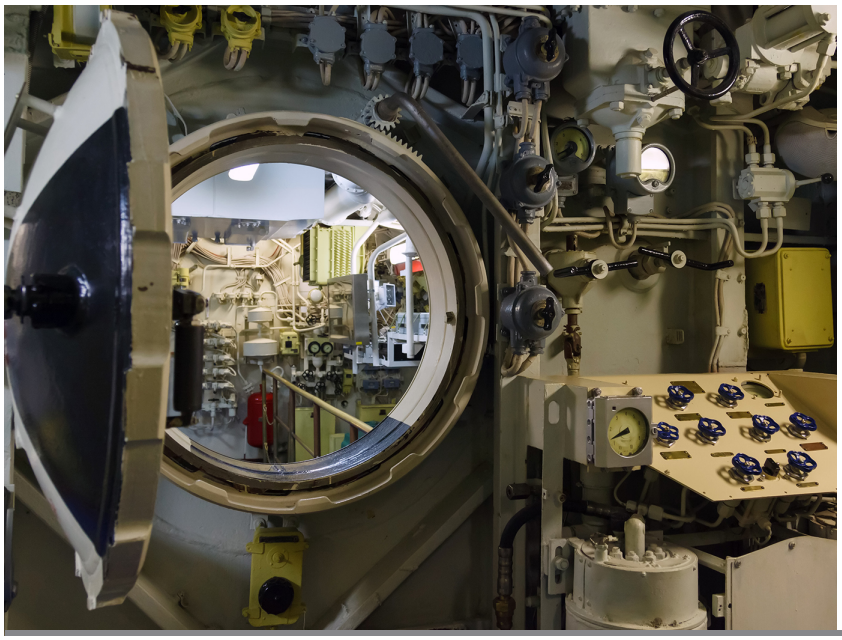


National Aeronautics and Space Administration

TECHNOLOGY SOLUTION

Mechanical and Fluid Systems

Seal with Integrated Shroud to Protect from Exposure to Extreme Environments

A durable seal design with extremely low leak rates

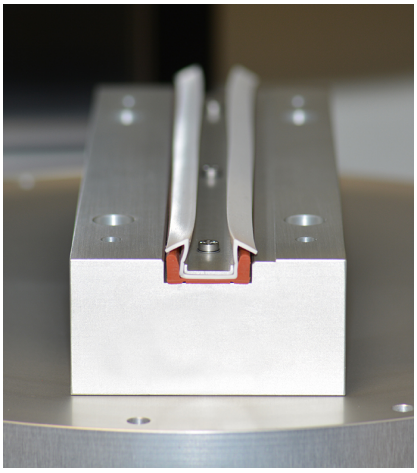
Innovators at NASA's Glenn Research Center have designed a superior seal assembly that is durable and highly dependable in extremely harsh environments. This fault-tolerant design features a novel protective shroud that shields its interior seal element(s) from hazardous conditions that can quickly degrade the seal material and cause higher leak rates. The thin and flexible shroud is able to retract to expose the seal element(s) when the shroud comes into contact with the desired mating surface, ensuring a tight, leak-proof interface. When it is time to break the seal, the process reverses itself, and the shroud arms return to their extended position to cover and protect the seal element(s). Sheltering the seal element(s) when they are not in use extends the lifetime of the seal and lessens the need for expensive and inconvenient maintenance and repairs. Originally designed to protect seals from atomic oxygen, ultraviolet radiation, and impacts from debris in space, these seals are an ideal solution for a variety of industrial and chemical applications that operate in hazardous conditions.

BENEFITS

- Fault-tolerant design: Features a protective shroud that reduces the likelihood of system failure by shielding seal elements from hazardous conditions
- Extremely low leak rates: Maintains an air-tight, water-tight seal when the shroud is retracted
- Time Savings: Reduces the need for maintenance and increases operating time
- Cost Savings: Protects seal elements from harmful conditions, resulting in a longer lifetime of the product and fewer repairs and replacement parts

THE TECHNOLOGY

Approximately 50 inches in diameter, Glenn's unique sealing system consists of multiple elements installed in a recessed rectangular sealing groove. The main sealing function is provided by an elastomer element (e.g., silicone) comprising one or more sealing wall(s) connected by a web. The wall(s) extend above the top of the sealing groove so they are compressed by the opposing mating surface during the sealing process. The retractable shroud element is installed between the wall(s), with its base resting atop the web of the sealing element. The shroud is typically composed of an elastomer material to allow for flexibility (which is essential to retraction), but it can also be made from thin metal or plastic materials. When the seal is no longer in use, a pair of V-shaped shroud "arms" extend upward from the base of the seal to cover the wall(s). A thin metal retainer is installed on top of the shroud, and fasteners pass through holes in the retainer, shroud, and sealing elements to secure the system to the base of the sealing groove. Metal washers are installed in these holes to provide a load path between the metal retainer and the surface of the sealing groove. The system can seal against either a flat metal surface or another seal of the same design. This sealing system has been designed to accommodate multiple sealing cycles and has exhibited extremely low leak rates, making it an attractive solution within a variety of industries from aerospace to agriculture.



This seal features an innovative shroud that protects the seal elements from harsh environments

Protecting seal elements from harsh conditions will increase operating time and reduce the need for maintenance

APPLICATIONS

The technology has several potential applications:

- Aerospace
- Agriculture
- Building construction
- Maritime
- Petroleum
- Pharmaceutical
- Plastics processing

PUBLICATIONS

Patent No: 10,330,201

technology.nasa.gov

NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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