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TECHNICAL NOTE

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Removing Interfering Contaminations from Gelatin Lifters

ABSTRACT: Gelatin lifter is widely used for recovering shoeprints from crime scenes. Dusty shoeprints removed from paper with loose fibers, cloth or plasterboard, might be concealed by the detached fibers. A novel technique to clean the gelatin lifter from the interfering contaminations, using adhesive lifters, was developed. The adhesive lifter is applied directly on the surface of the gelatin lifter, and is removed instantly. The adhesive lifter removes the upper layer of the attached material on the gelatin lifter. After removing the concealing material from the hidden imprint, the quality of the visualized imprint is improved. The cleaning process can be applied as many times as needed and the optimum number is different for each substrate. The small dust particles comprising the shoeprint remained attached to the sticky side of the gelatin lifter even though the adhesion force applied by the adhesive lifter is great. Repeating the procedure too many times could harm the quality of the print severely, yet the advantages of this method are greater than the risks of relocation of image quality reduction.

KEYWORDS: forensic science, press method, gelatin lifter, adhesive lifter, shoeprints

Several methods are described in professional literature for lifting dusty shoeprints: electrostatic lifting (1), lifting with an adhesive lifter (2), and lifting with a gelatin lifter (3). In a previously published paper, a new method for lifting dusty imprints from different substrates was described (4). The "press method" was compared with conventional methods of electro-static lifting and adhesive lifters. On most substrates the press method yields equal or better results than the other methods. It was found that "exerting uniform pressure on gelatin lifters by the hydraulic press contributes significantly to the quality of the comparison of weak shoeprints imprinted on smooth or rough surfaces. Lifting shoeprints with the hydraulic press is relatively simple, convenient to operate, and very rapid" (4).

Adhesive lifters used for removing dusty shoeprints were found to be too destructive for loosely fibrous materials such as paper and corrugated cardboard (4) due to their very strong adhesive force (5). The gelatin lifters, however, collect less dust than adhesive lifters and therefore, are more suitable for lifting shoeprints from loosely fibrous materials.

The disadvantage of the press method arises when lifting shoeprints from surfaces containing many loose fibers. On fibrous materials such as paper, clothes (flannel) and corrugated cardboard, the internal texture of the cardboard was sometimes lifted together with a large quantity of fibers. This phenomenon causes the dusty footwear imprints to be covered with the displaced fibers, and therefore invisible to the examiner.

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By applying the press method in numerous cases, the authors obtained good results that were found to be superior to conventional methods of gel or electro-static lifting, even though there were a few cases in which the screening of lifted fibers made it difficult to examine the shoeprint.

The authors' hypothesis is that under the detached loose fibers, the lifted shoeprint exists, although the examiners are unable to see it clearly.

It is also assumed that adhesion of small particles of dust to the adhesive layer of the gelatin lifter is greater than the adhesion of larger screening fibers.

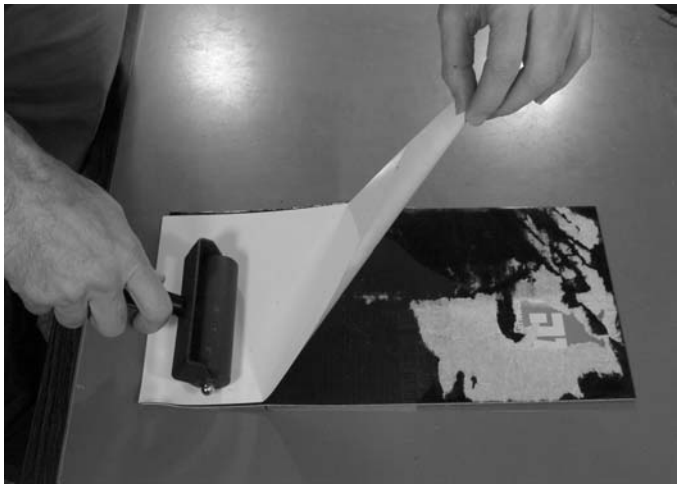

FIG. 1—*Applying an adhesive lifter directly to the surface of the gelatin lifter, covered with screening fibers.*

