Technology News

From the Bureau of Mines, United States Department of the Interior

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A Geolaser for Mapping Planar Geologic Features in Deep Underground Mines

Objective

Develop a method for mapping planar geologic features in deep underground mines where the presence of metal interferes with compass readings.

Background

A fundamental problem of mapping planar geologic features in deep underground mines is the presence of metal (water and air pipes, track, equipment, etc.), which affects the accuracy and consistency of compasses. Present geologic mapping methods include use of transits or theodolites, both of which are cumbersome and time consuming to use. To complicate the mapping process each planar feature must be surveyed, and if that feature is not apparent on the opposite wall, it cannot be mapped. Another method of mapping is to stretch a tape measure between two survey spads and place a string along a planar feature on one wall and out into the opening until it intersects the tape measure. This method, in addition to being time consuming, is also inaccurate.

Because detailed mapping of planar geologic features deep underground involves many repetitive measurements, a quick, accurate, and reliable method for making such measurements was necessary. The geolaser was developed to make such measurements in deep underground mines where metal interferes with conventionally used compasses.

How It Works

Operation of the geolaser is based on the fact that any beam of light laid horizontally along on a planar feature will define the strike of that feature. Thus, a laser beam can actually project where a planar geologic feature should occur along the back or opposite rib in an underground opening.

A plan view map of the mine showing survey spads is required. Underground, a tape measure is stretched from spad to spad. The geolaser is then placed on any planar geologic feature to be mapped, and a level contained in the unit is used to orient the beam horizontally. If the instrument cannot be placed in a tight opening, metal strips along one side or bottom of the instrument can be extended to fit into the opening. The laser beam is activated and the beam traced to its intersection with the tape measure. A 4- to 6-foot-long rod is placed perpendicular to the tape measure to mark the intersection of the beam with the tape measure. The location of the geolaser and the point where the beam crosses the tape measure are marked on the mine map. The resulting line between these points defines the line of strike relative to the survey line between the two spads. The time needed to take a measurement is about 20 seconds. Two people are required.

Test Results

The instrument and methodology have been extensively tested and have been successfully used to map planar geologic features at two deep underground mines. Time saved mapping with the geolaser is estimated at about 50%, with an increase in accuracy.

Patent Status

The U.S Department of the Interior has applied for a patent on the geolaser.

For More Information

Additional information about the Bureau's geolaser may be obtained by contacting the investigator involved with this research:

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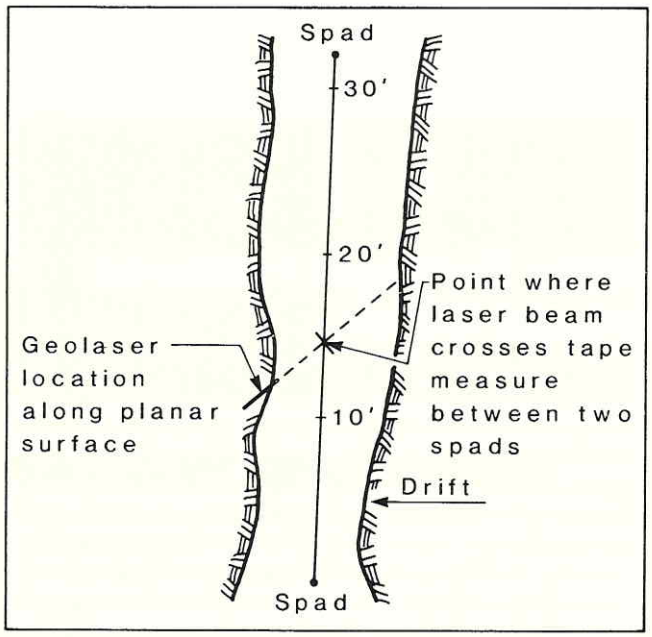
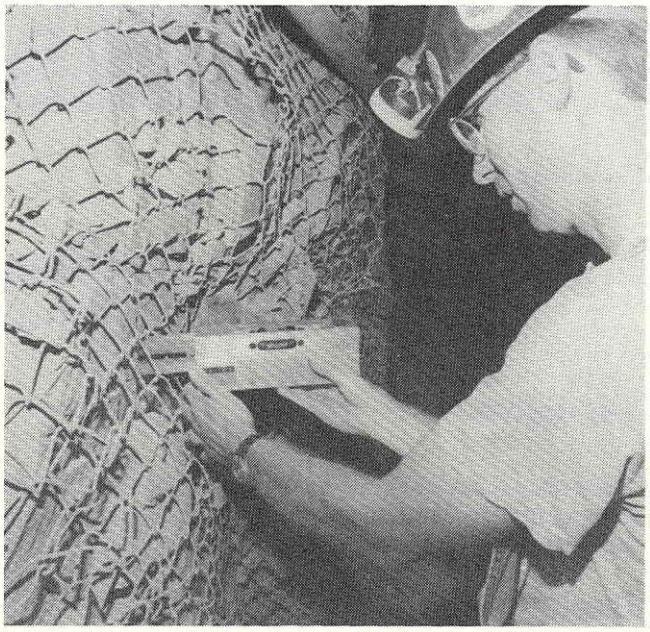


A line between geolaser location and its beam intersection with a tape measure defines the line of strike relative to a survey line between two spads.



Metal strips along one side or the bottom of the geolaser can be extended to allow the instrument to be placed in a tight opening.