GEOELECTRIC DISCONTINUITY DETECTOR

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Summary

It is sometimes necessary to quickly localize a mine bed within an accuracy of a few cm. in depth. Such high accuracy measurements are made by chemical or physio-chemical methods. These methods have the disadvantage of requiring a few hours of time due to the necessity of measuring the metallic content of the ore in the laboratory rather than in situ. Sometimes high accuracy in the measurements can be sacrificed in the interest of obtaining results more quickly.

When the electrical parameters of a bed differ from those of nearby layers, the geoelectrical boundaries often are the same as the geochemical or litological boundaries, thereby establishing a method for rapid localization of a bed by geoelectrical methods.

Drifts in mines usually have rough walls making it difficult to use electrodes attaching to those walls. A more suitable method makes use of an antenna which need not be in physical contact with the mine walls. Its input impedance is dependent upon the electrical parameters of nearby regions of the earth. Such a device for making measurements of the electrical parameters of the earth usually consists of an antenna and a UHF generator. If the antenna is kept a fixed distance from the mine wall then the load impedance on the generator is a function of the electrical parameters of the earth near the antenna.

The electrical parameters detector designed by the author makes use of three refinements of the device mentioned above.

1. A two element antenna was used. The resulting directivity minimizes the influence of nearby persons on the measurements.

2. A reference generator was used in the circuit to aid in measurement of the antenna voltage and current.

3. The frequency of the antenna current was determined by measuring the difference between the reference generator and the generator connected to the antenna.

A block diagram of the detector is shown in Fig. 1. Its characteristics are shown in Fig. 2, and it is pictured in Fig. 3.

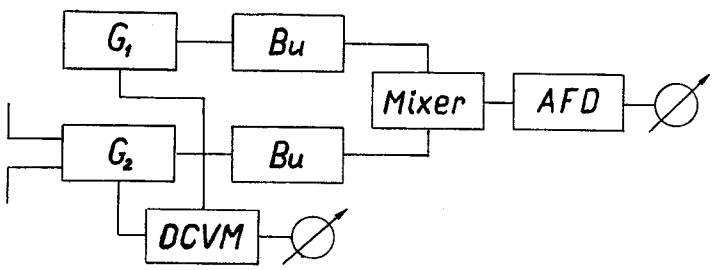

Fig.1 Block diagram of the detector

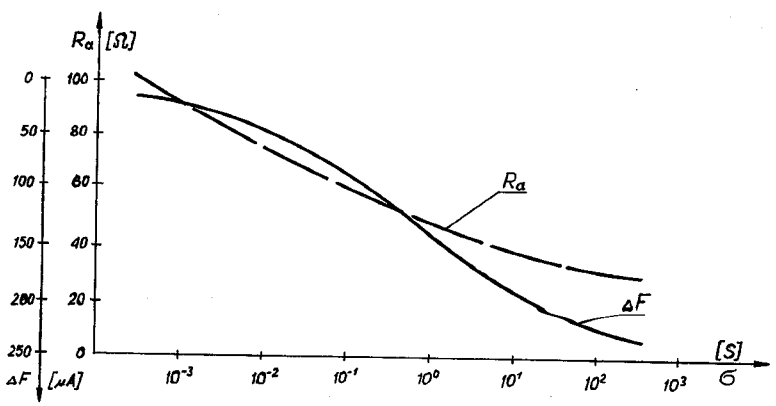

Fig.2 Calculated curve $R_a = f(\sigma)$ of the dipole placed off conducting medium in distance $h = 0{,}1\lambda$ The next curve shows experimental results of the frequency difference for the same antenna as above / for two ranges of the frequency difference measurements, the scale is graduated in uA /.

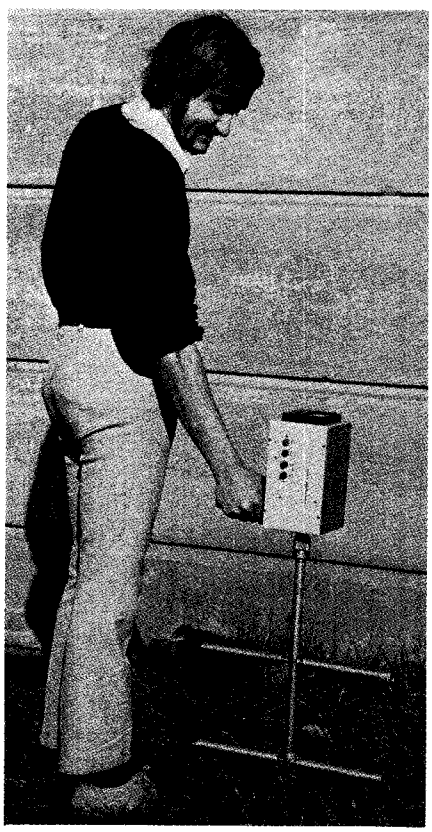

Fig. 3