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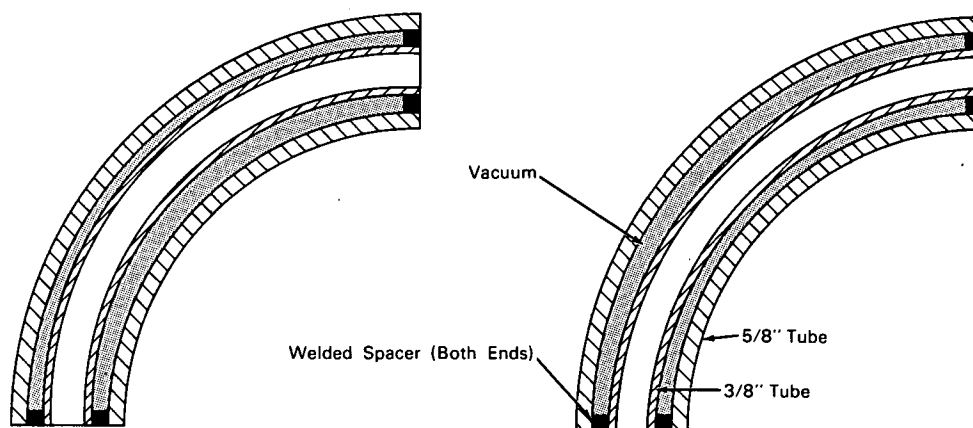
Brief 63-10368

NASA TECH BRIEF



This NASA Tech Brief is issued by the Technology Utilization Division to acquaint industry with the technical content of an innovation derived from the NASA space program.

Composite, Vacuum-Jacketed Tubing Replaces Bellows in Cryogenic Systems



The problem: Improving the reliability of high-pressure cryogenic systems. To allow for metal contraction and expansion required in such systems, metal bellows are normally employed where necessary. These become potential trouble spots in the equipment.

The solution: Eliminate the need for bellows by employing one or more 90-degree elbow expansion devices consisting of a conducting tube surrounded by a larger support tube. A vacuum in the space between the two tubes serves as insulation.

How it's done: Two pieces of tubing, one 3/8 inch in diameter and one 5/8 inch in diameter are each bent in a 90-degree circular section. The radii of the bends are chosen so that when the smaller tube is placed inside the larger, more clearance will be available between the tubes on the inside of the bend than on the outside. Spacers are welded at the two ends of the composite tubing, the space between the tubes being evacuated.

Under cryogenic temperatures the smaller, inside tube repositions itself by moving toward the inside

curve of the larger tube. Expansion and contraction are thus permitted without the use of bellows.

Notes:

1. This principle has been used satisfactorily in straight line systems, Y-sections, and 4-way sections:
2. It has been used successfully with liquid hydrogen, and also at pressures up to 2500 p.s.i.
3. For further information about this innovation inquiries may be directed to:

Technology Utilization Officer
Lewis Research Center
21000 Brookpark Road
Cleveland, Ohio 44135
Reference: B63-10368

Patent status: NASA encourages the immediate commercial use of this invention. It is owned by NASA and inquiries about obtaining royalty-free rights for its commercial use may be made to NASA Headquarters, Washington, D.C. 20546.

Source: Howard F. Calvert (Lewis-67)



NASA TECH BRIEF

The NASA Tech Briefs series is the Technology Administration's primary medium with the technical content of an innovation derived from the NASA space program.

Composites Reinforced Tubing Replaces Hollow in Hydraulic Systems



Use of the new tubing in hydraulic and pneumatic systems will increase the efficiency of these systems.

Notes:

The principal advantages of this tubing are its strength, low weight, and resistance to corrosion. The tubing is made of a composite material consisting of a central bore surrounded by a layer of carbon fiber reinforcement. The tubing is available in diameters of 1/2, 3/4, 1, 1 1/4, 1 3/4, 2, 2 1/2, 3, 3 1/2, 4, 4 1/2, 5, 5 1/2, 6, 6 1/2, 7, 7 1/2, 8, 8 1/2, 9, 9 1/2, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.

The composite tubing is made of a central bore surrounded by a layer of carbon fiber reinforcement. The tubing is available in diameters of 1/2, 3/4, 1, 1 1/4, 1 3/4, 2, 2 1/2, 3, 3 1/2, 4, 4 1/2, 5, 5 1/2, 6, 6 1/2, 7, 7 1/2, 8, 8 1/2, 9, 9 1/2, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100.