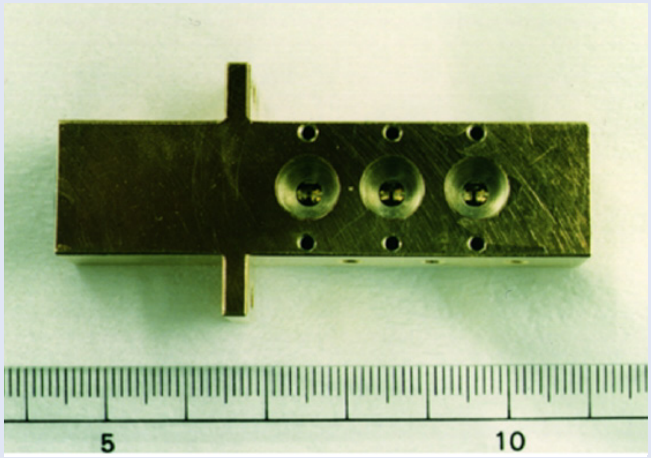
Japanese Patent Application No. H02-069375 (Patent No. 1928086)

Two-Dimensionally-Arrayed Compression-Stressed Semiconductor Photodetector

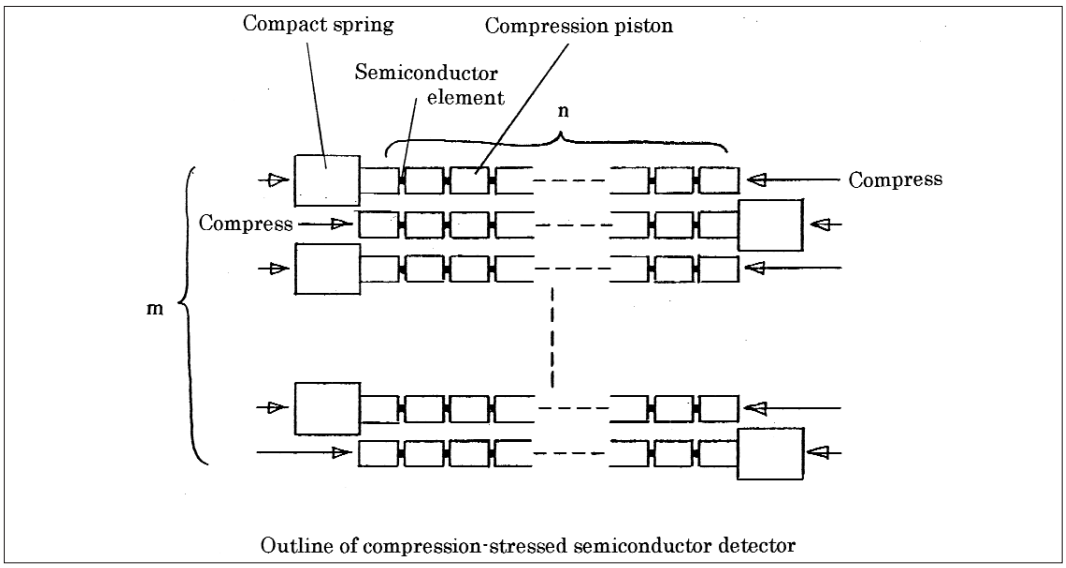
Invented by: ***Norihisa HIROMOTO***



Appearance of compression-stressed semiconductor photodetector

Outline of the technology

This invention has been developed to devise a two-dimensional array of compression-stressed semiconductor photodetectors, in which each of the component semiconductors is subjected to compression distortion for the purpose of extending the range of wavelengths to which the light will respond (including ultraviolet and infrared light). That is, a one-dimensional array is formed, composed of n units of the compression-stressed semiconductor detectors whose ranges of wavelength sensitivity can be extended by compressing the semiconductor elements to cause distortion therein. Additionally, m pieces of arrays are arranged side-by-side (in a direction perpendicular to the direction of compression) to form a two-dimensional array, which will be compressed, simultaneously by a powerful, compact spring and a compression piston. As a result, an arrayed detector with stable stress and a high density of elements can be realized. This photodetector can be applied to a wide range of uses - as a two-dimensional detector in the far-infrared region (an area where high-sensitivity two-dimensional arrayed detectors is lacking), for example, or as a two-dimensional-arrayed detector mounted at the focal point of a telescope, or as a two-dimensional detector for a spectrograph.



