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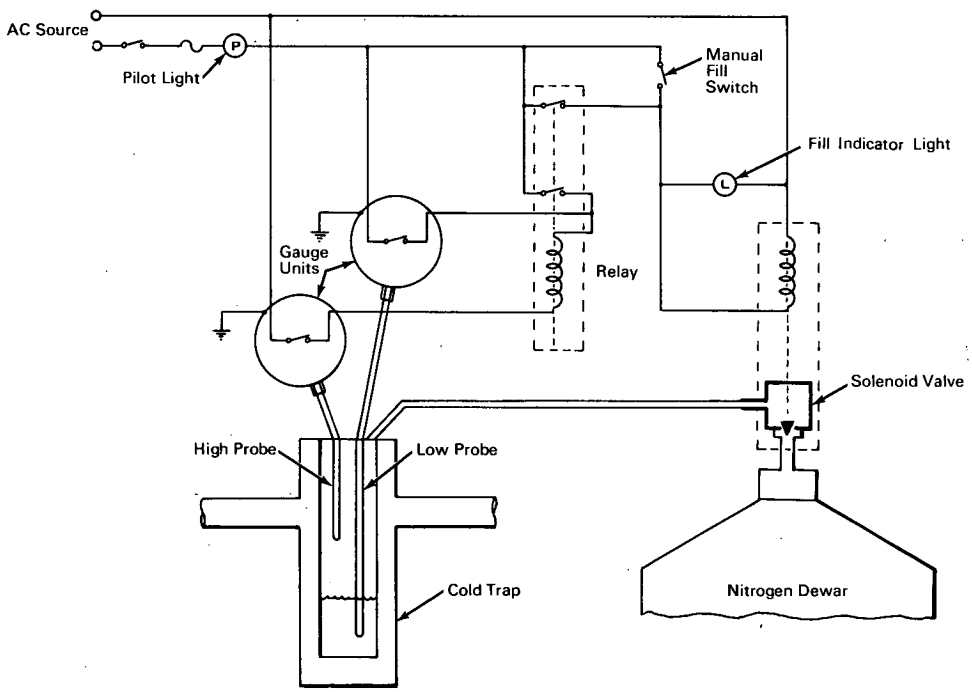
NASA TECH BRIEF

Charged Probes, Bourdon Tubes Maintain Cryogenic Liquid Level



The problem:

To design a system that automatically maintains the fluid level in a liquid nitrogen cold trap. It is frequently necessary to operate a vacuum system using one or more cold traps for a prolonged period with the cold trap liquid level maintained between set limits. Electronic devices have been subject to failure due to the effect on components of cryogenic temperatures.

The solution:

An automatic liquid nitrogen dispensing system that uses gas filled probes, driving Bourdon tube gauges equipped with microswitches that, through a relay, control a solenoid valve in the liquid nitrogen storage line.

How it's done:

The system is comprised of two probes that are in essence gas-filled (dry nitrogen) capillary tubes, the ends of which are inserted into a cold trap or liquid nitrogen reservoir at different depths. The vertical distance between the ends of these probes will govern the length of the fill cycle. When the level of nitrogen drops below the lower probe, its internal pressure rises causing the Bourdon tube in

(continued overleaf)

the gauge unit to close a microswitch that energizes an electrically latching relay. When the level of nitrogen rises to that of the second gas filled probe, another switch operates to break the current to the relay, thus unlatching it. This relay controls the solenoid valve in the liquid nitrogen transfer tube. The self-sustaining nitrogen transfer tube is made of brass in order to introduce an intentional heat leak path into the supply dewar. This creates a sufficient pressure differential to achieve fluid transfer when the solenoid valve opens.

Notes:

1. The system is fail-safe since loss of a probe gas charge will automatically open its gauge-switch unit to deactivate the relay.
2. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio, 44135
   Reference: B66-10109

Patent status:

No patent action is contemplated by NASA.

Source: Mylo J. Krejsa
(Lewis-261)