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In Cooperation with the University of Wisconsin

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PORTABLE APPARATUS FOR SURFACE EVALUATION OF FURNITURE PANELS

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In 1959, a new technique was devised at the Forest Products Laboratory that provided a means of examining, evaluating, and recording the show-through pattern (often called telegraphing) of panels made with particle board cores. Although the technique was devised as a working tool to evaluate show-through characteristics of particle board cores, it can be used equally well on anyfurniture panel, regardless of color, pattern, or type of core, provided the surface is finished with a satin (or brighter) finish. This means that the technique has potential applications far beyond the original concept, and it was proposed at the time that if the apparatus was redesigned and made portable it could be used as an evaluation tool on furniture. This might be for in-plant inspection or as a method of evaluating the effect of certain service conditions on furniture.

This work was reported in 1960,[2] and shortly thereafter a technical note was prepared showing how to assemble and use the apparatus.[3]

During 1963, a portable apparatus, employing the same basic techniques as the original apparatus, was designed and built. The apparatus was found to be highly sensitive, reproducible, and easy to use, as judged by a few exploratory trials on available pieces of furniture. It, therefore, offers a nondestructive means of evaluating the surface characteristics of furniture panels (especially tops) which should have wide application in the furniture field and possibly providing specified limits of distortion in such panels.

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[1] Maintained at Madison, Wis., in cooperation with the University of Wisconsin,

[2] Heebink, B. G. A New Technique for Evaluating Show-Through of Particle Board Cores, Forest Prod, Jour. X(8):379-388. (1960).

[3] U.S. Forest Products Laboratory. FPL Show-Through Comparator for Furniture Panels. Technical Note No. 263. August 1960.

A diagrammatic sketch of the optics of the apparatus is shown in figure 1, and the completed apparatus in figure 2. Its use on a desk top is shown in figure 3. As can be seen in figures 1, 2, and 3, a wide angle projector projects a grid pattern (shown in Technical Note No. 263) through a prism onto the surface being evaluated. The evaluation area is approximately 5 inches square. This surface, after being properly wiped with kerosene to improve its reflectance, reflects the grid pattern back to a translucent screen, which can be viewed from the topside for focusing and observation of the pattern. When the focus is sharp and it is desired to record the pattern, a glass slide on which the proper identification is printed, is inserted through the slot on the side of the apparatus, so that it can be photographed along with the pattern. This operation is shown in figure 4. The camera is thenadjusted and cocked (by reaching through the small opening in the back of the apparatus) and tripped by means of a remote control, as shown in figure 5. The apparatus is so designed that, when the inspection doors are closed, it can be used in a fully lighted room; consequently on office desks or home furniture in place without special lighting or preparation.

