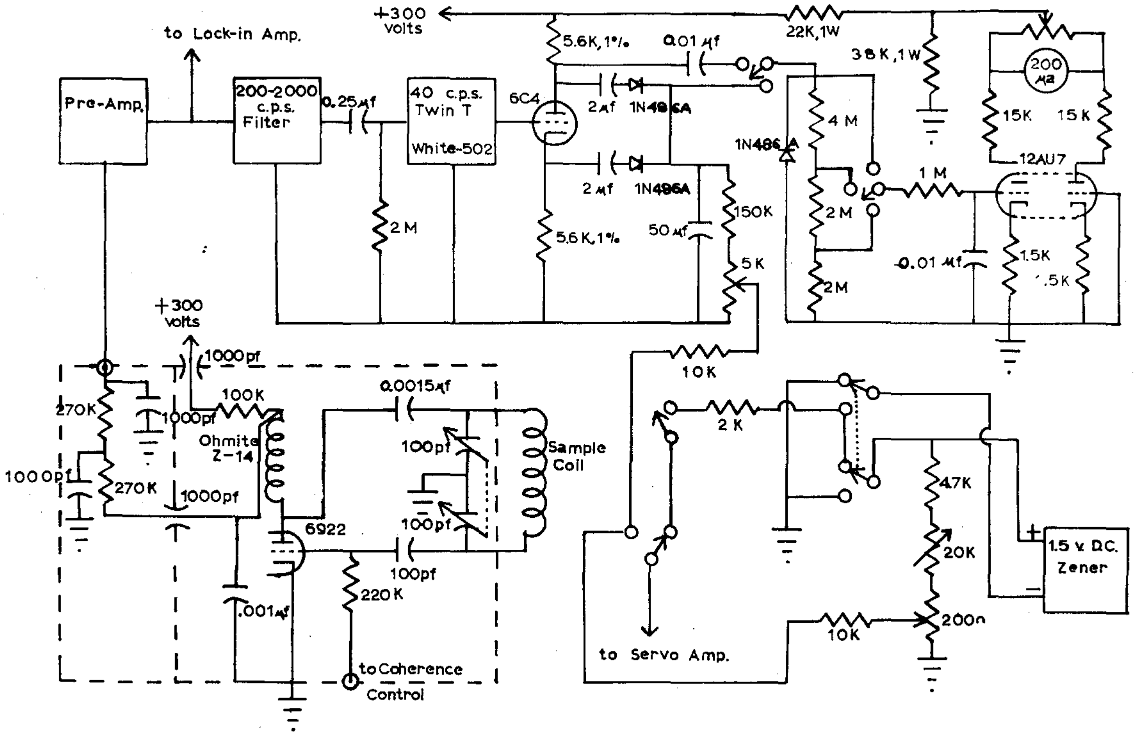

FIG. 1. Schematic diagram of oscillator and noise monitoring circuit.

setting of the spectrometer. In addition to the noise monitoring circuit the oscillator design was changed from that of Peterson to allow wider frequency coverage. An additional filter section was added preceding the phase splitter to provide further elimination of the quench frequency and limit the noise bandwidth to 200–2000 cps.

The basic monitoring circuit consists of selecting either the ac or dc noise signal from the phase splitter-rectifier section, by taking it from across a high impedence voltage divider, and using it to drive one grid of a difference amplifier. Taps on the voltage divider serve to set the full scale deflection of a microammeter placed between the plates of the difference amplifier. On the most sensitive scale the meter requires 0.8 V dc at the rectifier output for full scale deflection. Manual control of the servosystem is accomplished by using the Zener reference voltage, connected through a reversing switch, as a driving potential for the servoamplifier. This feature allows one to set the grid potential of the oscillator to a point giving any desired noise level. Once the noise level is set the reference voltage can be adjusted to set the servocontrol at that particular level. Searching over wide ranges at any desired noise level is then possible. The oscillator was found to be most sensitive when the average noise signal was less than the residual quench voltage at the output of the preamplifier (gain = 150).

The oscillator circuit gives sufficient output and is easily controlled from 5 to 140 Mc by interchanging tank coils only. Seven coils varying from 50 turns of No. 24 wire to one turn of 12.7 mm braided ground strap are needed to cover the range. Resonances have been observed from 14.7 Mc ($TlCl_3$) to 97.9 Mc ($AlBr_3$). The use of a 200-2000 cps filter preceding the phase splitter enables one to have a more reproducible noise signal. It also eliminates a majority of the modulation signal, which when strong, is not entirely eliminated by the twin T, and prevents adequate control.

---

* Work supported by the National Science Foundation.

[1] G. E. Peterson and P. M. Bridenbaugh, Rev. Sci. Instr. 35, 698 (1964).

