NASA TECH BRIEF

Four-Bar Linkage for Thermal Compensation In Test Mounts for Structures

Fig. 1. Thermal proof-testing of a spacecraft

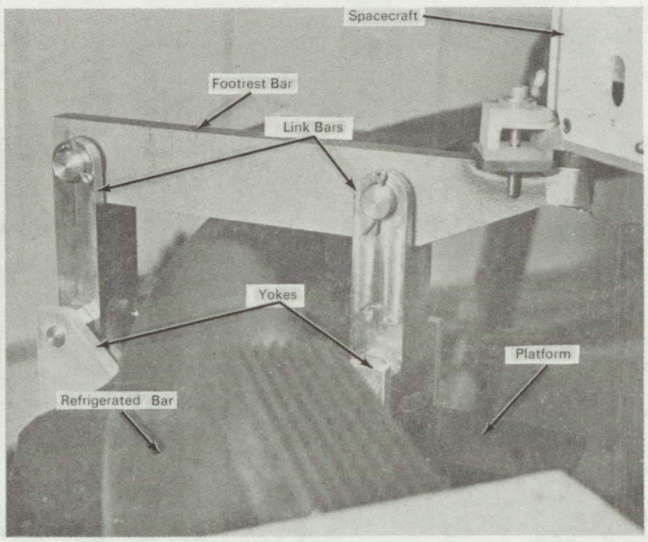

Fig. 2. Linkage

The problem:

Prevention of damage, by thermal expansion or contraction, to structures undergoing thermal proof-testing on mounts. A spacecraft undergoing thermal proof-testing in a space-simulator (Fig. 1) is mounted at three points on a ring of tubing that is chilled by circulation of liquid nitrogen. With alternate chilling and warming, the ring contracts and expands, so that structurally destructive forces would be exerted on the craft.

The solution:

Use of a supporting system that compensates automatically for the dimensional changes produced by this contraction and expansion.

How it's done:

One of the three footings of the craft is rigidly mounted on the bar; each of the other two is mounted on a four-bar linkage, each linkage being so oriented that the axis of its compensatory movement intersects that of the other at the point of the rigidly mounted footing.

Each linkage is normally a rectangle, but when it absorbs inward or outward movement it forms a parallelogram. Each (made of stainless steel) consists of a base platform welded to the underside of the refrigerated bar (Fig. 2), with a drilled yoke projecting upward from each corner of it. A footing of the spacecraft is clamped to the inner end of a horizontal footrest bar that is placed over the platform

(continued overleaf)

and linked to it by two pairs of bars pinned to the footrest and to the yokes.

The pinned bars, pointing at the rigidly mounted footing of the craft, are free to rock toward or away from the rigid mount and so absorb dimensional changes in the craft; yet the craft is 100% constrained in the three directions of motion.

Notes:

1. This system of mounting may interest anyone concerned with dimensional changes in structures during testing or service.
2. Documentation is available from:
   Clearinghouse for Federal Scientific and Technical Information
   Springfield, Virginia 22151
   Price $3.00
   Reference: TSP 69-10298

Patent status:

No patent action is contemplated by NASA.

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