Conceptual diagram

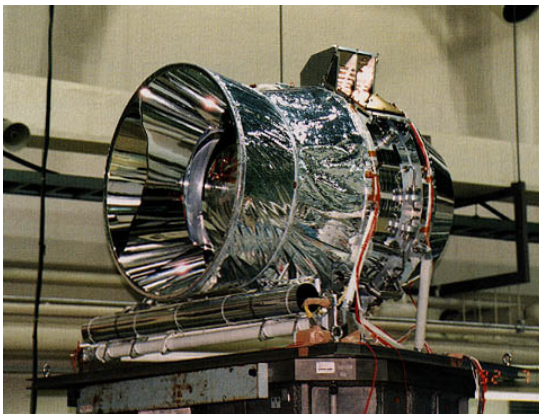
The CRL patent that plays an active role in space

The SFU (Space Flyer Unit) is a spacecraft, or a "space experiment and observation free flyer," that maintains a low earth orbit, carrying out experiments for a few months before returning to earth through recovery via space shuttle. The SFU, loaded with observation instruments, is intended to complete missions involving a variety of observations.

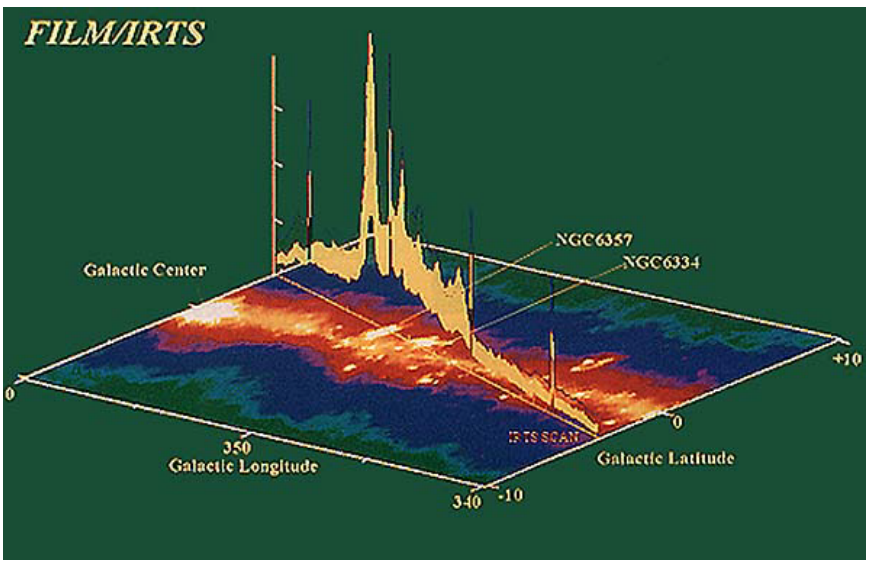
External view of SFU © ISAS

Carrying the two-dimensionally-arrayed compression-stressed semiconductor photodetector (hereinafter referred to as the "photodetector") on board, the SFU was launched on an H-II rocket on March 18, 1995. Notably, it was only 8 days before the rocket lifted off that the patent application of this photodetector was awarded a patent.

After entering orbit, the SFU performed various observations and was recovered successfully by the space shuttle on January 13, 1996, thanks to astronaut Mr. Koichi WAKATA, who manipulated a robot arm to capture the SFU. In this mission, the photodetector, installed aboard the spacecraft as a detector for the Far-Infrared Line Mapper (FILM) of the InfraRed Telescope in Space (IRTS), measured the intensity distribution of an emission line of a 158 μm wavelength originating from carbon-ion gas, successfully collecting a great deal of the most exceptional data ever collected in respect of the far-infrared emission line. Later, this photodetector won the 24th annual prize awarded by the General Director of the Science and Technology Agency of Japan on April 15, 1998.



External view of IRTS
(InfraRed Telescope in Space) ©ISAS



158 μm emission line of carbon ion of the Milky Way galaxy obtained with the compression-stressed Ge:Ga detector three-element array ©ISAS

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