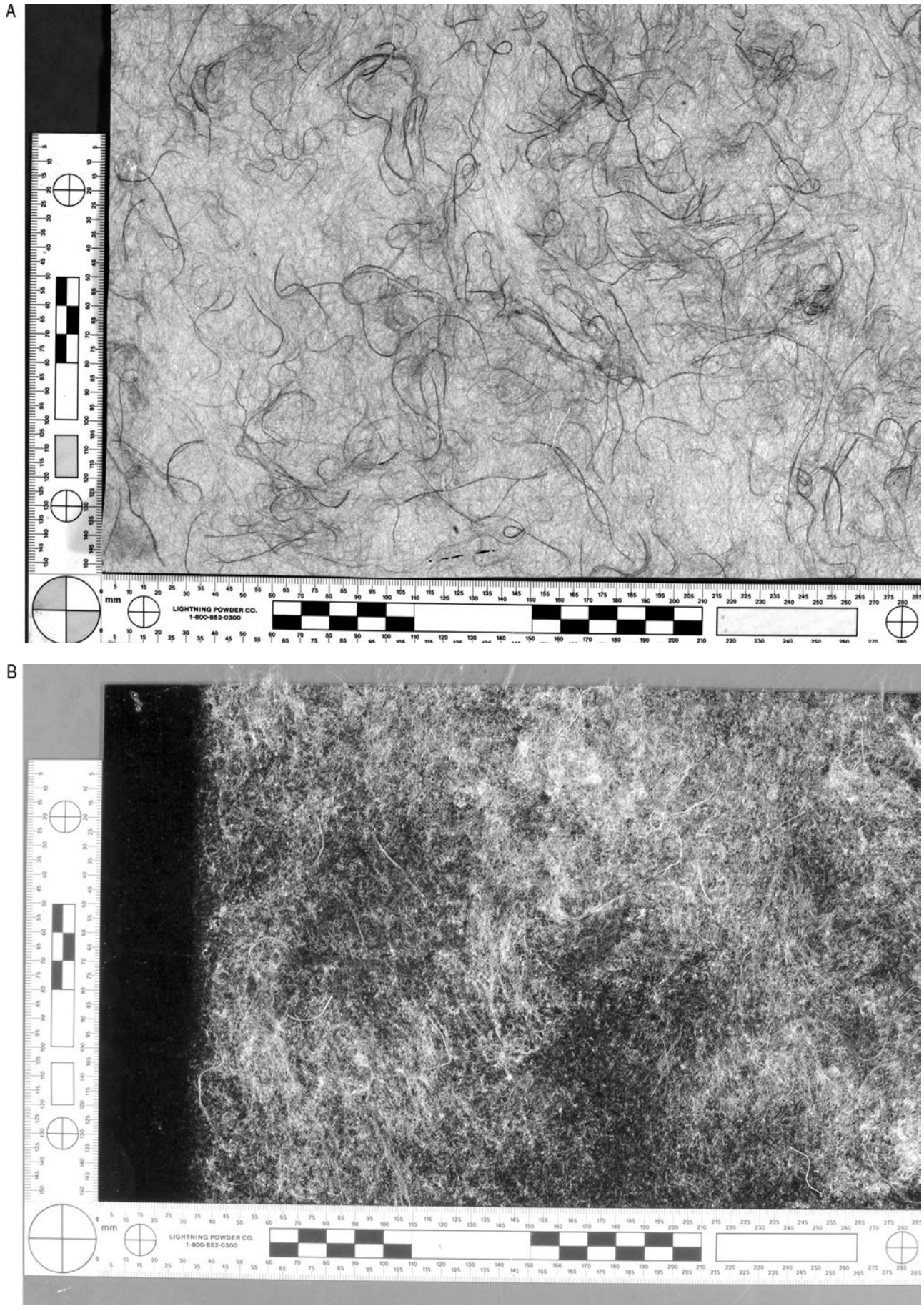

FIG. 2—*A: Hand made fibrous paper with shoeprint, before treatment. B: The gelatin lifter with paper fibers on it after it was applied to the paper.*

