DEVICE FOR DETAIL REPRODUCIBILITY TEST OF IMPRESSIONS

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ABSTRACT

An assembled type original model was devised for the fine-line-reproducibility test of impressions. It consisted of a brass base and six stainless steel blocks assembled on it. Lines of exactly desired widths could be readily made by cutting one line on each of the blocks separately by using a scratch hardness tester with varying load. Six blocks of any series of different line widths could be assembled depending on the purpose of test. With this equipment, the limit of fine line reproducibility of an impression material on stone models can be readily determined.

One of the most important requirements for the indirect models produced from dental impressions is a high surface-detail reproducibility. For testing reproducibility, Miller, Hansen, and Dickson[1,2] have used a fine-line-reproducibility test with a 0.0015 inches (approximately 40 μ) wide line cut on a metal die surface and thought a combination of impression and die materials was acceptable when the line was reproduced on resultant dies.

Hosoda and Fusayama[3] have cut several lines of varying width from 8 to 40 μ on an original metal die for determining the limit of reproducibility of materials. It was, however, difficult to cut several lines of different widths which were accurate through their whole lengths and so some particular spots having exactly desired widths on those lines were selectively used. Ayers, Phillips, Dell, and Henry[4] have used a die having Knoop indentations of varying widths for testing detail reproducibility[4].

The American Dental Association Specification test adopted the fine-line-reproducibility test and used a stainless steel die having 16 lines of 25 to 300 micron widths[5,6]. There have, however, occurred some confusions due to inaccurate line widths since it is difficult to cut more than several lines of different widths accurately on a same die.

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In this study, a new testing die having six lines of different and exactly desired widths was devised.

MANUFACTURING THE TEST APPARATUS

The original die devised consisted of a brass base and six stainless steel blocks assembled on it, on the top surface of each of which a fine line was cut in varying width (Figs. 1 and 2).

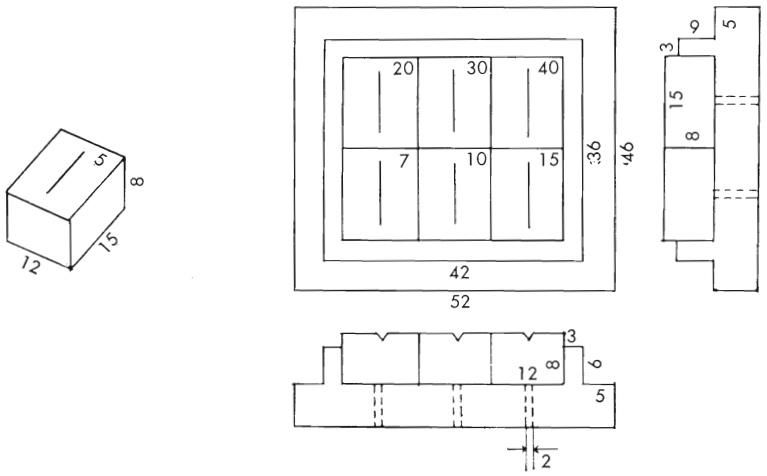

Fig. 1. The newly devised equipment for testing fine line reproducibility of indirect impressions: the original die (left), a tray (center) and a resultant stone model (right)

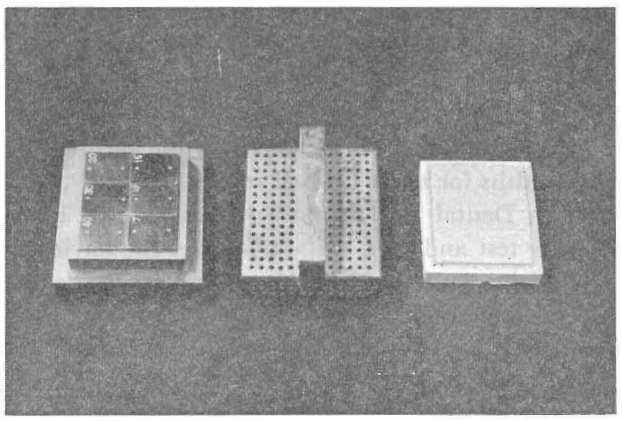

Fig 2. The design of the original die with sizes in milimeters: a single block (left) and the whole die assembling six blocks and a base with holes to push out blocks

The lines were made on the blocks in the following technique: The top surfaces of more than seven stainless steel blocks were finished by emery papers up to No. 2,000 (with 8 micron grains) placed on a flat glass surface. One of the blocks was used for preliminary test. On its top surface, many fine lines were cut with a tungsten-carbide blade of 60° blade angle and 30° contact angle mounted on Fusayama's Scratch Hardness Tester[7] applying varying load (Fig. 3). From the results, cutting loads required for obtaining desired widths were known (Fig. 4).