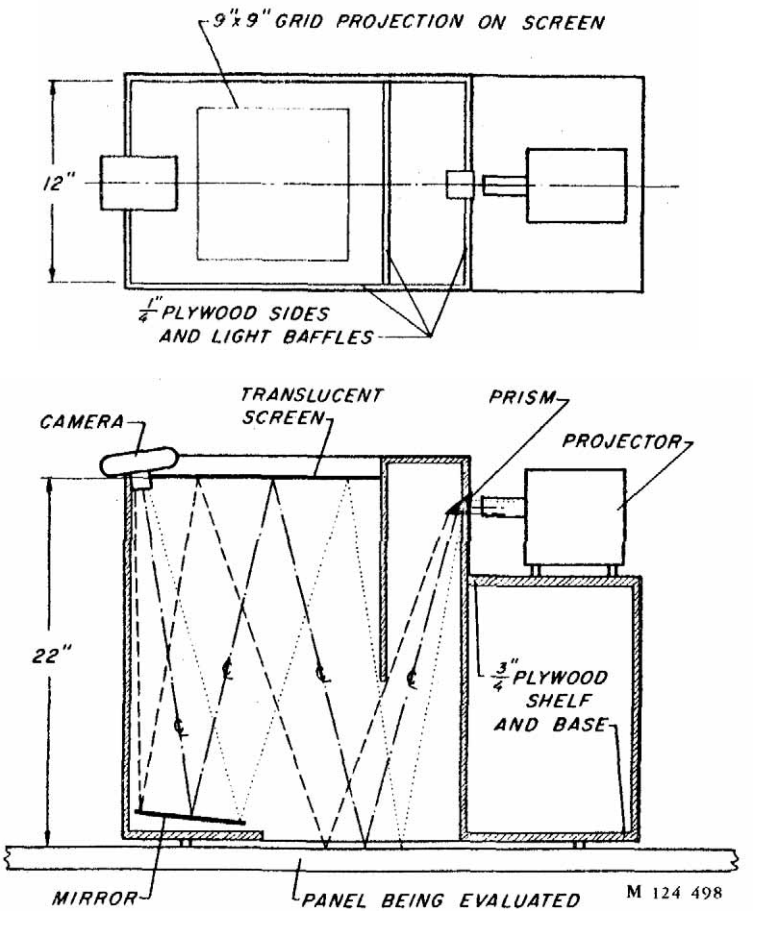

Figure 1.--Sketch of FPL portable show-through comparator.

To illustrate the sensitivity and application of the instrument, the following enlarged prints of photographs actually taken on the apparatus are presented. Figure 6 shows the pattern produced from a perfect surface, in this case a ground plate glass having one side sandblasted. Note that the lines are all straight and uniformly spaced in both directions. Figure 7 shows the pattern produced from an almost perfect desk top. The top was approximately 1-1/2 inches thick, having a lumber core, conventional crossbands, and a thin oak veneer on the face and back. Note that the lines are almost as perfect as shown in figure 6, with the exception of 2 or 3 minor distortions and one vertical row of squares (the fourth from the left) being wider than normal.

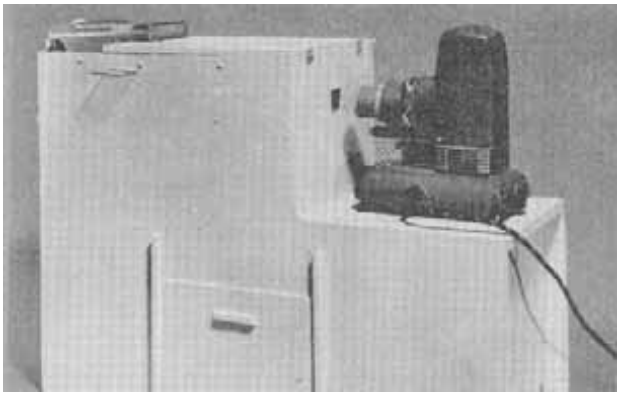

Figure 2.--FPL portable show-through comparator.

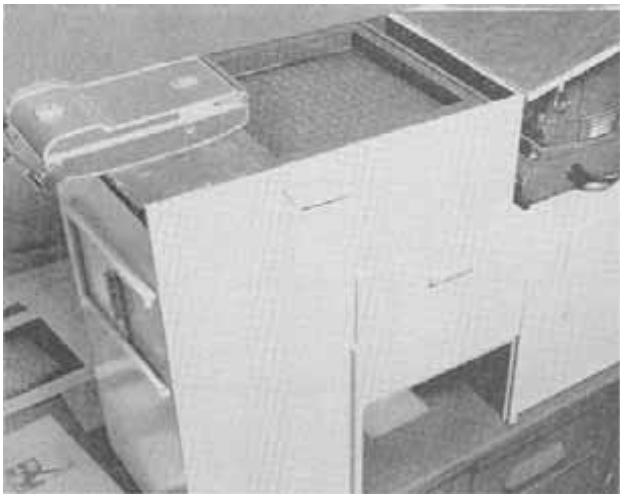

Figure 3.--FPL comparator in use on a desk top.

