References

ČERNÝ, P. & TURNOCK, A.C. (1972) : Rare-earth-rich pegmatites from Shatford Lake, Southeastern Manitoba. Ms. in prep.

DERRY, D.R. (1930) : Geology of the area from Minaki to Sydney Lake, District of Kenora. *Ont. Dept. Mines Ann. Rept.* **39,** Pt. 3, 24-41.

KHVOSTOVA, V.A. (1962) : Mineralogy of allanite. Mem. Inst. miner., geoch., cryst. rare elem., *Acad. Sci. U.S.S.R.* **11,** pp. 119 (in Russian).

LIMA DE FARIA, J. (1964) : *Identification of metamict minerals by X-ray powder photographs.* Lisbon.

VLASOV, K.A. ed. (1964) : *Geochemistry and mineralogy of rare elements and genetic types of their deposits,* Vol. II, Mineralogy of rare elements. Moscow, Engl. translation Jerusalem 1966.

Manuscript received September 1970.

Canadian Mineralogist
Vol. 11, pp. 543-547 (1972)

ELECTRICAL TRAVERSING ACCESSORY FOR VICKERS PROJECTION MICROSCOPE

S. KAIMAN * AND D. M. NORMAN **

Introduction

In the mineralogical laboratory of the senior author when a detailed examination of a suite of polished or thin sections is required, a projection microscope (Vickers 55) is used to reduce eye strain. The microscopical field is observed in the viewing screen while the section is systematically traversed by means of the two micrometers which actuate the mechanical stage.

Because the stage-traverse micrometers are positioned high on the Vickers instrument, even short periods of manual traversing were found to cause arm fatigue and it was therefore considered desirable to employ motor power to drive the microscope stage. At first, the use of a flexible cable drive was attempted. By coupling a three-foot length of speedometer cable to one of the stage micrometers and to the recording unit of a Hurlbut electric counter (Hurlbut, 1939) placed at bench level, comfortable, digitally controlled traversing was made possible. This arrangement was satis-

* Head, Mineralogy Section, Extraction Metallurgy Division, and
** Mechanical Engineer, Technical Services Division, Mines Branch, Department of Energy, Mines and Resources, Ottawa, Canada.

factory for only short periods, however, because the cable soon unravelled near the counter coupling and thus required periodic repair or replacement. Also, it was necessary to avoid rapid traversing to prevent possible mechanical damage to the micrometer at the ends of the traverse. This experience indicated that a more satisfactory accessory should incorporate a direct drive as well as a traverse limiting device and led to the design by the junior author, of the attachment described below.

Traversing Unit

An electrically controlled drive was fitted for the stage of a Vickers 55 microscope which traverses the stage laterally in either direction, the drive automatically being switched off at the end of each pass. By manually offsetting the stage at the end of each lateral pass, it is possible to completely scan a mineralogical section.

The unit (Figure 1) was designed so that it could be attached without structural alterations to the microscope. The only modification to the microscope consisted of the addition of a gear (G_2) approximately $1\frac{1}{4}''$ in diameter and $1''$ long which was slid over and fastened to the knurled head of the lateral-traverse micrometer (M_1).

The unit consists of a steel bracket (B), attached by screws to the rear column of the microscope, which also holds the stage support. Attached to this bracket is the motor mounting plate (C) which is pivotted at one edge and a yoke (D) which pivots horizontally and is moved by the gear (G_2) attached to the lateral-traverse micrometer. The tail of the yoke actuates micro-switches (E) which prevent overtravel of the lateral-traverse micrometer and the stage in either direction. On the motor mounting plate is assembled the motor (F) with a gear (G_1), on its output shaft, of approximately $1''$ diameter and $\frac{1}{4}''$ width. The driver gear (G_1) on the motor is so positioned relative to the gear on the micrometer (G_2) as to accommodate the 15 mm of the lateral travel by the driven stage.

