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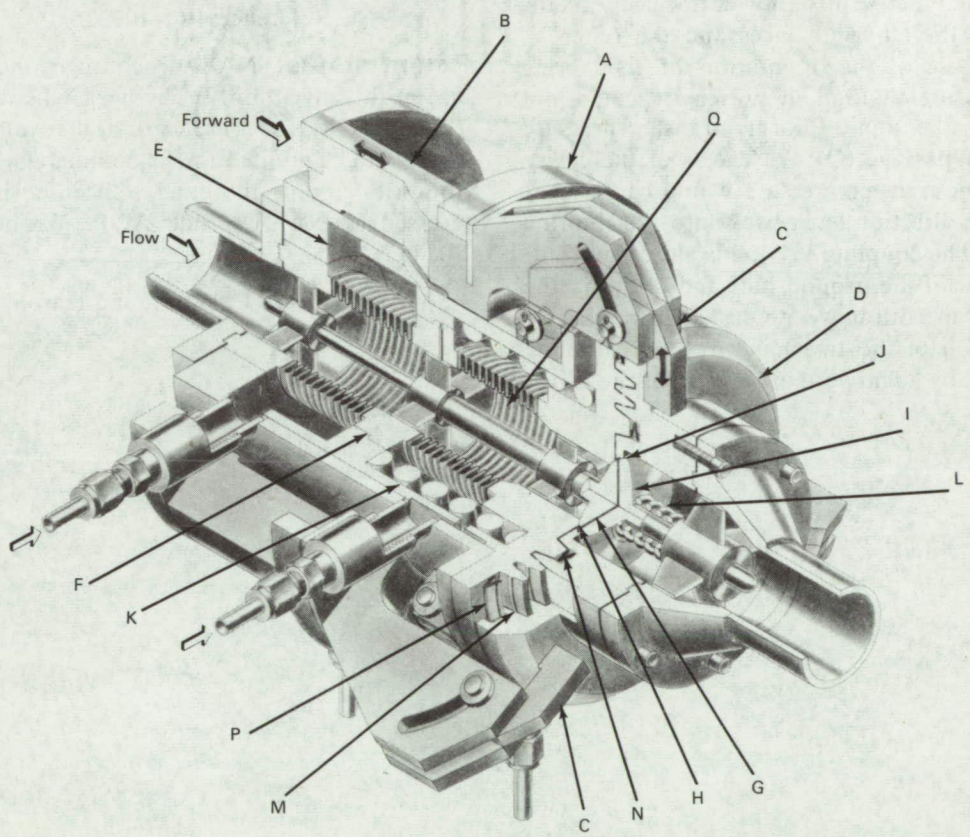
NASA TECH BRIEF

Quick-Disconnect Coupling Provides Safe Transfer of Hazardous Fluids



The problem: To develop a device which allows quick and safe uncoupling of plumbing during ground-to-vehicle transfer of cryogenic fluids and hazardous fluids such as fluorine.

The solution: Use a "quick-disconnect" coupling which allows remote positive control of liquid pressure and flow during the transfer operation, remote connection and separation capabilities, and negligible liquid spillage upon disconnection.

How it's done: To commence the connection phase, a rearward movement of the driver (A) relative to the ground-half housing (B) spreads the locking fingers (C). Both halves of the coupling are then aligned and mated. Finally, a forward movement of the driver arrangement closes the fingers around the vehicle-half housing (D). To continue positive contact between the halves, it is necessary to maintain the driver in this forward position.

(continued overleaf)

The coupling valving is opened by introducing pressurized gas into the chamber (E) of the ground half. The force developed moves the concentric slider ring (F) downstream and raises the ground-half trim (G) from its seat (H). As the ground-half trim continues its movement, it bears against the trim (I) of the vehicle half of the coupling and forces it from its seat (J). Both the ground-half loading spring (K) and the vehicle-half loading spring (L) are compressed by the operation, which gives assurance of a positive shutdown in case of a pressurizing gas failure.

During liquid-fluorine transfer through the coupling, external leakage is prevented by a combination of the static labyrinth grip (formed by the intermeshing faces (M) of the two halves) and the inner and outer V-ring seals (N and P). Any cryogenic liquid leakage past the inner seal is allowed to gasify in the cavity between the labyrinth faces and the outer V-ring seal. Because of the orientation of the V-ring seals, any pressure buildup in the cavity could not exceed that of the liquid-fluorine transfer pressure within the flow passage (Q). An excess of the cavity pressure over the transfer pressure would cause leakage in a reverse direction (e.g., back into the fluorine flow passage). The coupling valving is closed by venting the chamber of the ground half and allowing the loading springs in both halves to seal their respective trims. Separation of the two halves of the coupling is accomplished by a rearward movement of the driver to spread the locking fingers and a final rearward movement of the entire ground half.

Notes:

1. This coupling could be used in plumbing systems for the transfer of any cryogenic or hazardous fluids such as rocket propellants, and in low pressure (150 psig) gas transfer operations. It can also be used as an "in-line" pressure and flow control valve.
2. Inquiries concerning this invention may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio, 44135
   Reference: B65-10202

Patent status: NASA encourages the commercial use of this invention. It has been patented by NASA (U.S. Patent No. 3,170,486), and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to NASA, Code AGP, Washington, D.C., 20546.

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(Lewis-125)