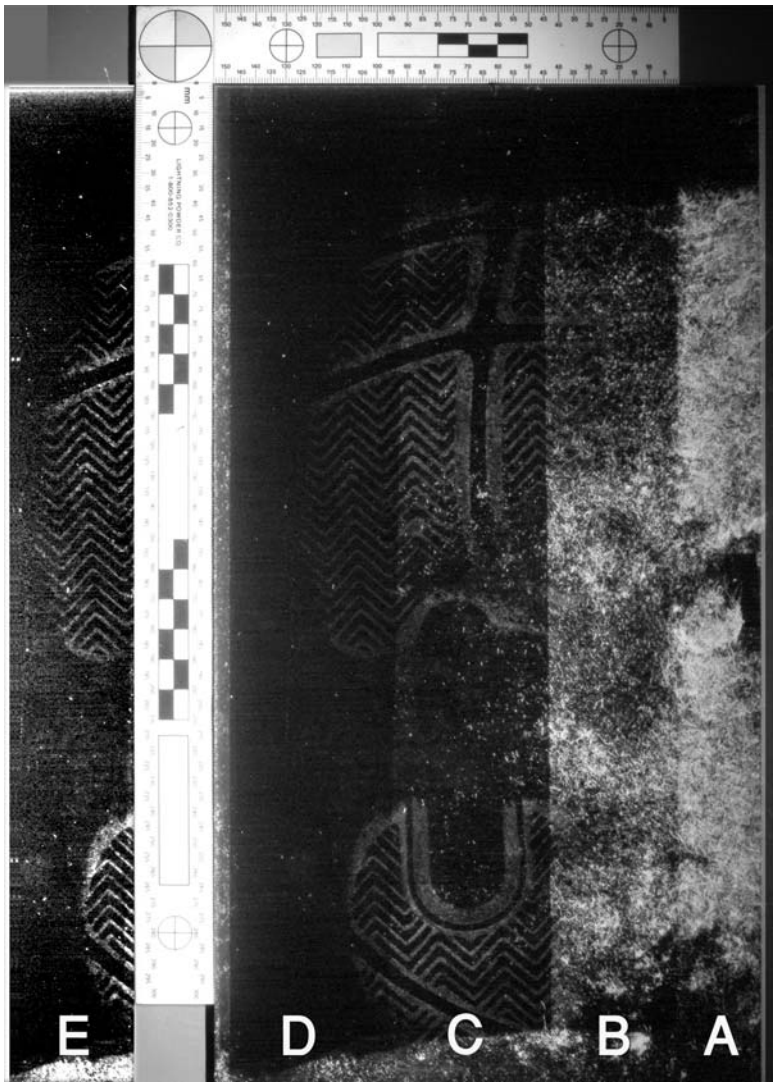

FIG. 3—*The four stages of the cleaning procedure (from right to left) done on contiguous panels of the same lift: A: The original lifting of the fibrous substrate. B: After one removal, partial subtraction in the intensity of the detached fibers. C: After second removal, good image discovered. D: Third consecutive adhesive cleaning. E: The third step enhanced photographically.*

Experimental

Several shoeprints were placed on fibrous substrates such as corrugated cardboard, flannel cloth and hand-made fibrous paper (Fig. 2*A*.) The press method was then applied. Black 180 × 360 mm^2 size gelatin lifters (BVDA International BV, PO Box 2323, 2002 CH, Haarlem, Netherlands) were used for lifting the dusted imprints. Pressure was applied using an adjustable pneumatic press with a 30 × 30 cm^2 table (6.) This was done for a period longer than necessary (one minute instead of the usual 5 to 10 sec.) In most cases the result was concealing of the dusty shoeprints by detached fibers of the substrates.

The authors then applied a 333 × 175 mm^2 size adhesive lifter ("white JAC vinyl" manufactured by "Industrial Self Adhesives Ltd", Nottingham, England) directly on the adhesive side of the gelatin lifter (Fig. 1.) This application was performed with a roller to prevent air pockets.

The adhesive lifter was removed immediately, and many of the concealing fibers were transferred to the adhesive lifter (Fig. 2*B*.) The procedure was repeated several times and each cycle was photographed. The cleaning adhesives were removed from the gelatin, photographed, and then treated with bromo-phenol blue, a reagent used to develop shoeprints in dust (2,5). The results are shown in Figs. 3 (the cleaning adhesives,) and 4 (the enhanced adhesives).