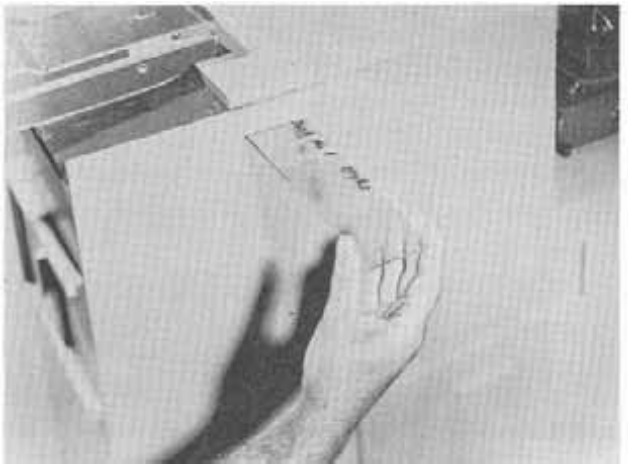

Figure 4.--Insertion of glass identification slide.

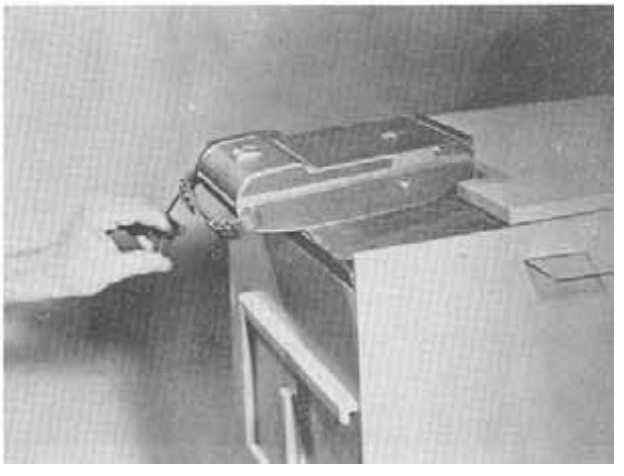

Figure 5.--Tripping camera by means of remote control.

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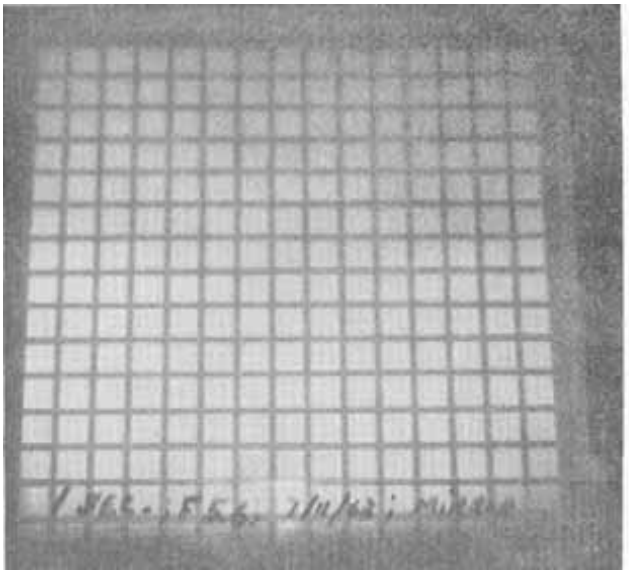

Figure 6.--Pattern produced from perfect surface.

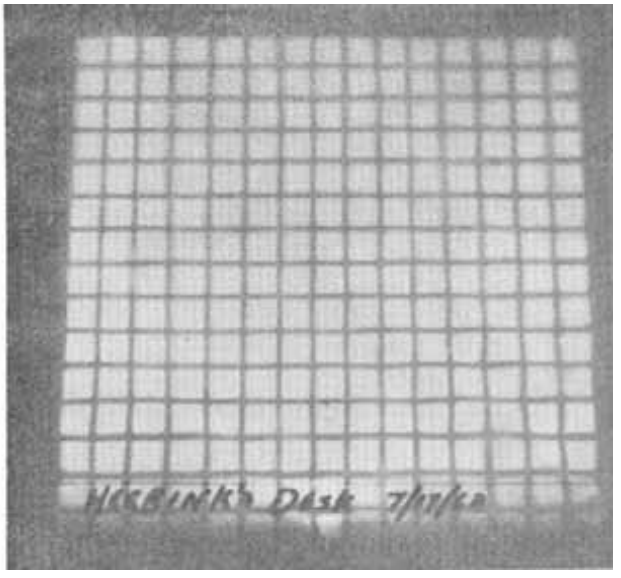

Figure 7.--Pattern produced from almost perfect desk top.

