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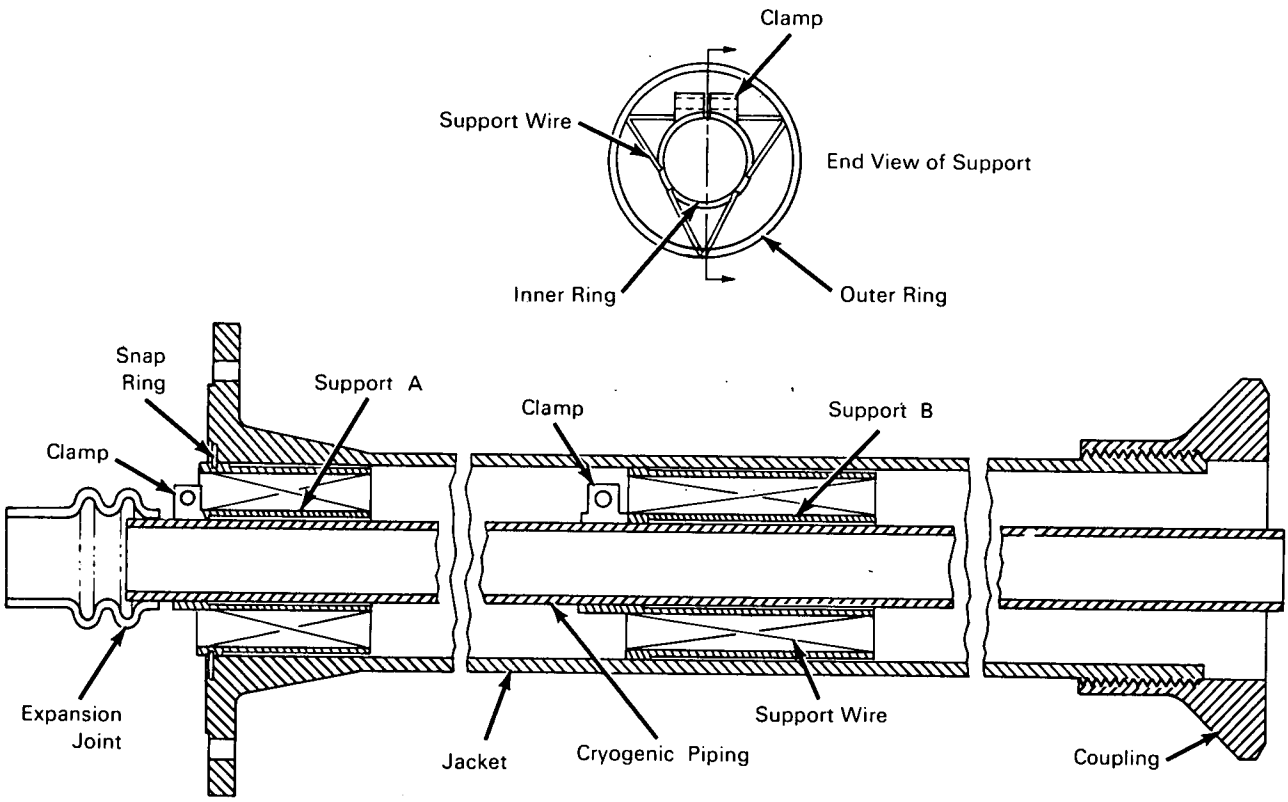
Brief 70-10306

NASA TECH BRIEF

Low Heat-Gain Cryogenic-Liquid Transfer System



Wherever cryogenic liquids are transferred by piping, it is essential to keep heat gains to the system at an absolute minimum to prevent boil-off. A conventional means of reducing heat flow into the transfer piping is to enclose the piping in a vacuum jacket to insulate the cryogenic liquid from conductive heating. However, the means of supporting the piping within the evacuated jacket must be designed not only to provide adequate physical support, but also to minimize conductive heat paths between the piping and jacket, and to allow for thermal expansion and contraction of the piping.

A conceptual design to accomplish these ends takes advantage of the fact that a ring structure with tensioned small-diameter, high-strength wires will provide the necessary rigid support, with a sufficiently small thermal cross section to reduce conductive heating to an acceptable minimum. As shown in the figure, the

(continued overleaf)

wires are tensioned between inner and outer rings which form concentric supports A and B for the piping. The inner ring of support A is clamped to the piping, and the outer ring locks into the end flange of the jacket by a snap ring. The arrangement of the tensioned wires within this support and the means of attaching the inner and outer ring are designed to limit the movement (from thermal contraction or expansion) of the piping to the length between support A and the expansion joint. Support B is also clamped to the piping but is free to slide within the jacket to enable unrestricted expansion or contraction of the piping.

Notes:

1. Calculations show that the piping supports made of stainless steel will conduct less than 10% of the heat conducted by a laminated polyester block designed for the same application.
2. This development is in the conceptual stage only, and as of the date of publication of this Tech Brief neither a model nor prototype has been constructed.
3. Requests for further information may be directed to:

   Technology Utilization Officer
   Manned Spacecraft Center, Code BM7
   Houston, Texas 77058
   Reference: B70-10306

Patent status:

No patent action is contemplated by NASA.

Source: George E. Hows and Ben J. Wright of
North American Rockwell Corporation
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