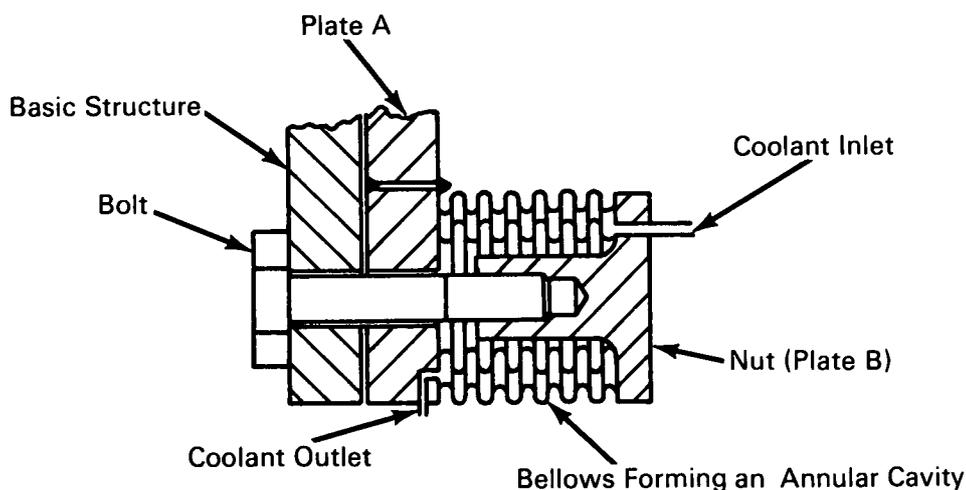


# NASA TECH BRIEF



NASA Tech Briefs are issued by the Technology Utilization Division to summarize specific technical innovations derived from the space program. Copies are available to the public from the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, 22151.

## Fastener Provides Cooling and Compensates for Thermal Expansion



**The problem:** To provide cooling and thermal expansion compensation for a fastener used in a high-temperature environment.

**The solution:** A fastener that includes a bellows through which fluid coolant may be circulated.

**How it's done:** Concentric bellows are welded to two plates, A and B, to form an annular cavity. One plate (B) is the nut that mates with the bolt to form the fastening mechanism. The other plate (A) is one face of the device or component to be fastened to a basic structure or assembly. Plate A and the basic structure are drilled to receive the bolt that mates with the nut. Plates A and B are drilled with ports for the inlet and outlet of the coolant medium. Coolant pressure is such that it does not overload the bolt but does provide compensation during thermal expansion plus the proper cold-configuration clamping load.

### Notes:

1. The device would be useful where high thermal gradients are present and a minimum clamping load is required continuously. This includes high gamma radiation zones where heating may be a problem.
2. By varying fluid pressure, remote control of clamping loads could readily be accomplished.
3. Inquiries concerning this innovation may be directed to:

NASA Space Nuclear Propulsion Office  
Technology Utilization Branch  
U.S. Atomic Energy Commission Bldg.  
Germantown, Maryland  
Reference: B65-10038

**Patent status:** NASA encourages commercial use of this innovation. No patent action is contemplated.

Source: Aerojet General Corporation under contract to NASA Space Nuclear Propulsion Office (NU-0003)

Category No. 05