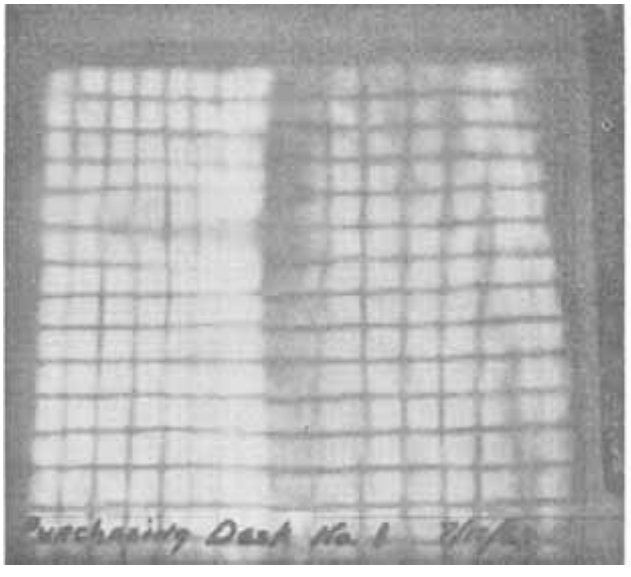

Figure 8.--Pattern produced from desk top having objectional wavy pattern caused by the lumber core.

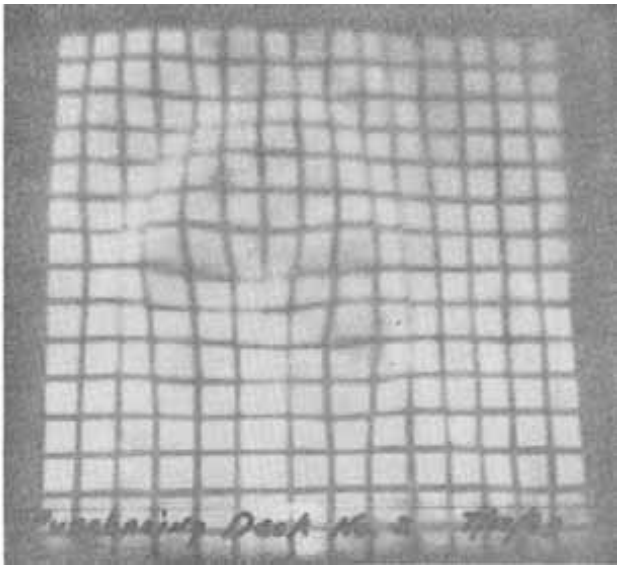

Figure 9.--Pattern showing a local distortion that might be objectionable in high-quality furniture.

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Figure 8 shows the pattern obtained from a similar desk having a definitely objectionable wavy pattern caused by the lumber core. There is, undoubtedly, a glue joint, between two pieces of lumber core, approximately in the center of the photograph (where coloring changes from light to dark, going from left to right). Also, the left half of the photograph is of a slightly concave surface, as the vertical lines are closer together, and the pattern is lighter than normal. Conversely, the right half shows a slightly convex surface, as the vertical lines are spread apart, and the coloring is somewhat dark. There is also evidence of minor distortions caused by cross grain in the lumber core or imperfections in the crossband.

Figure 9 shows a local distortion, in a similar desk top, which was not exceptionally obvious from reflected light but might be objectionable in high-quality furniture and, certainly, should not be permitted in new furniture of supposedly high quality, The distortion of the grid pattern at the center is caused from either imperfections in the crossband or imperfections such as a knot or short-grain portion in the lumber core.


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