Results and Discussion

The long pressing time of the gelatin lifter in the press created conditions similar to several real cases, in which fibers prevented examination of the lifted shoeprint. This phenomenon occurs when the substrate exhibit is too loose, and the pressure was applied for too long (Fig. 2).

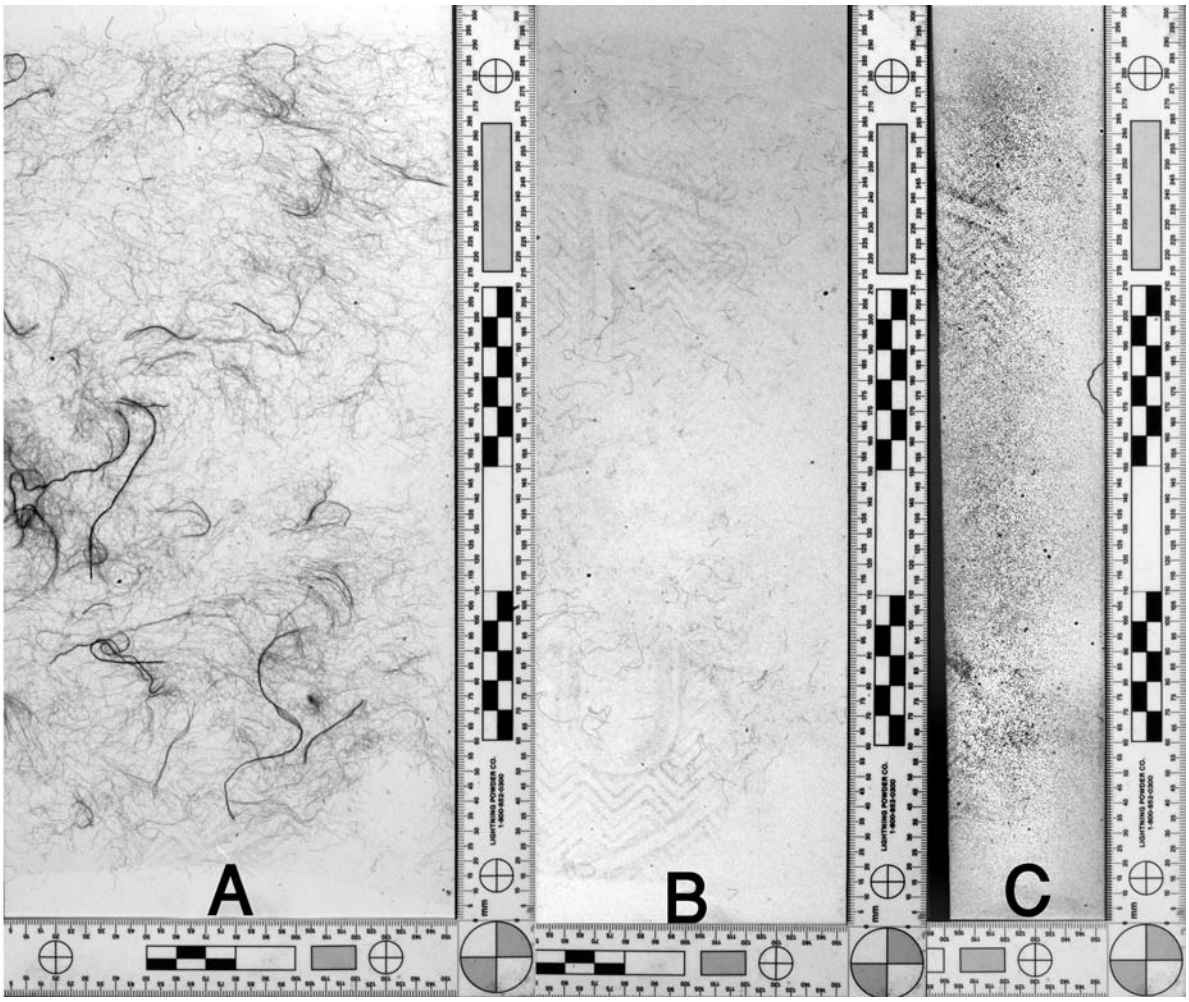

FIG. 4—*The three cleaning adhesive strips (from left to right): A: Many fibers removed from the gelatin lifter. B: The second strip removed smaller amounts of fibers. C: The third strip; unnoticeable amount of fibers removed from the gelatin.*

The authors' hypothesis, that the lifted shoeprint exists under the detached loose fibers, was proven. A clear shoeprint was discovered after the removal of the detached fibers. The quality of the visualized imprint was sufficient to find small individual characteristics that existed on the original shoeprint, adhering to the exhibit (Fig. 3.)

