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NEW METHOD OF SURFACING WOOD SPECIMENS FOR STUDY

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ABSTRACT

In preparing cross-grain wood surfaces for examination, the old method of sanding a considerable area at once can now be superceded by a new method called *abrasive cutting along a line.* This article describes a machine which uses this new method to obtain a very superior finish excellent for microscopic study, quicker than the old method and without need for highly skilled operators. The machine is primarily for use in laboratories where considerable numbers of specimens need to be given "readable" surfaces.

An important part of the program in a progressive tree-ring laboratory is research and development aimed at improvement of mechanical equipment needed in all phases of collection, preparation, and analysis of tree-ring specimens. An article on a power-driven coring tool for taking cores up to six feet long was published in the *Tree-Ring Bulletin,* Vol. 23, Nos. 1-4. The following is a report on a new method for laboratory preparation of cross-grain wood surfaces for microscopic study. In a later issue there will be an article on improved equipment for taking short cores in the field.

Ever since tree-rings have been systematically studied in the cross-sections of wood samples, sanding the surfaces by various means has been one of the standard methods of preparation for close examination by hand lens or microscope. However, in order to avoid the smearing effect which seemed to be inevitable when working with very small grit sizes for the final finish, the use of razor blades was often substituted. Smearing is an inherent result in the conventional sanding process because particles removed by the abrasive at the start of a pass across the area being sanded must be dragged all the way across the area of contact with the belt, gathering other particles on the way. These fine particles may be ground into the surface in a way that clouds the clear definition of cell structure.

While the razor blade makes individual cuts in which the rings are clearly defined and easily readable, even the best operator can hope to produce only a succession of individual cuts — a wavy surface not in a true plane. The two main objections to the razor method have been that it is a very slow process and requires a highly skilled operator. Thus for a long time some method has been needed that would eliminate these difficulties and enable a relatively unskilled operator to quickly prepare a surface finish suitable for microscopic study.

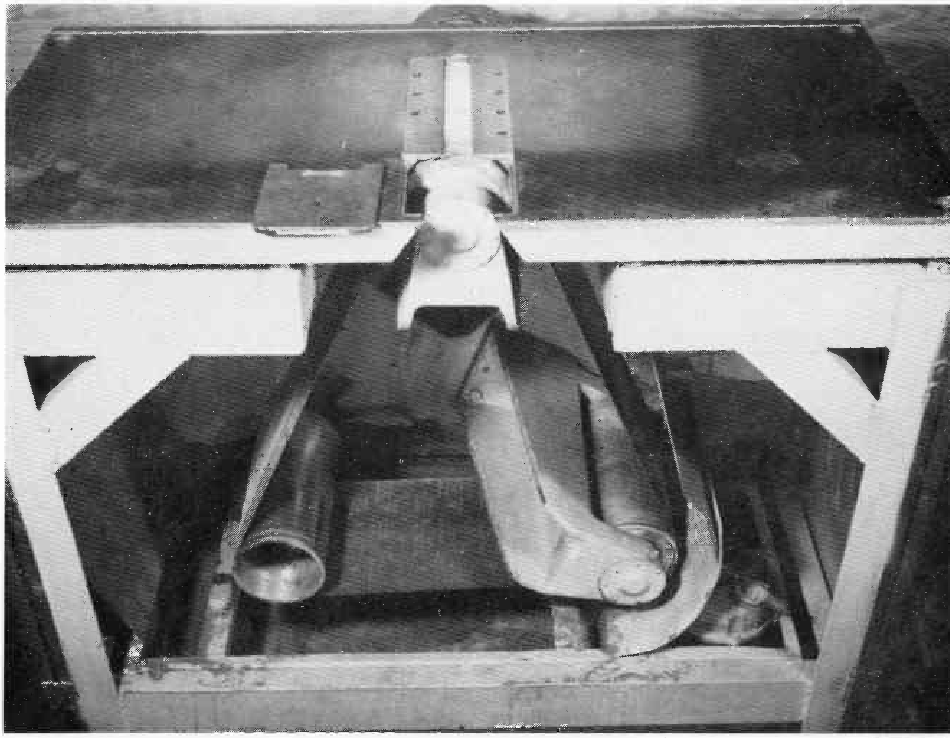

FIG. 1. The sanding machine.

These objectives have been achieved, it is believed, by a machine designed and built expressly for the Laboratory of Tree-Ring Research at The University of Arizona. It is a heavy-duty, stationary, abrasive-belt sander using the same commercially-available abrasive belts widely employed in ordinary sanding machines. With this machine (Fig. 1), familiarly known as the "BVX," the important difference from other sanding devices is that the belt contacts the specimen being surfaced only along a line instead of over an entire area all at once.

This method eliminates the possibility of smearing since no particles abraded from the specimen are carried across the finished surface. The resulting finish consequently is like that obtained with a razor, and the advantages are particularly marked as the surfacing progresses and belts with the finer grits are used.

To provide a durable machine which would be largely an experiment, the first BVX was built to a heavy-duty pattern and weighs almost three quarters of a ton. It takes endless belts, 12 inches wide and 96 inches long, which are readily available commercially in all grit sizes. However, unlike the ordinary belt sander, the BVX uses three pulleys, two of which are in the lower part of the machine while the third is just below a narrow slot in the table top (Fig. 2). The length of the slot is slightly more than the 12-inch belt width and the pulley is at a level such that its top surface is below the table top by a distance equal to the fabric thickness of abrasive belts with the finest grits.

