quantitative numbers on the relative proportions of the aforementioned minerals. The spectrometers of the microprobe were set to the $K\alpha$ wavelengths of Ca, Mg and P. Olivine is then recognized by its high Mg but negligible Ca content. Rhombic pyroxene has high Mg and small but measurable Ca content. Ca-rich Cr clinopyroxene is characterized by its high Ca, and chlorapatite by its high P content. Plagioclase is easily recognized by its bright blue luminescence. In Table 1 the results of the repeated measurements of section 1 are presented to establish a measure of the reproducibility of the method. The variations in the total number of counts in different runs are due to the different stepping distances used each time (20–100 microns). In Table 2 the results of the integration of seven sections of different nodules are summarized. The average of the seven sections was calculated taking into account the size of each section. The weight percentages were calculated from the volume percentages by means of the following density values: olivine 3.3, rhombic pyroxene 3.1, Ca-rich Cr clinopyroxene 3.3, plagioclase 2.6, chlorapatite 3.2. It is apparent that the relative proportions of the silicates and of chlorapatite are quite different from nodule to nodule.

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AN IMPROVED HOLDER FOR GRINDING THIN SECTIONS[1]

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A new holder for grinding thin sections using diamonds for wear points has been found to be highly satisfactory and a distinct improvement over a previously described holder using boron carbide strips.[2] This holder is made of two blocks of brass, joined by a pair of $\frac{1}{4}$ inch stainless steel pins

[1] Publication authorized by the Director, U. S. Geological Survey.

[2] Cochran, M. C., and A. G. King (1957) Two new types of holders used for grinding thin sections. *Am. Mineral.* **42**, 422–424.

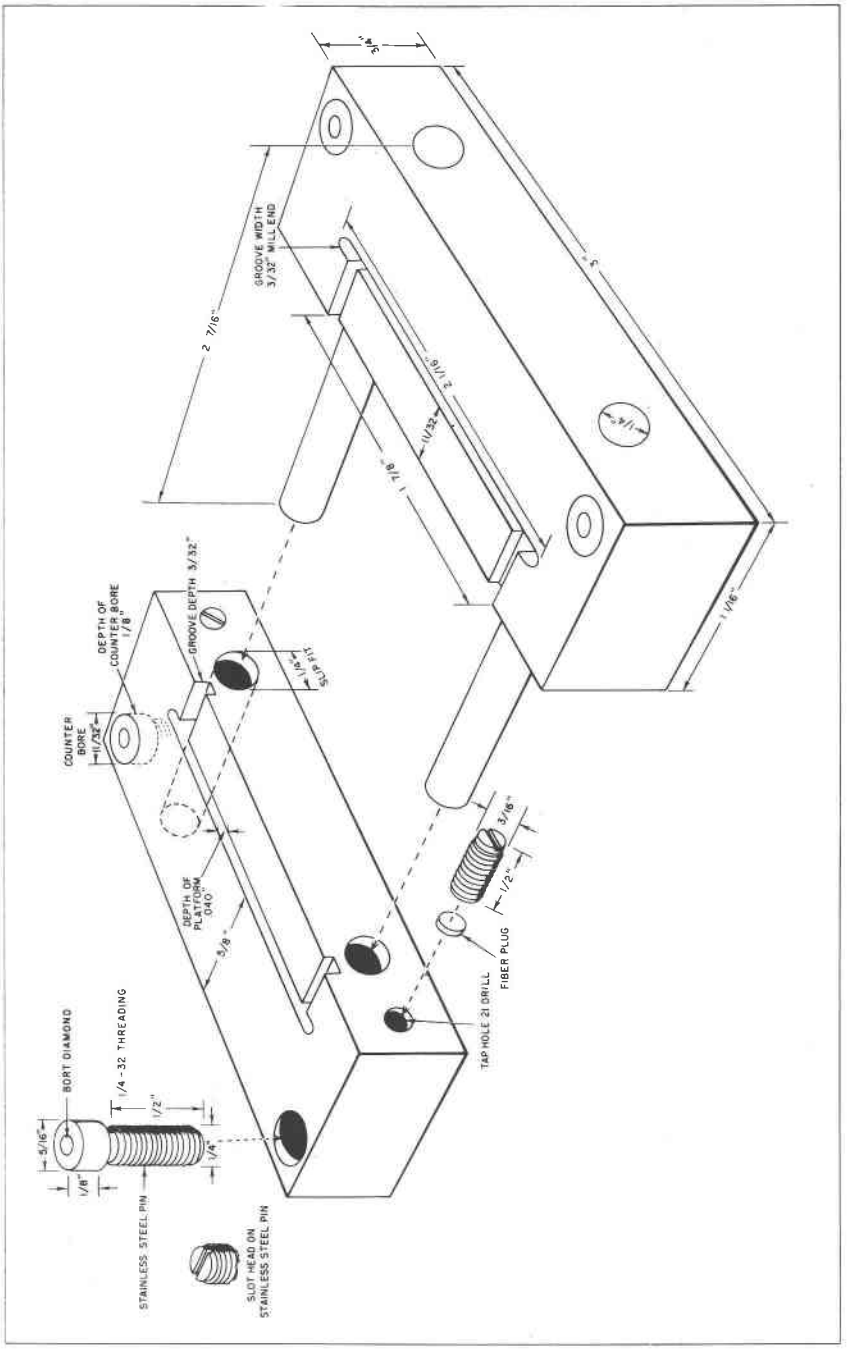

FIG. 1. Isometric projection drawing of improved holder for grinding thin sections.

on which one of the blocks slides; a rectangular depression accommodates a petrographic glass slide with its mounted rock chip (see illustration). These pins are fixed to the second block by a press-fit. The small groove shown around the alignment platform facilitates milling the platform. The use of brass, instead of aluminum (used in the previously described model), gives less binding on the pins, because there is less wear and fouling by abrasive and rock powder.[1]

Four commercial bort diamonds, each weighing about $\frac{1}{4}$ carat, are mounted in the ends of screw-like pins of stainless steel. The exposed surface of each diamond should be about 2 to 3 mm in diameter, thus with about 3 to 8 sq. mm of bearing surface. The diamonds are mounted similarly to diamonds in a drill bit except that their flatter surfaces are mounted upward and no points or sharp edges are exposed. If an experienced diamond bit setter is not available to do peen mounting, the diamonds can be brazed, by use of minimum heat, into shallow drilled holes.

The pins are adjusted with a screw driver until the diamonds protrude far enough to give the desired final thickness of the slide and chip. The pins are then locked with set screws. The fiber plugs, shown in the illustration, prevent damage to the threads of the pins. This type of mounting is obviously superior to the use of the boron strips previously described; the latter requires milling the platform for any adjustment for thickness.

The chip cannot be ground below the plane determined by the diamond surfaces. A good gauge for setting the diamond points holder is to use one of the thicker slides from the available stock on which a chip has been mounted and ground down to about 0.004 inch. The final reduction, using a conventional holder, to a thickness of about 0.001 inch (or to "standard" thickness) requires very little extra grinding. The thinner slides of those available, which of course result in correspondingly thicker chips when used with this diamond-controlled holder, require so little additional finishing time that no preliminary gauging of slides is necessary and one diamond-controlled holder can be used for all routine work. Chips as thick as 0.04 inch can be started with this holder and ground to gauge thickness with a minimum of stoppage for inspection.

[1] An objectionable amount of wear, after several years of steady use, has been satisfactorily corrected by adding two small brass bushings to the sliding brass block.