The motor mounting plate is pivotted so that instant disengagement of the drive is available and thereby any advantages of manual operation of the micrometer are still retained. The engagement of the driver gear on the motor is instantly obtained by pivoting the mounting plate to mesh the motor gear teeth with the micrometer gear teeth. The weight of the motor is sufficient to keep the gear teeth engaged and the fit of the teeth is determined by a stop (H) which controls the lowered position of the motor mounting plate.

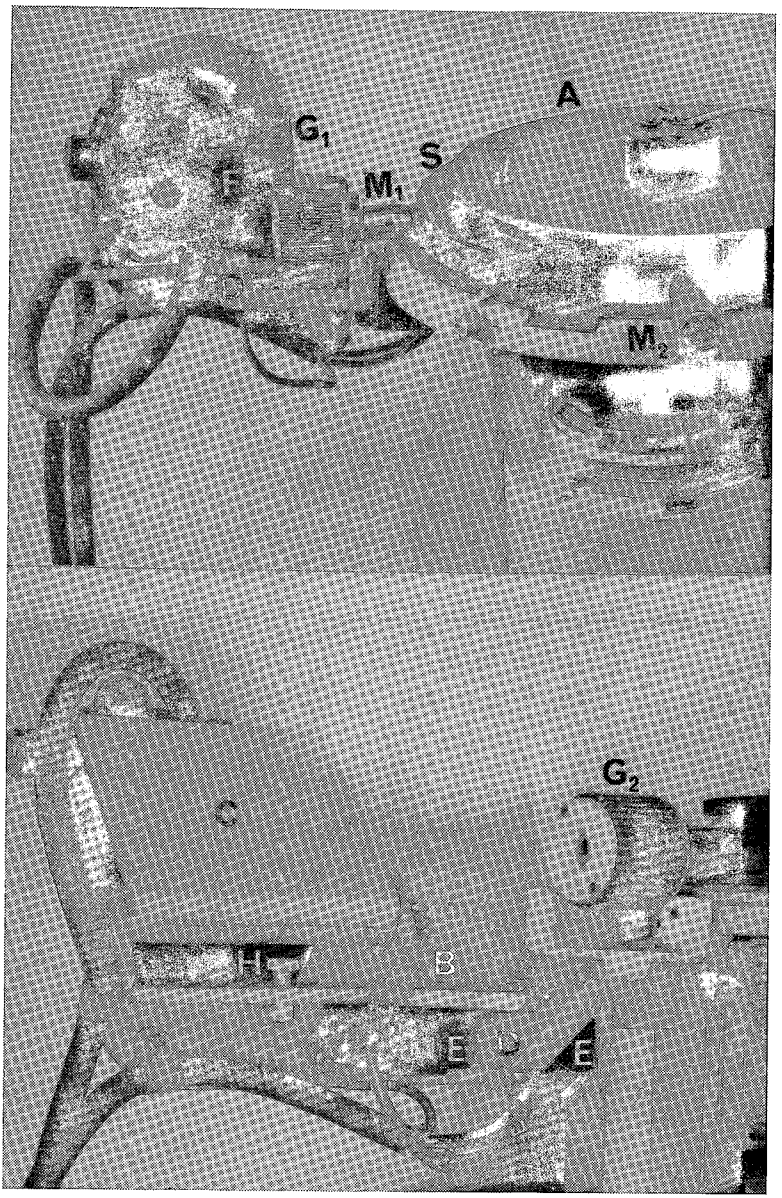

FIG. 1. Photographs of traversing accessory for Vickers 55 microscope: top — general view showing motor gear (G_1) meshed with micrometer gear (G_2), and micrometer stage (S) near the end of a lateral traverse; bottom—close-up, with motor mounting plate (C) rotated so that gears are disengaged and showing detail of yoke (D) and micro-switches (E).

