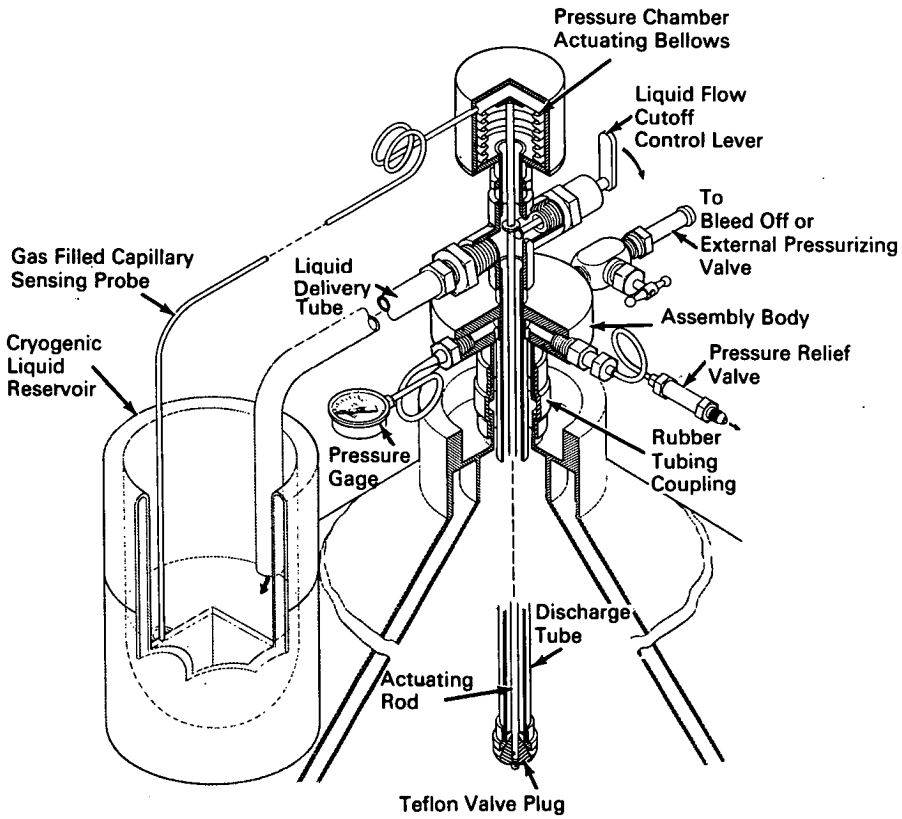
NASA TECH BRIEF

Automatic Cryogenic Liquid Level Controller Is Safe for Use Near Combustible Substances



The problem:

To develop an automatic cryogenic liquid level controller that is independent of an external source of power for its operation. The shortcomings of externally powered controllers are: (1) if the power fails the equipment becomes inoperative, and (2) if the device is used in the presence of combustible substances such as liquid hydrogen, there is a definite safety hazard.

The solution:

An automatic mechanical liquid level controller that is independent of any external power sources. A gas filled capillary tube leads from a pressurized chamber and becomes a liquid level sensing element or probe.

How it's done:

The gas filled capillary tube sensing element is inserted into the cryogenic liquid reservoir or cold trap,

(continued overleaf)

whose liquid level is to be maintained. When the liquid drops below a desired level or end of capillary tube, the change (or increase) of gas pressure in the capillary tube compresses the bellows, which is enclosed in a nitrogen gas pressurized chamber, transmitting a downward movement through the actuating rod causing the valve plug to leave its seat. Cryogenic liquid in the supply tank flows up through the delivery tube and out into the liquid reservoir. When the liquid in the reservoir rises to the desired level and contacts the capillary tube, the gas pressure in the capillary tube drops, permitting the bellows in the pressure chamber to expand due to its own inherent spring action, and the associated ambient pressure differential. The actuating rod attached to the bellows rises causing the valve plug to be seated, stopping the flow of cryogenic liquid up through the delivery tube.

Notes:

1. This system is entirely mechanical in operation and can be used with the utmost safety in the presence of combustibles because there is no electrical spark hazard involved. Another desirable feature of this system is its complete portability.
2. The safety or pressure relief valve shown is set to unload at approximately 7 psig (which has been found to be safe for metal dewars). The long stainless steel goosenecks on the pressure relief valve and pressure relief valve and pressure gage are to prevent frosting of these units due to atmospheric moisture.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   Lewis Research Center
   21000 Brookpark Road
   Cleveland, Ohio 44135
   Reference: B66-10482

Patent status:

No patent action is contemplated by NASA.

Source: Mylo Krejsa
(Lewis-195)