Rebuilding A 60 mm Spectrohelioscope

by

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My interest in making a spectrohelioscope began in 1962 and my first instrument was completed in 1964. Construction involved using simple woodworking techniques, nuts, bolts, and tools and it was easily portable. The focal length of the telescope was 108 inches (2.7 meters) while the spectroscope itself had a focal length of 75 inches (1.9 meters). The grating was 32x30mm ruled area, 1200 gr./mm. Linear dispersion was 4A/mm creating a 40 inch (1 meter) long solar spectrum from the violet to the red. The solar image synthesizer was the rotating glass disk painted black and cut with 24 slits of .005" (125 microns), producing 0.5A half bandwidth. Center-to-center separation of the slits was three inches on the 4-inch diameter glass disk. As the glass disk rotated, the H-alpha line would lag at the exit slits by .004" (100 microns). All of the middle field of view was H-alpha. The extreme top and bottom was a slightly different wavelength but this caused no problems.

Now a new spectrohelioscope design is made so that the yellow helium and Fe, Mg and Na metallic lines can be employed at a necessary 0.1A half bandwidth. The solar image synthesizer is redesigned. If the separation of the projected slits is reduced to about 1.25" (32mm.), the H-alpha lag is much less. And using a longer focal length for the spectroscope lens further reduces the H-alpha lag to about .001" (25 microns).

Instead of a glass disk, a short piece of aluminum tube 5 inches in diameter is attached to a wide flange and the later is put on the output axle of a 1 r.p.s. synchronous motor. A thin slitting saw cuts 24 slits of .008" around the aluminum tube. Blades from pencil sharpeners decrease the slits down to .002" or 0.1A half bandwidth. Two small 1/10th wave diagonals are fixed inside the aluminum tube. They fold up the entrance and exit sunlight beams of the spectroscope lens. Brian Manning of England was the first to use this folding-up technique with two fixed diagonals in conjunction with vibrating slits.

The telescope is still a 2.4" diameter of 108" focal length. The new spectroscope is a 2.4" lens of 108" focal length. The new grating is 58x58mm ruled area, 1800 gr./mm., 5000A blazed wavelength. Linear dispersion is 1.8A/mm, yielding about an 80 inch (2 meters) long solar spectrum. An air current wall is near the two diagonals, preventing air currents in the spectroscope box. Two eyepieces were used: a 4.5" (112mm) for the solar disk in H-alpha and other wavelengths and a 2"(50mm) for the solar spectrum. Except for young people, the human eye has low sensitivity to violet light. The violet Ca, H and K lines cannot be utilized. Total costs are about $800.

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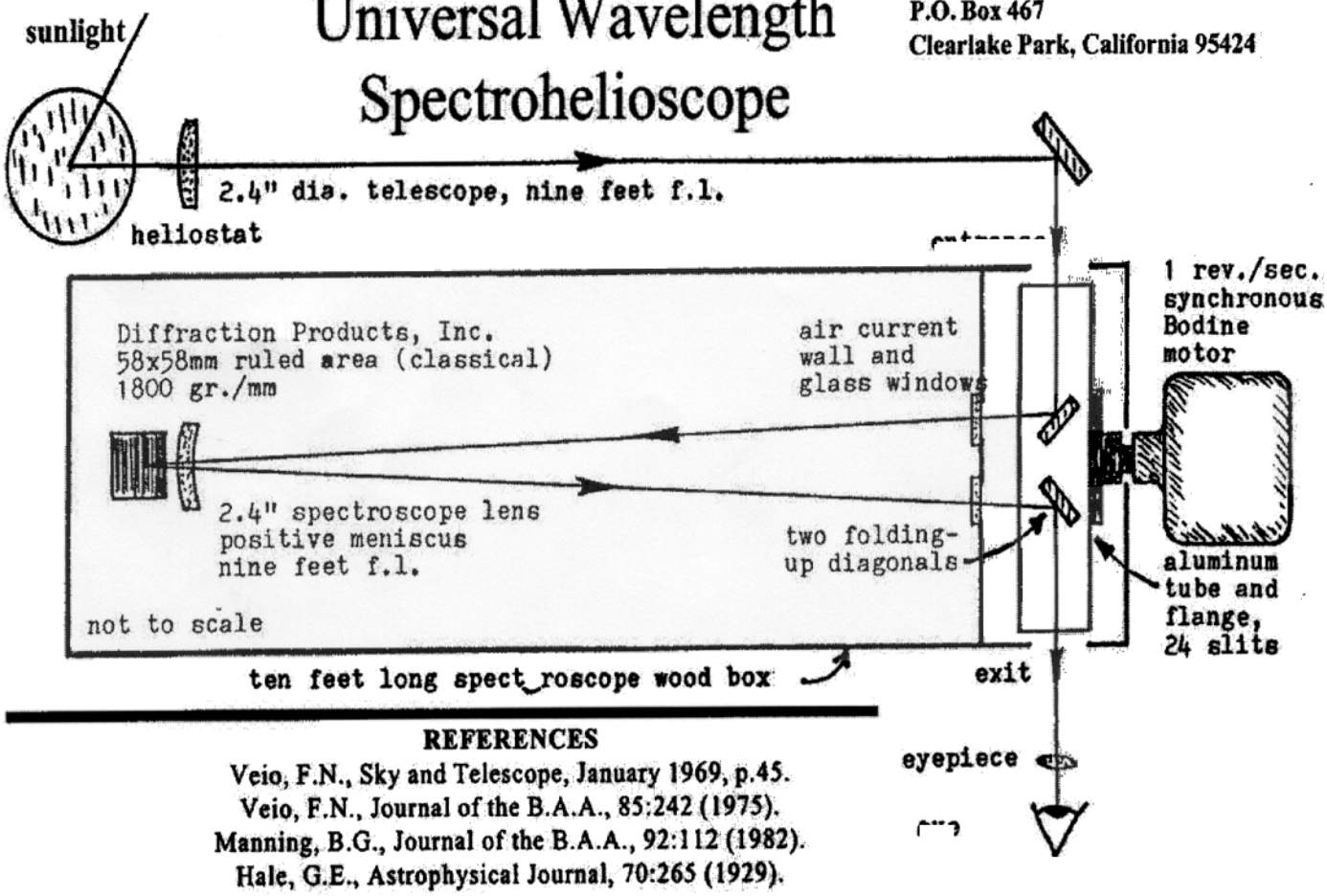
Universal Wavelength Spectrohelioscope



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