The gelatin lifter shown in Fig. 3 shows four stages of the procedure (from right to left); the first (marked "A") is the original lifting of the fibrous substrate. The second strip ("B"), after one removal, shows partial subtraction in the intensity of the detached fibers. The third strip ("C") shows the good image discovered after the second cycle of cleaning. The fourth strip ("D") shows the results of the third consecutive adhesive lifter. Although the mark looks weaker, after proper photographic enhancement ("E") it is well demonstrated that the print is very clear and lacks concealing particles.

A danger of applying this method was also discovered. The great adhesion of the cleaning lifter collected, amongst the loose fibers, some of the dust particles as well. This could create a decrease in the clearance of the lifted shoeprints if the process is continued beyond this cycle.

The results of this process were also observed on the cleaning adhesive strips. The first strip removed many fibers from the gelatin lifter (Fig 4-*A*); the next two strips removed less fibers (Figs. 4-*B*–4-*C*.) After enhancement, the strip showed a fade shoeprint beneath the fibers (Fig. 5-*A*). The second and third enhanced strips showed the shoeprint with even greater clarity, due to the smaller number of fibers (Figs. 5-*B*–5-*C*).

It is obvious that one should use the method very carefully; always keeping in mind that removal of screening fibers improves the quality of the shoeprint, but at the same time diminishes the amount of dust in the shoeprint. The cleaning process can be applied as many times as needed. On a gelatin screened by newspaper, twelve consecutive adhesive lifters were applied until the print was discovered beneath the newspaper fibers.

In Fig. 6, the changes in the image quality versus the cleaning cycles are described. It can be seen that the number of cleaning cycles in order to achieve maximum clarity, is different for each substrate.

The advantages of this method are greater than the risks of relocation of the dust on the gelatin lifter or image quality reduction.

