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Squib-Operated Disconnect

The problem:

A small squib-operated disconnect was required for the Mariner Mars 1971 spacecraft; the device had to withstand repeated proof-testing at extreme vibration with no degradation of performance even when stressed at 1,360 to 2,160 kg (3000 to 5000 pounds) tension. Moreover, at the time of disconnection, neither gases nor debris could be ejected.

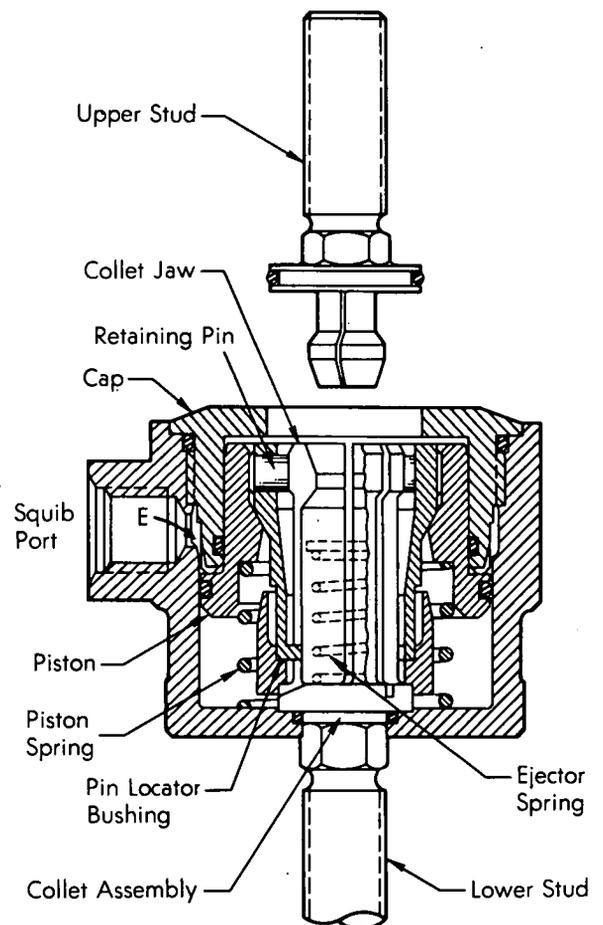
The solution:

A stud with an enlarged end is held in a collet locked by pins held in place by a piston; when a squib is fired, trapped combustion products force the piston to release the pins.

How it's done:

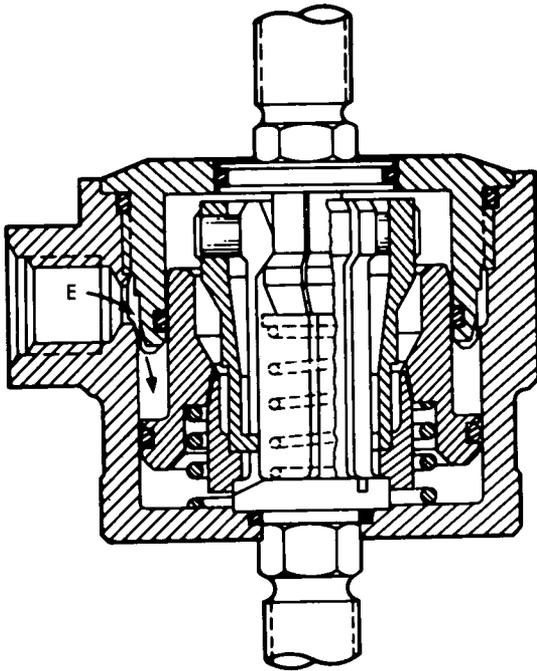
A multiple-jaw split-collet assembly is mounted in a cylindrical cavity as shown in the following diagram; the lower stud fastened to the collet serves as the means for attaching the disconnect to the rocket. When the upper stud (fastened to the spacecraft) is inserted into the collet, it will be held lightly by the natural spring action of the collet jaws; however, when the pin locator bushing is put in place, retaining pins are forced by the piston against the collet jaws. Since the pins prevent the collet jaws from expanding, the upper stud is held securely in place; the piston is held in position by the piston spring shown in the diagram.

The annular volume E, formed by the clearance between the cap and the piston, is made gas-tight by O-rings. When the squib is fired, gases enter the squib port and the annular volume, forcing the piston to compress its spring; this action frees the retaining



pins and allows the ejector spring to push the upper stud out of the collet jaws, as indicated in the following diagram.

(continued overleaf)



Exhaust gases from the squib are confined by O-rings to remain in the annular volume E; the retaining pins have shoulders to prevent their being thrown out when the upper stud is released. The upper and lower studs are equipped with O-rings to effect an hermetic seal of the inner working parts of the device.

Note:

Requests for further information may be directed to:

Technology Utilization Officer
NASA Pasadena Office
4800 Oak Grove Drive
Pasadena, California 91103
Reference: TSP 72-10713

Patent status:

This invention is owned by NASA, and a patent application has been filed. Inquiries concerning non-exclusive or exclusive license for its commercial development should be addressed to:

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Source Paul Alexander, Jr. and
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