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NASA TECH BRIEF

NASA Pasadena Office

Embossed Metal Diaphragm Has Two-Way Stretch

The problem:

To provide a metal diaphragm of a configuration that permits expansion in two directions and offers greater resistance to rupture.

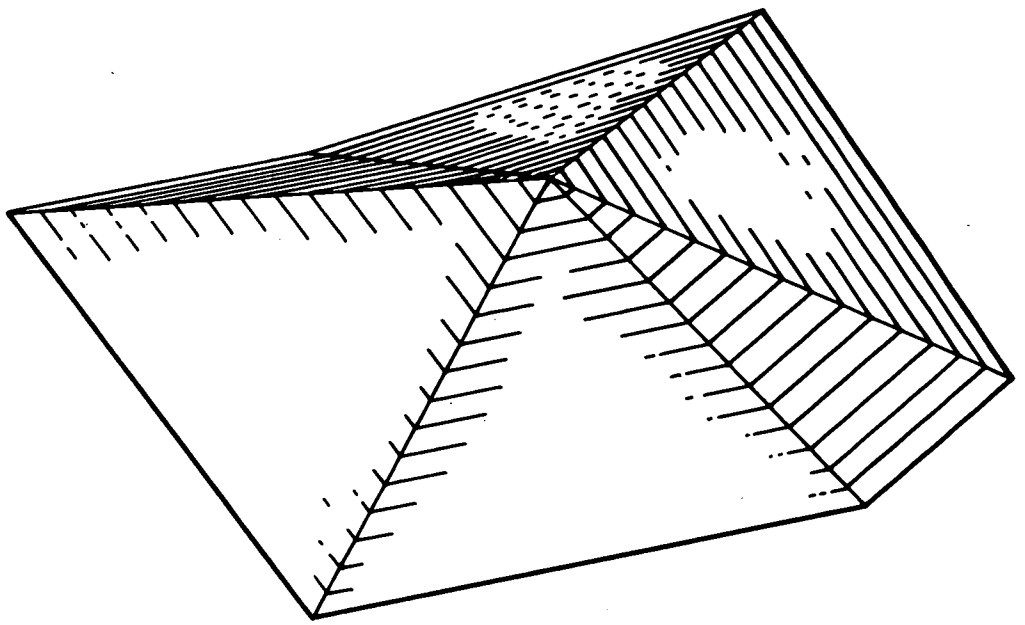
The solution:

Emboss a hexagonal pattern with alternating ridges and valleys in diaphragm sheet stock.

How it's done:

A series of uniformly located hexagonal patterns is embossed on the diaphragm sheet stock. The alternating ridges and valleys radiate outwardly from the center of the hexagonals to the corners. The diagram shows a typical hexagonal embossment of the pattern as viewed from the top and to one side.

A diaphragm with an embossed pattern of the type shown in the diagram has greater structural rigidity than one with smooth surfaces, but under severe stress, tensile loads will flatten the embossing. The flattening of the embossing provides the necessary additional panel stretch needed to prevent rupture of the diaphragm material. The hexagonal embossing-configuration allows a panel stretch in any direction or in all directions simultaneously.



The size of the basic hexagon, the depth of embossing, and the material thickness can be varied to

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suit the application. A typical relationship for a 5-cm (2-in.) diameter diaphragm could be 0.025-mm (0.001-in.) metal sheet, 1.52-mm (0.060-in.) basis hexagon (measured across opposite corners), and 0.152-mm (0.006-in.) depth of embossed pattern.

In addition to flexure diaphragms, other applications could be in the fabrication of pressure vessels and tubing to withstand severe liquid pressure surges, load-bearing panels for earthquake-resisting structures, materials to resist shock loading or thermal shock, or decorative sheeting.

Patent status:

NASA has decided not to apply for a patent.

Source: William F. MacGlashan, Jr. of
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