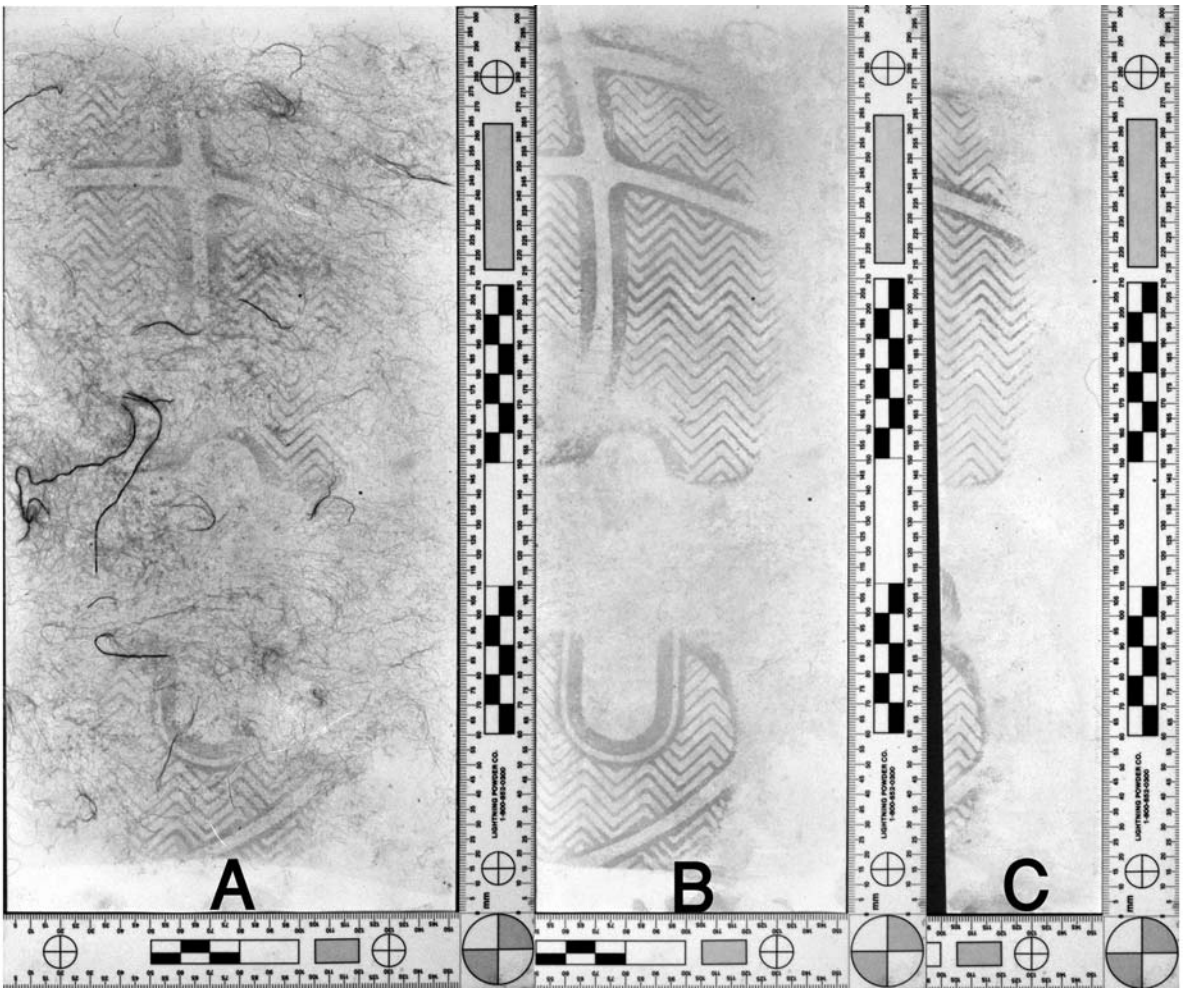

FIG. 5—*A–C: The three cleaning adhesive strips after chemical enhancement (from left to right):*

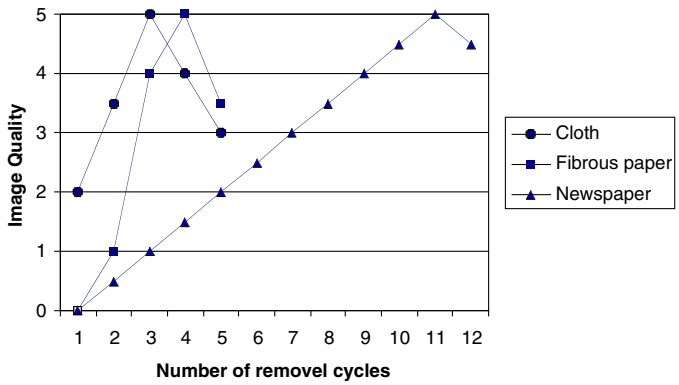

FIG. 6—*Improvement of the shoeprint versus the number of cleaning cycles applied on several substrates. On the Y axis-quality of the treated shoeprints graded from 1–5 (5 = best possible quality for this substrate). The X axis-the number of cleaning lifters used.*

This cleaning procedure was applied on a real case. A thin cardboard envelope with faint traces of partial shoeprints was accepted for examination in the toolmarks and materials laboratory (Fig. 7-*A*). The pressure from the pneumatic press was applied for ten seconds, which proved to be a significant mistake. In the photographs of the gelatin lifter after applying the pressure (Fig. 7-*B*), it is clearly seen that the fibers from the exhibit fully covered the latent shoeprints. An adhesive lifter was then applied with a roller directly on the gelatin lifter, as described above. The adhesive lifter was removed, and the gelatin lifter was photographed (Fig. 7-*C*). It can be seen that many fibers were removed, but the resultant print is still unclear.

Several cycles of this procedure were applied, and after using three adhesive lifters, the gelatin lifter looked clean enough. The last photograph (Fig. 7-*D*) shows the result of the full procedure.

Conclusion

It was clearly shown that the small particles of dust attached to the adhesive layer of the gelatin lifter, remained attached to the sticky side of the gelatin lifter. This occurred even though the adhesion force applied on the concealing fibers by the adhesive lifter is much greater.

