Nov. 16, 1965 D. L. FITTON 3,217,797

SPACE RADIATOR

Filed Nov. 30, 1961

FIG. 1

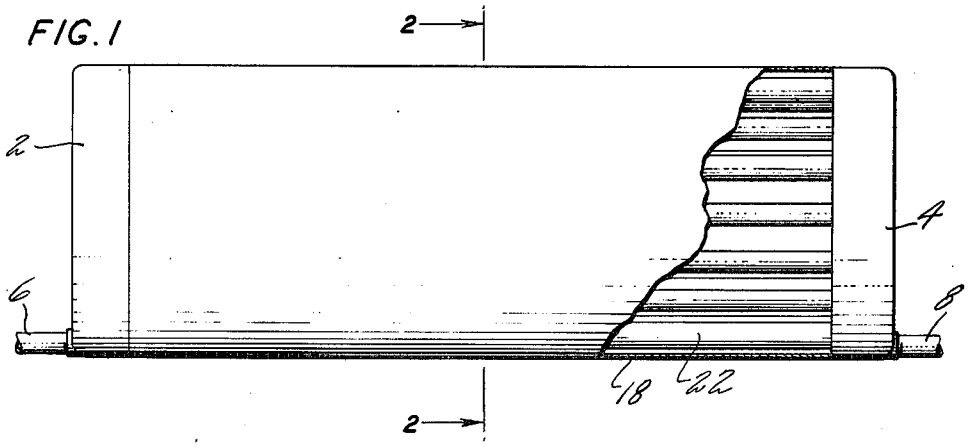


FIG. 2

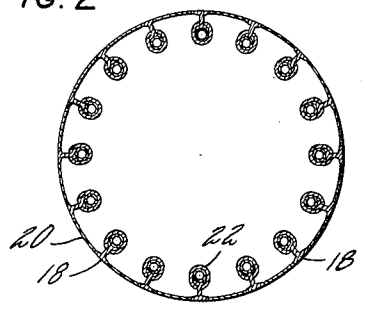
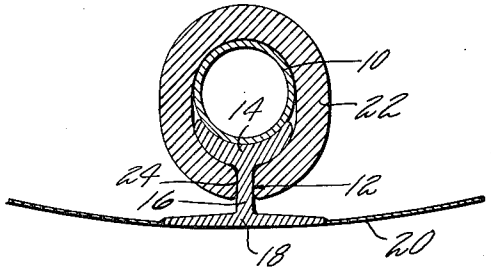


FIG. 3



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SPACE RADIATOR

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This invention relates to a space radiator and is particularly adapted to use in power generating systems for satellites.

One feature of the invention is a shield arrangement which is easily applied and provides protection against meteorite damage. Another feature is a light-weight radiator construction for this purpose.

One particular feature is the use of beryllium as a shielding means without the necessity for a weld or braze attachment to hold the shielding means in position. Another feature is the use of the shields as structural members for the radiator.

Other features and advantages will be apparent from the specification and claims, and from the accompanying drawing which illustrates an embodiment of the invention.

FIG. 1 is a side elevation of the device with parts broken away.

FIG. 2 is a sectional view along the line 2—2 of FIG. 1.

FIG. 3 is a fragmentary view of one of the tubes and shields of FIG. 2 shown on a larger scale.

In the arrangement shown the radiator has opposed headers **2** and **4**, one of which has an inlet **6**, the other of which has an outlet **8**. The arrangement is used particularly in the cooling cycle in a satellite-borne radiator which is frequently used in cooling the liquid metal in nuclear and solar power-generating systems. The headers **2** and **4** are connected by a plurality of tubes **10** which extend in parallel relation to each other and provide for a flow of the fluid from one header to the other. The tubes are preferably arranged in cylindrical configuration in FIG. 2 with the cylinder diameter nearly the same as the diameter of the headers **2** and **4**.

As shown in FIG. 3, each tube is attached to a longitudinal tube support **12** which consists of a tube-engaging arcuate portion **14**, a stem **16** and flange **18**, the latter being located in the installation substantially in alignment with the peripheries of the headers **2** and **4** and attached thereto. The flange **18** has attached to it a portion of the thin skin **20** that extends between the headers and forms a surface from which heat is radiated.

In accordance with the present invention, each of the tubes, which is as light weight as possible, is made from a material that will resist the corrosive action of the fluid flowing therein, such as steel. Each tube is protected from damage by meteorites by a substantially cylindrical shield **22** which is made of a light and strong material, preferably beryllium, which has a high heat of fusion, low density and high strength. This shield has a slot **24** therein to accommodate the stem **16** of the tube support and is shaped as shown to fit around both the tube and

the arc-shaped portion **14** of the tube support. These shields **22** are made of such a length that they will engage with the headers **2** and **4** at opposite ends of the tubes and, being relatively strong, they will form longitudinal struts which may form the structural elements interconnecting the headers **2** and **4**. By making these shields **22** in this manner such that they will carry the stresses in the radiator, the tube support and the radiator skin may be made of a light material such as aluminum, the skin being extremely thin. Obviously as an alternative the skin may be wrapped completely around the assemblage of supports to avoid any welding of the skin to the flanges.

The tube supports serve to transmit heat from the tubes **10** into the flange **18** so that the heat will radiate from the flange **18** and from the skin **20** attached thereto. In the arrangement shown in FIG. 2, the skin is made up in sections which extend between and are attached to the edge of the flanges **18** on adjacent tube supports.

It is to be understood that the invention is not limited to the specific embodiment herein illustrated and described, but may be used in other ways without departure from its spirit as defined by the following claims.

I claim:

1. A radiator construction including a pair of substantially circular, spaced-apart headers, a plurality of parallel tubes extending between and connected to said headers, a plurality of tube supports extending between said headers in parallel relation to the tubes and secured to the headers, each support having in cross section an arcuate portion to receive the associated tube, a flange portion, and a stem integrally connecting the arcuate portion to the flange portion, the flange portions of the supports being located substantially in a cylindrical configuration coinciding with the circular peripheries of the headers, and a slotted sleeve positioned around each tube with the edges of the slot engaging the stem portion of the support and with the ends of the sleeve in engagement with the headers.

2. A radiator construction as in claim **1** in which a lightweight heat-conducting skin extends between and is supported by the cylindrical configuration of the flange portions of the tube supports to form a substantially continuous cylindrical surface.

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