Thus when a belt passes over the upper pulley the depth of the cut taken off is the distance by which the abrasive surface extends above the table top. Hence the depth of the cut made in a wood surface passed over

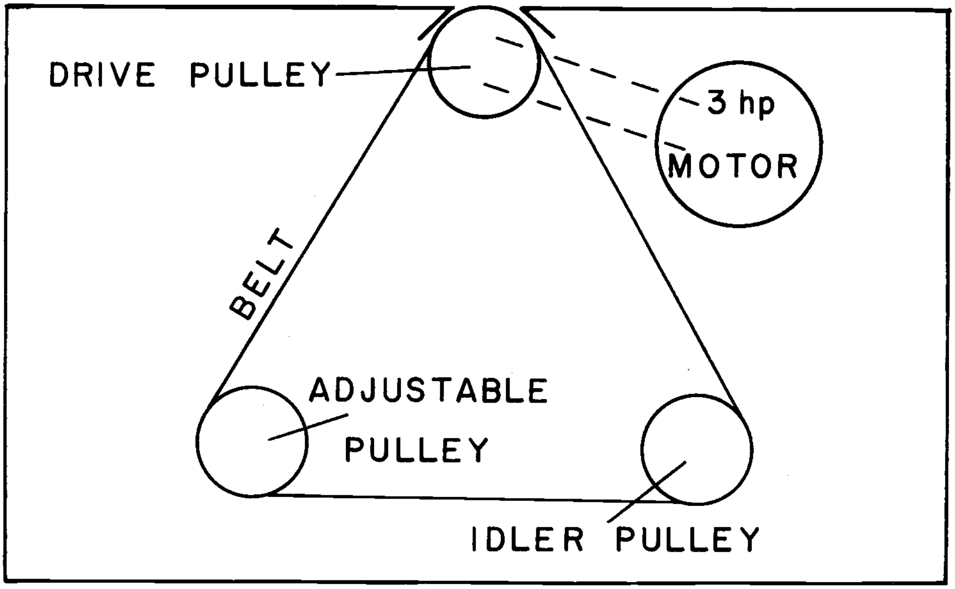

FIG. 2. Schematic sketch of details of sanding machine.

the moving belt is equal to the depth or thickness of the abrasive above the supporting fabric. With coarse grits the cut is deeper than with fine grits but, in either case, once the specimen passes beyond the very narrow zone or line along which it contacts the abrasive, there is no further contact and the finish of the sanded surface thereafter remains undisturbed.

In final stages of working down to the ultimate finish, only very fine cuts are made and a very small amount of wood is removed at each pass. Throughout the abrasive cutting, the machine automatically works the finished surface to a perfectly true plane without the need of a specially trained operator.

Usual practice in preparing for a sanding session on the BVX is to lay out a considerable number of specimens on the machine's ample top (24 x 48 inches). Each of the specimens is then worked across the first or coarse-grit belt. This would be a 40, 80 or 100-grit size, according to the roughness or smoothness of the original surface of the specimen. The belt then would be changed to the next finer grit size; all specimens again worked across the belt and so on down to the finest grits to be used.

This plan makes it economical, timewise, to use a considerable number of grit sizes with relatively little time loss, per specimen, chargeable to changing belts. When working for the best possible surface finish the sanding continues to the finest grit sizes available. However, on some easily read sections all useful purposes will be served by a finish obtainable without going all the way to the smallest grits. Such specimens can be set aside whenever inspection, preferably with a hand lens, shows the surface free from scratches and rings easily readable. A complete set of belts that have been found useful on the BVX includes grit sizes 40, 80, 100, 150, 220, 320 and 400.

It its original form the machine was built with provision for water jets directed against the belt at strategic points to wash off swarf and to provide cooling that would eliminate friction burns on the specimens. This scorching effect had been encountered to notable degree in experiments that preceded design of the BVX. However, from first operation of this machine it was apparent that an advantage of abrasive cutting along a line would be freedom from danger of scorching the surface of a specimen. So small an area is subjected to friction and the exposure is so brief that no harmful amount of heat is generated. The water jets, therefore, were never needed and ultimately were removed.

Two features of the BVX deserving special mention are the adjustable table top and the grooved rubber surface of the pulley that operates in the slot. Adjustment of the table top is accomplished by four screws, one at each corner, with locking nuts to firmly hold a finally selected setting. Maximum range of elevation change is less than a half inch.

All three pulleys have the same six-inch diameter, but while the two lower pulleys are steel, with a slight crown to keep the belt centered, the slot pulley is a true cylinder (no crown) and carries a thick, solid-rubber tire in which deep, spiral grooves of rectangular section have been made to provide flexibility in the gripping areas where the belt transmits pressure to the pulley beneath.

The design of this pulley plus the rugged construction of the machine as a whole are given much of the credit for four years of uninterrupted operation. Had the BVX been in some commercial plant it would be expected that the same trained personnel would have had it constantly under supervision, giving it expert care and handling. In the Laboratory, however, the requirements were that the machine would be expected to operate without highly skilled attention and the work of preparing specimens is assigned to graduate students some of whom come and go at relatively frequent intervals. In the four years of operation some two dozen men have been "broken in" as BVX operators.

Design of the BVX was begun after, and was based on, some two years of experimental work in search of the best method of preparing surfaces of large transects for microscopic study. When preparations for actually building a trial machine were being made, W. J. Vossbrinck, President of the Tool and Abrasive Engineering Co. of San Jose, Calif., was consulted. Much credit for details of the design goes to him and it was his company in San Jose that built the machine and installed it in the laboratory in Tucson.

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