Of course, repeating the procedure too many times could harm the quality of the print in a severe manner. This new technique is now operationally used in the authors' laboratory.

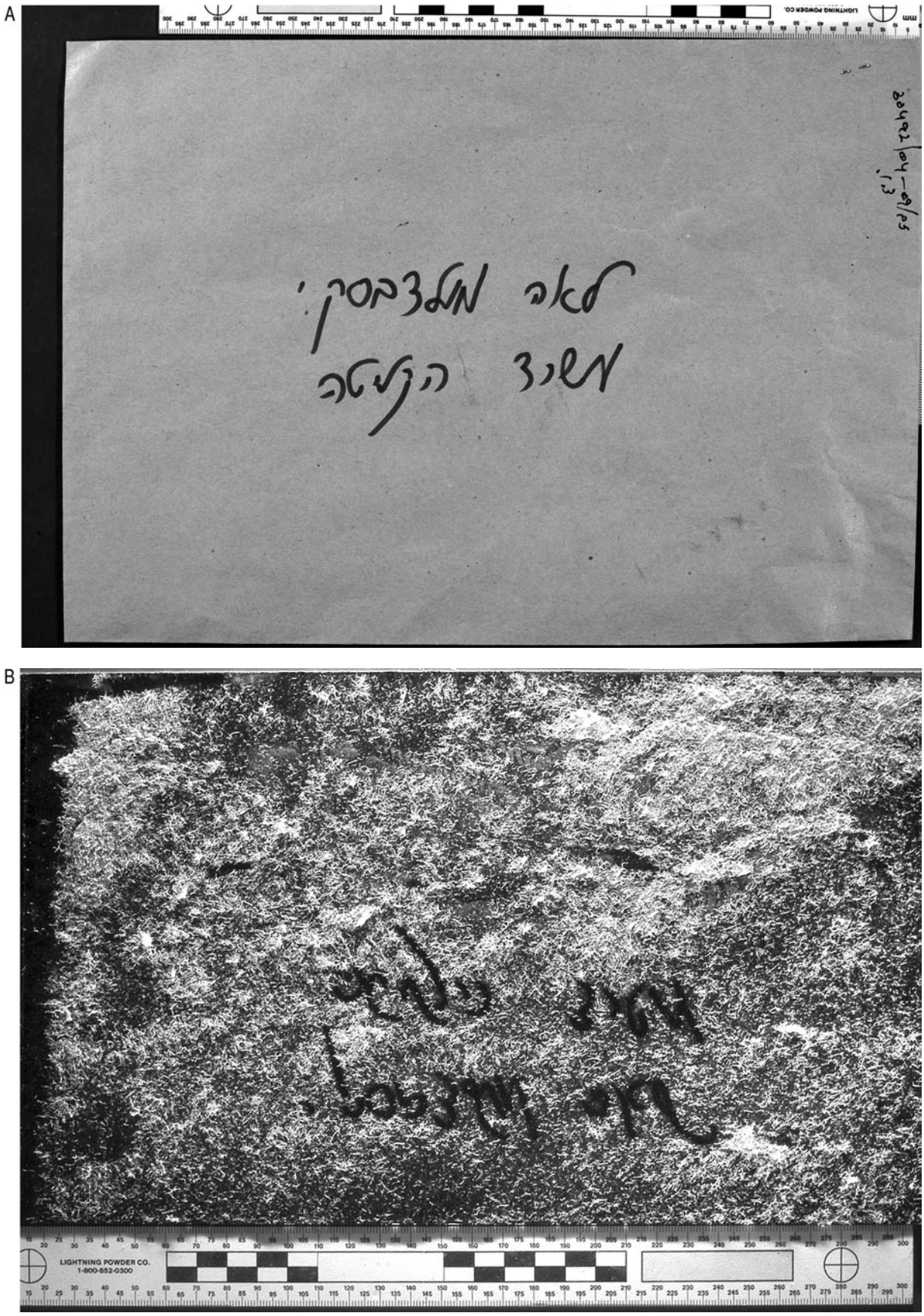

FIG. 7—*Application of the proposed method on a real case: a thin cardboard envelope with faint partial shoeprints, received in the authors' laboratory: A: The envelope received with a faint shoeprint on it. B: A gelatin lifter after applying pneumatic pressure for longer than necessary. C: The gelatin lifter after the first attempt to clear the surface of the adhesive layer. D: The final result of a gelatin lifter, after three cycles of adhesive lifter.*

