was concluded that it is possible in a certain percentage of cases to identify two different writings as having been written with the same ball pen by means of this feature.

A set of approximately two hundred Christmas card envelopes was examined microscopically. It was found that approximately eighty per cent of them were written with a ball pen. Of these approximately thirty-seven per cent possessed the type of distinctive striations described, representing thirty per cent of all the writing instruments used. In addition to this study of ball pen writings numerous ball pen tips and balls themselves were examined in an effort to determine what caused the distinctive striations.

In the examinations conducted it was found that microscopic observation between ten and fifteen diameters magnification was the most useful.

Ink strokes containing these striations consist of a pattern of successive inked and uninked or blank



FIGURE 1

Tip of ball pen showing five blank striations on ball

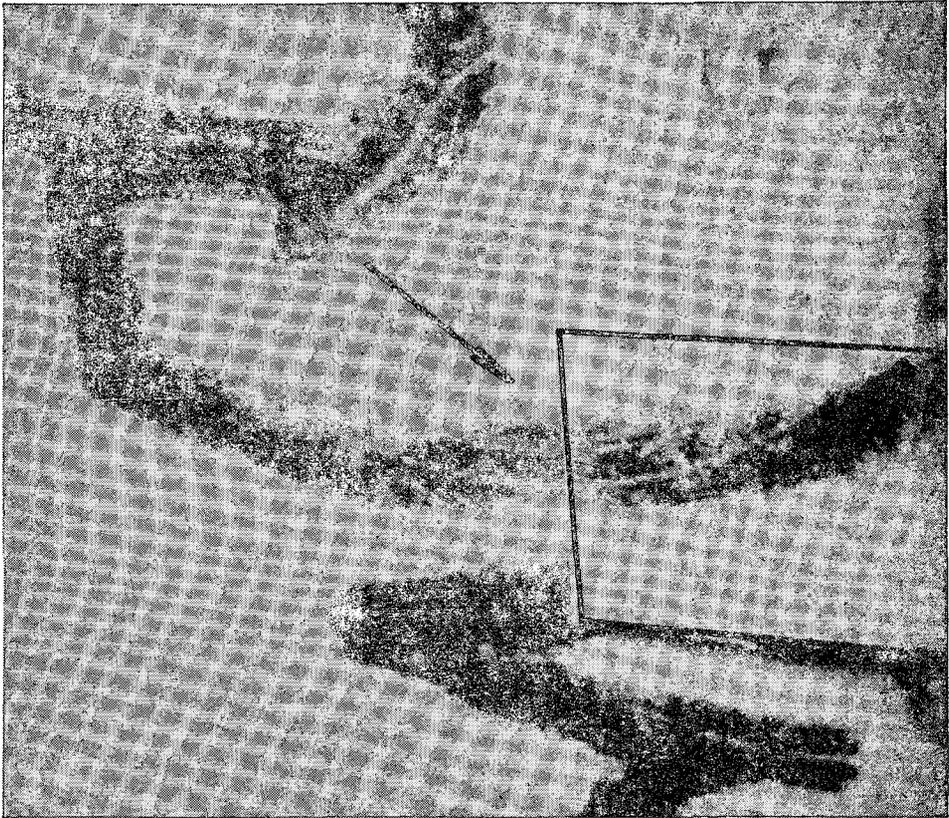


FIGURE 3.

Wedge of paper bearing one ink stroke (outlined in black) positioned on top of another stroke, showing similar striation pattern. (arrow)

of a ball pen stroke. They can also occur at the turn of a stroke. Examination of ball pen tips shows that these patterns are also found in the ink covering the ball. They are apparently caused by something on or within the housing of the ball, which appears to be minute burrs or projections of metal left by the machining process or irregularities on the machined surface of the housing holding the ball. These burrs or irregularities apparently scrape ink off the ball to an extent and in a manner matching their form (figure 1). This condition is then transferred to the ink strokes on paper when the pen is used. A wide variety of patterns was found in the specimens examined.

Each section of the circumference of the housing holding the ball of a ball pen has its own characteristics, and only about an eighth of it registers on the paper via the ball in any one ink stroke. Thus it is possible to have different patterns produced by the same pen, all of which may possibly be of use in identifying strokes made by that pen. A

single writing may thus have more than one such pattern. The big problem of course is to find matching patterns.

As previously indicated, it is necessary to distinguish these individualized striations from the grosser longitudinal blank streaks which are a class characteristic of defectively operating ball pens and are not therefore individually identifying (figure 2).

In the examinations conducted a small wedge or segment of paper bearing an ink stroke was cut from one area of an envelope and laid on top of or alongside another ink stroke on the envelope, as shown in figures 3 and 4. Each of the sets was taken from two different locations on the same envelope, so that there was no question that the same pen was used.

This method would of course not be permissible in actual cases. It would be necessary to make the examination using a comparison microscope or by means of photomicrographic comparison. In prin-

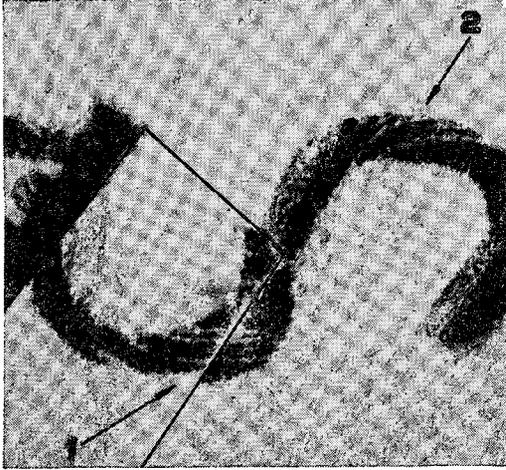


FIGURE 4

Wedge of paper bearing a curving ink stroke (outlined in black) positioned alongside another curving stroke, showing similar striation pattern. (arrow No. 1) Note that the same striation pattern again appears at arrow No. 2.

ciple and demonstration the procedures are analogous to bullet striation comparisons and tool mark comparisons.

If one or more sufficiently distinctive matching patterns are found in the strokes in two portions of writing compared, and if the other pen operating characteristics are similar or consistent, and if the ink is identical, then in this practitioner's opinion a determination that the same ball pen was used is in order.

Factors to be considered in weighing the identification value of patterns found are the number of blank striations, their width, their location in respect to each other in the ink stroke, and the width of the inked portions between them. The greater the number of striations and the more distinctive its other features, the greater is the identification value of the pattern, of course.

The angle of the striation pattern relative to the base line of writing need not be the same, as this will change with the rotational position of the pen in the writer's hand and with the location of the pattern in the strokes of letters.

The factors and techniques described herein provide the document examiner with a means of individualizing and identifying certain ball pens.