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NASA TECH BRIEF

Goddard Space Flight Center

Rotary Shutter Mechanism Contains Optical Elements

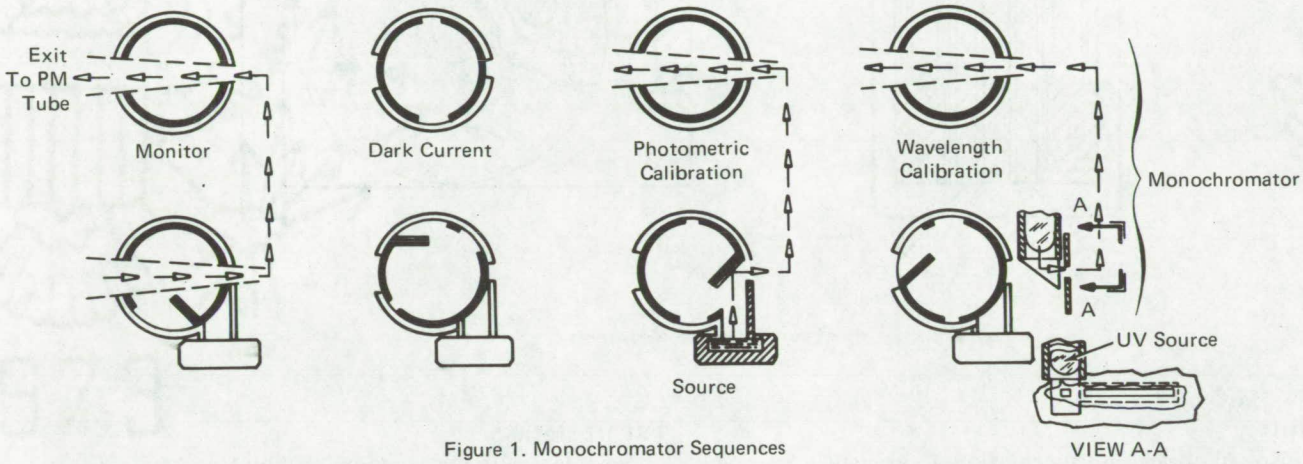

Figure 1. Monochromator Sequences

The problem:

To design a multi-position shutter capable of sequentially moving various optical components (mirrors, calibration sources, etc.) into the optical path of an ultraviolet monochromator. The shutter must also provide an extremely good light seal.

The solution:

A concentric, cylindrical design with a fixed outer sleeve and a rotating inner sleeve. Two such devices, driven by a single stepping motor and a compound Geneva mechanism, are used to control the input to the monochromator and the monochromator output to a photomultiplier.

How it's done:

The two sleeves of each shutter are machined from magnesium to fit within a radial clearance of 0.0380 mm (0.0015 in.). Rectangular opening which are just larger than the maximum light-beam are machined through the sleeves and the sleeves are anodized.

Figure 1 shows how the two shutters are positioned for various phases of monochromator operation. In the monitor position, both are open, permitting rays from the test source to pass through the monochromator to the photomultiplier tube. In the dark-current position, both are closed to allow measurement of photomultiplier noise, given a maximum shutter light-leakage ratio of 10^{-6}. For photometric calibration, the exit shutter is opened and a mirror on the entrance shutter is rotated to reflect energy from a tritium ultraviolet source into the monochromator. Finally, for wavelength calibration, the entrance shutter is closed, the exit shutter is opened, and a known-wavelength calibration source within the monochromator is turned on.

Both shutters are operated by one stepping motor, using the compound Geneva mechanism shown in Figure 2. With a common driver and two separately-driven stars, the Geneva mechanism permits the cyclic positioning of the shutters for each of the four functions, using only one motor.

(continued overleaf)

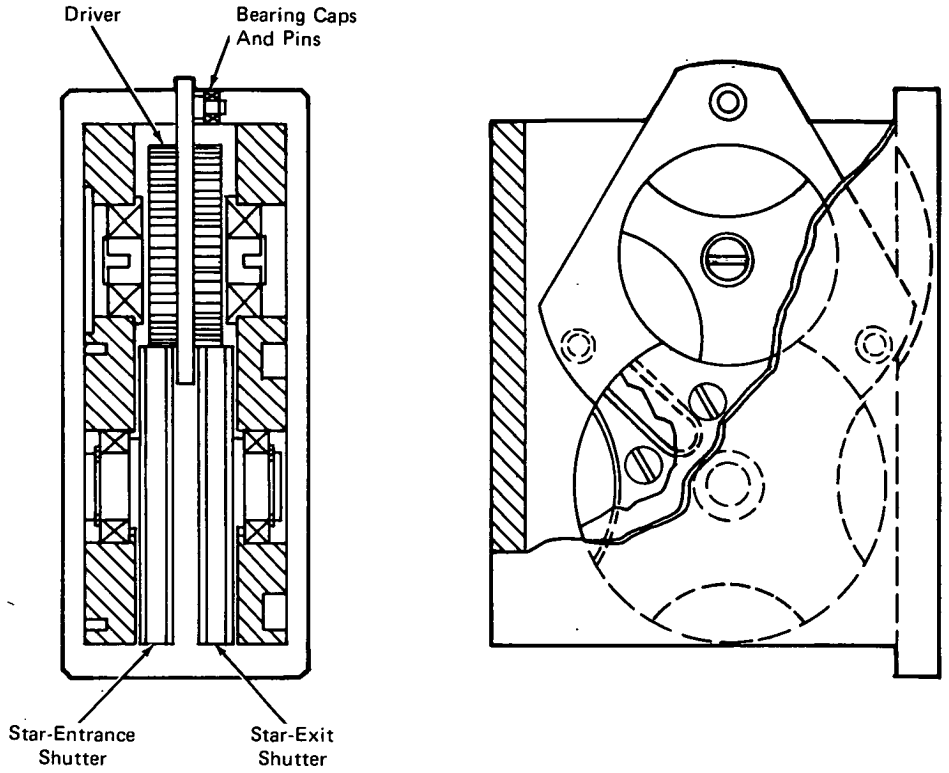

Figure 2. Geneva Mechanism

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
Code 207.1
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Patent status:

No patent action is contemplated by NASA.

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