June 1965

Brief 65-10163

NASA TECH BRIEF

Device Disconnects Several Couplings Simultaneously

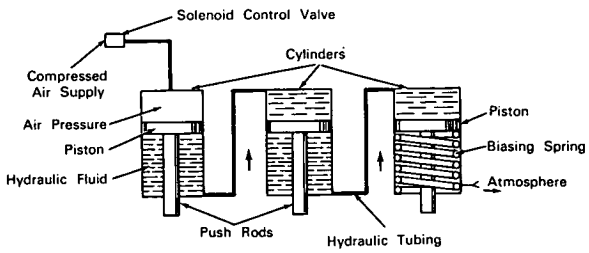

FIGURE 1

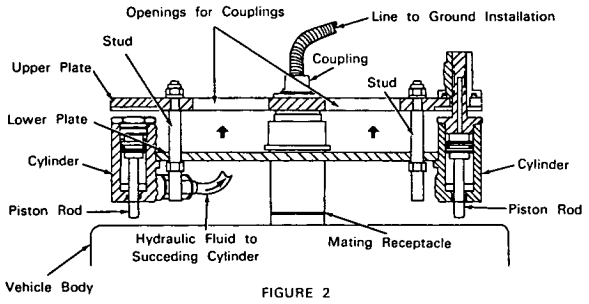

FIGURE 2

The problem: To devise an actuator assembly which will simultaneously and smoothly disconnect electrical cable and fluid-line couplings from a rocket vehicle. The electrical cables and fluid lines (umbilical cords) from launch-site equipment must remain coupled to the vehicle until the moment of launching.

The solution: An actuator assembly incorporating interconnected cylinders containing hydraulic fluid which exerts an identical force on a piston in each cylinder.

How it's done: Figure 1 schematically illustrates how three basically similar cylinders are interconnected to effect equal downward displacement of the pistons when compressed air is admitted through a solenoid control valve to the first cylinder. In order to ensure that the driving force on each piston, and hence piston displacement, will be of the same magnitude, the top and bottom surfaces of each piston must have identical areas. The last piston is loaded with a biasing spring which exerts a predetermined force on all of the pistons to keep them in an initially fixed position.

In the actuator assembly, four interconnected cylinders of the type described above are mounted between two circular plates. A cross section of the assembly is shown in Figure 2. Openings are provided in the plates for the couplings which are to be disconnected from a vehicle. When the solenoid control valve is turned on at launch, admitting compressed air into the system, all of the pistons are simultaneously moved by an equal amount toward a panel on the vehicle containing receptacles to which the couplings are mated. Since equal forces are exerted by the pistons on the vehicle wall, the lower plate of the assembly is forced to slide along the studs in a direction parallel to the wall toward the upper plate, thus simultaneously and smoothly disengaging all of the couplings from the vehicle. Disengagement does not occur until the device overcomes the maximum retardant force developed by any one of the couplings.

Notes:

1. The principle of this actuator may also have application in braking systems and various other types of mechanical controls.

(continued overleaf)

2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California, 91103
Reference: B65-10163

Patent status: NASA encourages the immediate commercial use of this invention. It is owned by NASA, and a patent application has been filed. Royalty-free nonexclusive licenses for its commercial use are available. Inquiries concerning license rights should be made to NASA, Code AGP, Washington, D.C., 20546.

Source: Alan K. Forsythe
(JPL-226)