

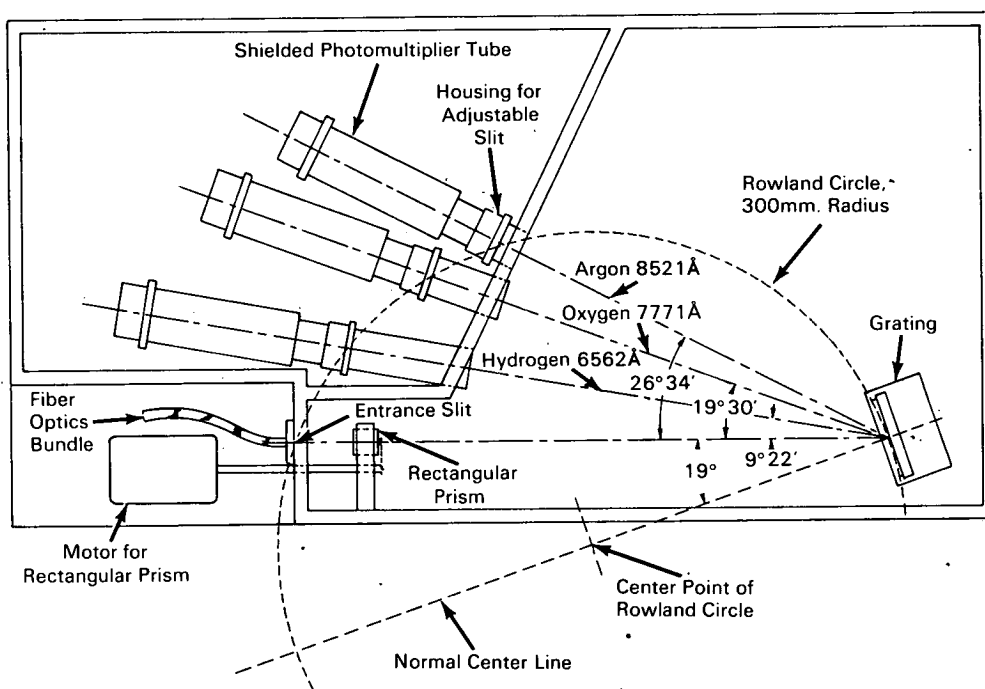
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NASA TECH BRIEF



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Portable Spectrometer Monitors Inert Gas Shield in Welding Process



The problem:

To develop a portable device that will accurately monitor the amount of oxygen and hydrogen in the inert gas shield of a tungsten-inert gas welding process.

The solution:

A spectrometer using photosensitive readouts to monitor the emitted light from the inert gas shield.

How it's done:

The illustration shows the overall layout. The hydrogen 6562.8Å and the oxygen 7771.9Å lines are the analytical lines and the argon 8521.4Å line is the

internal standard line. These lines are chosen because they have no other closely adjacent lines.

Because the welding arc does not necessarily stay in a fixed plane, a fiber optic bundle is used to transmit the light from the arc to the spectrometer. One end of the bundle serves as the entrance slit, and the other as the limiting aperture. A 1-mm entrance slit is used to compensate in some degree for the light loss in the bundle; this wide an entrance slit is made possible by the lack of lines to produce spectral interference.

The problem of blackbody radiation entering the spectrometer is eliminated by the use of an oscillating rectangular prism in the nondispersed light beam. The

(continued overleaf)

oscillation causes the emission line to oscillate across the exit slit, which effectively produces an ac signal over the dc blackbody signal.

The solid-state readout system is a direct ratio system and is therefore very sensitive. It uses Devar ratio computers in each channel to relate the analytical response readout to that of the internal standard. Outlets are also provided for oscilloscope monitoring of the waveform to establish proper optical alignment of the exit slits.

Notes:

1. The theoretical resolving power of this device is 90,000, and its optical speed is approximately $f/8$.

2. Inquiries concerning this innovation may be directed to:

Technology Utilization Officer
Marshall Space Flight Center
Huntsville, Alabama 35812
Reference: B67-10326

Patent status:

No patent action is contemplated by NASA.

Source: E. L. Grove, et al.,
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