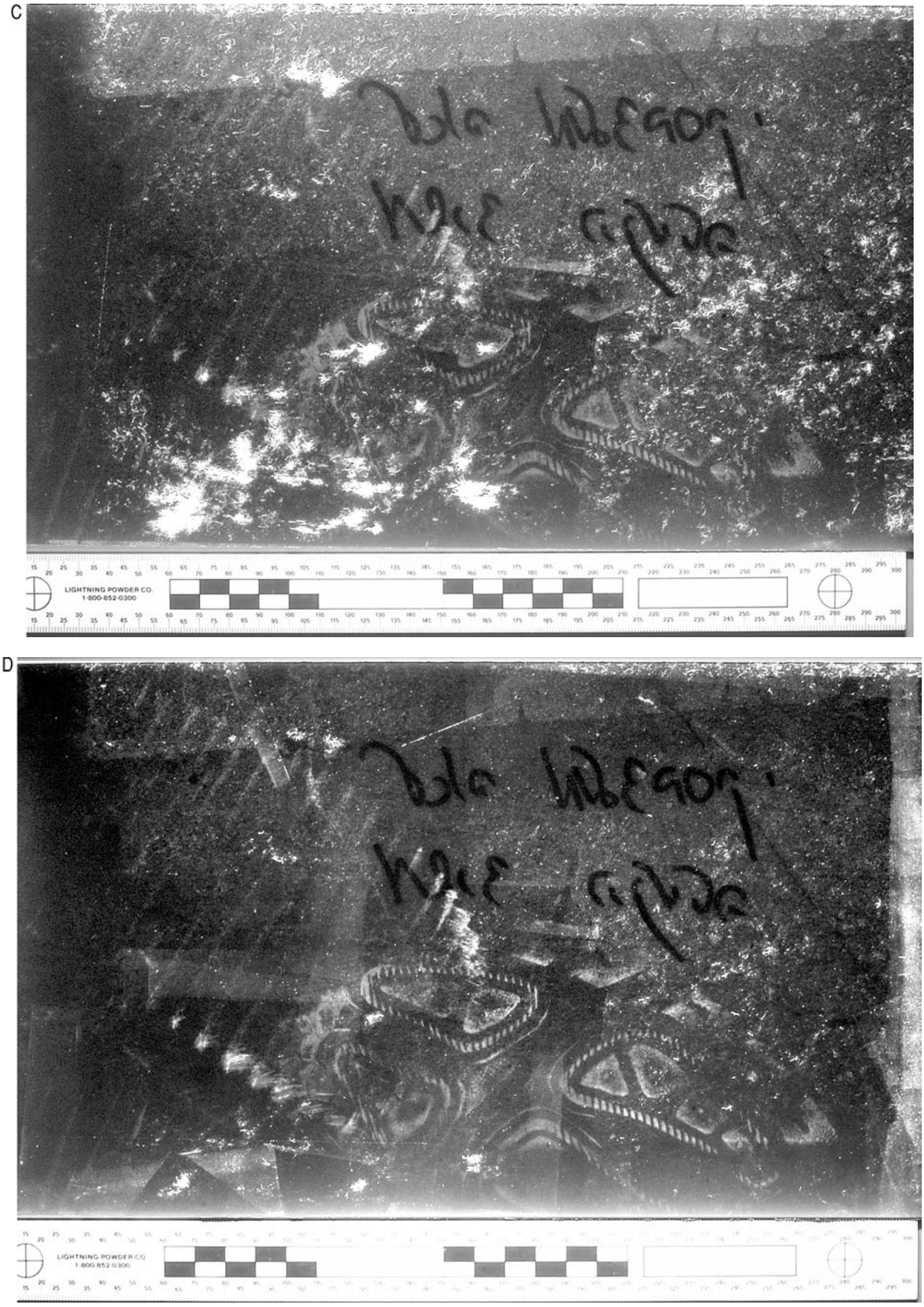

FIG. 7—*Continued*.

Acknowledgments

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