A diagram of the electrical circuit is shown in Figure 2. An ac-dc, series wound motor with gearhead is used to give a maximum output speed of 96 rpm at 4 in-lb torque. Motor speed in the low range can be infinitely varied, by means of the rectifier circuit, from zero to a maximal lineal scanning speed of approximately 50 mm/min : fast-scanning speed is provided by the ac circuit. A footswitch controls the power to the motor. The footswitch and relay contacts are normally in the open positions : operation of the footswitch closes the three contacts of one of the two relays, the direction of motor rotation being determined by the position of the reversing switch.

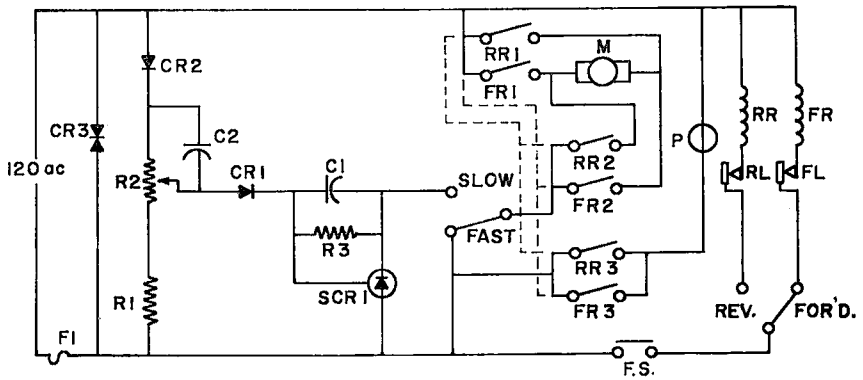

FIG. 2. Diagram of electrical circuit for traversing motor.

SCR1 — GE-X1A
CR1 — IN1693
CR2 — IN1693
CR3 — 6RS20SP454 (optional)
R1 — 2500 ohms, 2 watts
R2 — 1000 ohms, 2 watts
R3 — 1000 ohms, ½ watt
C1 — 2μF, 50V
C2 — 50μF, 12V
FR — forward relay, 3-pole, single-throw
RR — reverse relay, 3-pole, single-throw
FL — forward limiting switch
RL — reverse limiting switch
FS — footswitch
F1 — fuse
P — pilot lamp
M — Bodine motor, Cat. No. B2080-72

Operation

For systematic traversing of a mineral section, the gliding stage of the Vickers microscope (A) is first centered and locked on the micrometer stage (S) and the latter is clamped at its zero position of rotation, so that the fore-and-aft traverse micrometer (M_2) is in front of the stage and pointing at the operator. The motor mounting plate is then pivoted to engage the gears and the stage is traversed to one corner of the traverse area, which measures approximately 15 mm by 18 mm. The mineral section is placed on the stage and its position adjusted so that all or most of its surface will be within the traverse area. The section is now ready for the first lateral traverse. At the end of each lateral pass, the stage is manually translated, by means of the front micrometer, through a suitable traverse interval to the starting position for the next pass. The motor switch is reversed and the footswitch depressed to start the next lateral traverse. Consecutive traverses are thus in opposite directions.

Footswitch control of traversing leaves the hands of the operator free to adjust the focus as required. Observation of the viewing screen is comfortable and can be continuous for the duration of a complete traverse line unless it be interrupted for the purpose of recording. The speed of traversing can be adjusted as dictated by the nature of the sample under study and the ease of detecting features of particular interest. The traverse interval is determined by the magnification and should be such that successive traverses overlap slightly. For complete coverage of a large section it may be necessary to survey more than one traverse area.

Acknowledgments

The authors gratefully acknowledge the advice provided by Mr. E. K. Swimmings on the design of the electrical circuit and express thanks to Mr. M. Blais and Mr. G. E. Handy for the construction and installation of the traversing unit, to Mrs. P. A. Smith and Mr. P. Carriere for the photographs, and to Mr. G. W. Shanks for the diagram.

Reference

Hurlbut, C.S., Jr. (1939) : "An electric counter for thin section analysis", *Am. Jour. Sci.* **237**, 253-261.

Manuscript reveived November, 1970.