NASA TECH BRIEF

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Magnetic Field Mapper

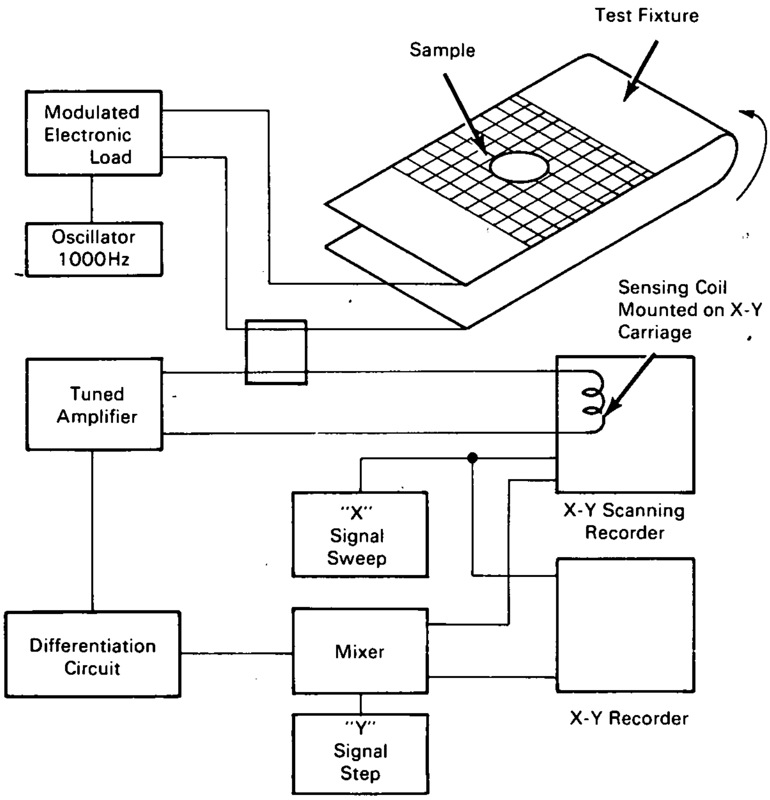

Fig. 1. Block Diagram Magnetic Field Mapper

A magnetic field mapper has been developed for locating imperfections in cadmium sulphide solar cells by detecting and displaying the variations of the normal component of the magnetic field resulting from current density variations. This same technique can be used to inspect for faults and other nonuniformities, such as thickness variations, in other electrically conductive materials.

The apparatus, together with a block diagram of the circuitry, is shown in Figure 1. The principle of operation is based on the fact that a folded flat-loop conductor has a very low external magnetic field as long as the current density in the conductor is uniform. A defect in the conductor, however, causes a nonuniform current density and an external magnetic fringe field. This results in a nonuniform normal com-

(continued overleaf)

ponent of the magnetic field near the defect. This nonuniform field can be detected with a sensing coil. In this particular instrument, the sensing coil consists of 200 turns of number 56 wire wound on a 1/8" bobbin.

This coil is mounted on the pen carriage of an X-Y recorder which scans the sample area by receiving signals from an external X sweep and a Y step generator. Sensing coil signals are passed through a polarity sensing transformer which adds a bias signal to determine the direction of the normal magnetic field component. The combined signal is fed to a tuned amplifier which detects and amplifies signals of the same frequency as the input signal. This technique minimizes interference from stray electromagnetic fields.

The signal output of the tuned amplifier is differentiated with respect to the X axis. This results in a signal which varies across the sample conductor in a way similar to the nonuniform current causing the magnetic field. This modified signal is then fed to the Y axis input of an X-Y recorder which is slaved to the X sweep and Y step of the scanning recorder. The resultant family of curves plotted by the X-Y recorder provides a qualitative map or picture of the current distribution over the surface of the flat conductor under test.

A typical family of curves illustrating the magnetic field sensed near a conducting sheet with a hole in it is shown in Figure 2. Magnetic field and hence current density changes are easily observed as the trace moves above or below the average field level.

Note:

No further documentation is available. Technical questions may be directed to:

Technology Utilization Officer
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Reference: B69-10476

Patent status:

No patent action is contemplated by NASA.

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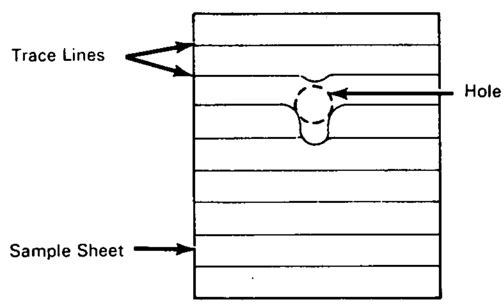

Fig. 2. Current Density Topographic Map