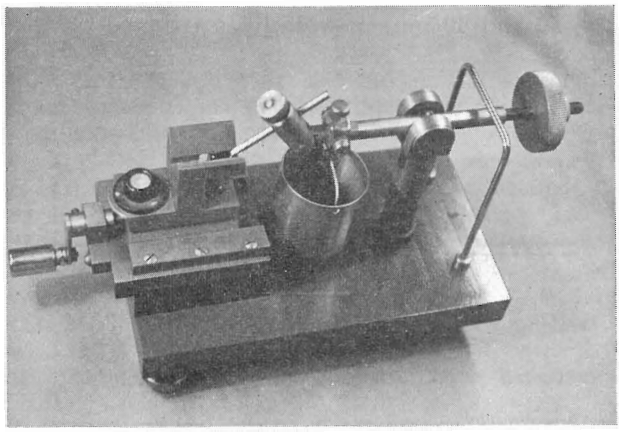

Fig. 3. Fusayama's Scratch Hardness Tester used for cutting lines on the steel blocks

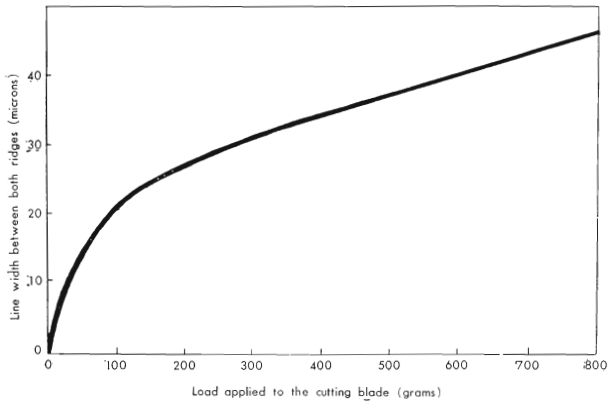

Fig. 4. The cutting load-line width relationship curve determined at the preliminary test

Then, a line was cut on each of the other steel blocks applying a load which was greater by 30 to 40 per cent than required for the desired line width according to the relationship curve. Since a freshly cut line had

irregular prominent ridges on both sides (Fig. 5), the surface of the block was again finished with a No. 2,000 emery paper until the line was obtained with exactly the desired width (x). The width was confirmed with a measuring microscope.

Two round depressions were cut at both ends of the line with a round bur so as to facilitate the finding of the line on the resultant stone die. A number indicating the line width in microns was also cut in the upper right corner of the top surface.

More than six blocks of different line widths were made but six blocks of 7, 10, 15, 20, 30 and 40 micron wide lines are used on the base in the regular test.

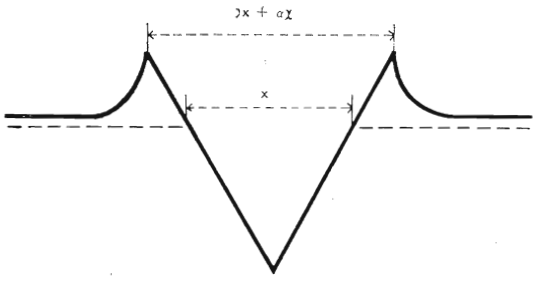

Fig. 5. The profil section of a line freshly cut on the steel block surface (solid line) and that after finishing (broken line)

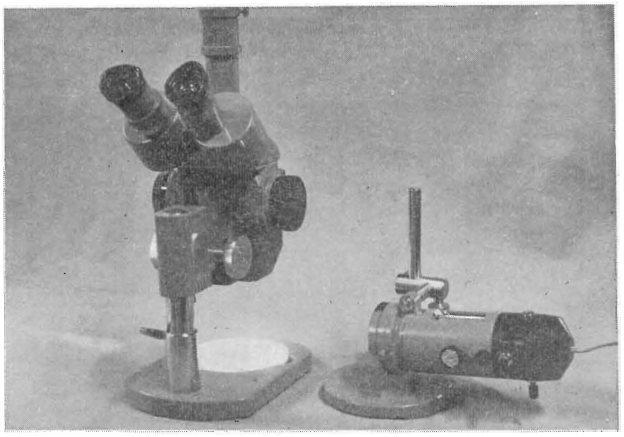

Fig. 6. Examination of a reproduced line on a stone model under a microscope and a horizontal illumination

Evaluation

For determining the limit of fine-line reproducibility of impressions, several lines of different widths must be impressed at once. The above device served an accurate and convenient testing apparatus for this purpose. The lines 7 to 40 microns wide are used in the regular test but blocks of any other width lines separately prepared can be assembled in stead depending on the testing purpose.

References

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