Comparison System for Microscope Images*

D. P. POPE, T. VREELAND, JR., AND D. S. WOOD

W. M. Keck Laboratory of Engineering Materials, California Institute of Technology, Pasadena, California 91109

(Received 11 October 1965)

A RELATIVELY simple system for the critical comparison of the two microscope images is described below. This system has advantages not offered by the split field optical system normally employed for the comparison of images. The split field system places the images from two microscopes side by side as viewed through a single eyepiece. The system described herein superimposes the two images in a single eyepiece, and displays them alter-

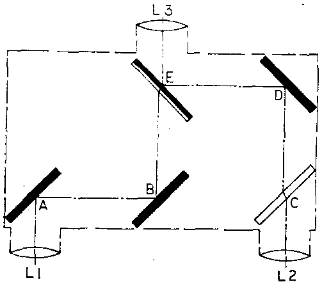

FIG. 1. Schematic diagram of comparison microscope optics. A—face silvered mirror; B—face silvered mirror; C—plane glass compensator; D—face silvered mirror; E—half-silvered mirror; L1—microscope objective lens; L2—microscope objective lens; and L3—ocular.

nately in time. Differences and similarities in the two images are readily observed, because those features which are different appear to change at the rate of the alternating display, while those features which are similar do not change. This "blink" display principle has been used for some time in astronomy to compare pictures of the sky taken at different times, but its use is not widely known.

The optics which superimpose the images may be accommodated in the optical paths normally occupied by the microscope tubes. The system therefore displays images with the same magnification as that of the standard microscope optics. A schematic diagram of the optical system is shown in Fig. 1. The alternating display of images is accomplished by appropriate switching of the light sources. Switching rates of approximately 0.1 to 10 cps are obtained with the circuit shown in Fig. 2. The circuit employs a unijunction transistor in a multivibrator section which drives a bistable flipflop. The state of the flipflop dictates which of the two silicon controlled rectifiers (SCR) is switched on to furnish current to a GE 1630 lamp (6.5 V, 2.75 A). Override switches are provided which trigger either SCR permitting one or both of the lights to be on continuously. The multivibrator and flipflop power supply is cut off when just one of the lights is to be used (blink on-off).

Both microscopes are fitted with two axis translating stages, and one stage can be rotated about the optical axis of the objective lens of the microscope to permit superposition of the images. The system has been found useful for comparing opaque replicas of etched crystal surfaces at magnifications of ×50 to ×500. Pits at dislocation sites are revealed by the etching. Replicas of the surfaces are made prior to and after a testing sequence, and the comparison system shows which dislocations were displaced. Berg-Barrett x-ray topographs have been examined using transmitted light in the comparison system. These topographs of crystal surfaces are made on high resolution plates with no magnification, and details of the order of a few microns in size can be resolved with a microscope using transmitted light (typical dislocation line images were 10 μ wide). Comparison of topographs of surfaces taken before and after a testing sequence reveals which dislocations were displaced.

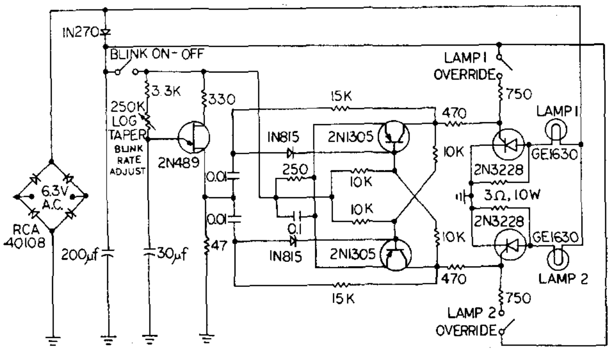

FIG. 2. Lamp blinking circuit.

---

* Work sponsored by the U. S. Atomic Energy Commission, Contract No. AT(04-3)-473.

Simple Method for Preparing Direct Glass Metal Seals

M. A. NOVACK, JR., AND G. F. DIONNE

Advanced Materials Research and Development Laboratory, Pratt & Whitney Aircraft, North Haven, Connecticut 06473

(Received 15 November 1965)

UNTIL recently, the vulnerability of glass-metal seals to attack from alkali metal vapors has been the result of a metal oxide layer at the glass-metal interface. The presence of the oxide layer has proven to be a serious limitation on the nature and extent of work which could be carried out in such systems. To avoid this danger, it has usually been necessary to use either glass-ceramic-metal seals or envelopes constructed entirely of metal.

Within the last two years, techniques for making oxide free glass-metal seals have been reported.[1,2] In each case, the resulting seals were found to be vacuum tight and would normally be expected to resist alkali metal vapor attack. However, both methods have the obvious disadvantage of requiring unnecessarily complicated equipment and fixturing, especially when only a small number of seals are desired. In addition, there is an appreciable amount of parameter adjustments (e.g., times and temperatures) nec-

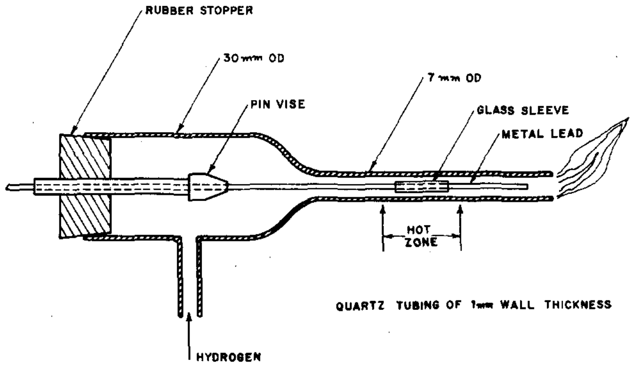

FIG. 1. Longitudinal section of quartz tube used in making direct glass-metal seals.