

United States Patent

McLafferty et al.

[15] 3,637,296

[45] Jan. 25, 1972

[54] COOLING MEANS FOR REFLECTING DEVICE

[72] Inventors: **George H. McLafferty**, Manchester;
George R. Wisner, Deep River, both of Conn.

[73] Assignee: **United Aircraft Corporation**, East Hartford, Conn.

[22] Filed: **June 4, 1970**

[21] Appl. No.: **43,493**

[52] U.S. Cl. **350/310**

[51] Int. Cl. **G02b 5/08**

[58] Field of Search.....350/179, 288, 93, 312, 61,
350/63; 126/270, 271; 353/52; 356/132

[56] References Cited

UNITED STATES PATENTS

1,530,441	3/1925	Thomson	350/310
2,705,948	4/1955	Rostock	126/271
3,488,110	1/1970	Evog	350/310

FOREIGN PATENTS OR APPLICATIONS

1,097,233	12/1953	France	126/271
568,612	11/1957	Italy	126/271

Primary Examiner—David Schonberg

Assistant Examiner—Michael J. Tokar

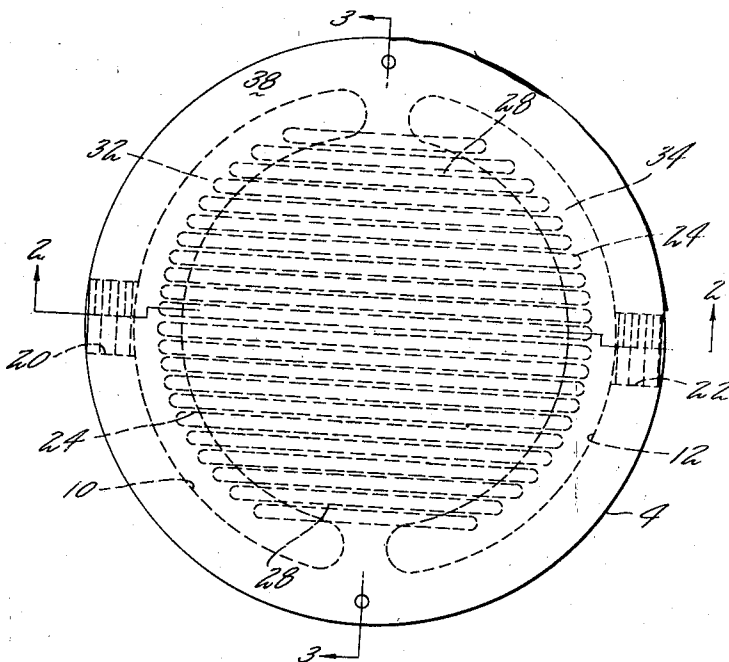
Attorney—Jack N. McCarthy

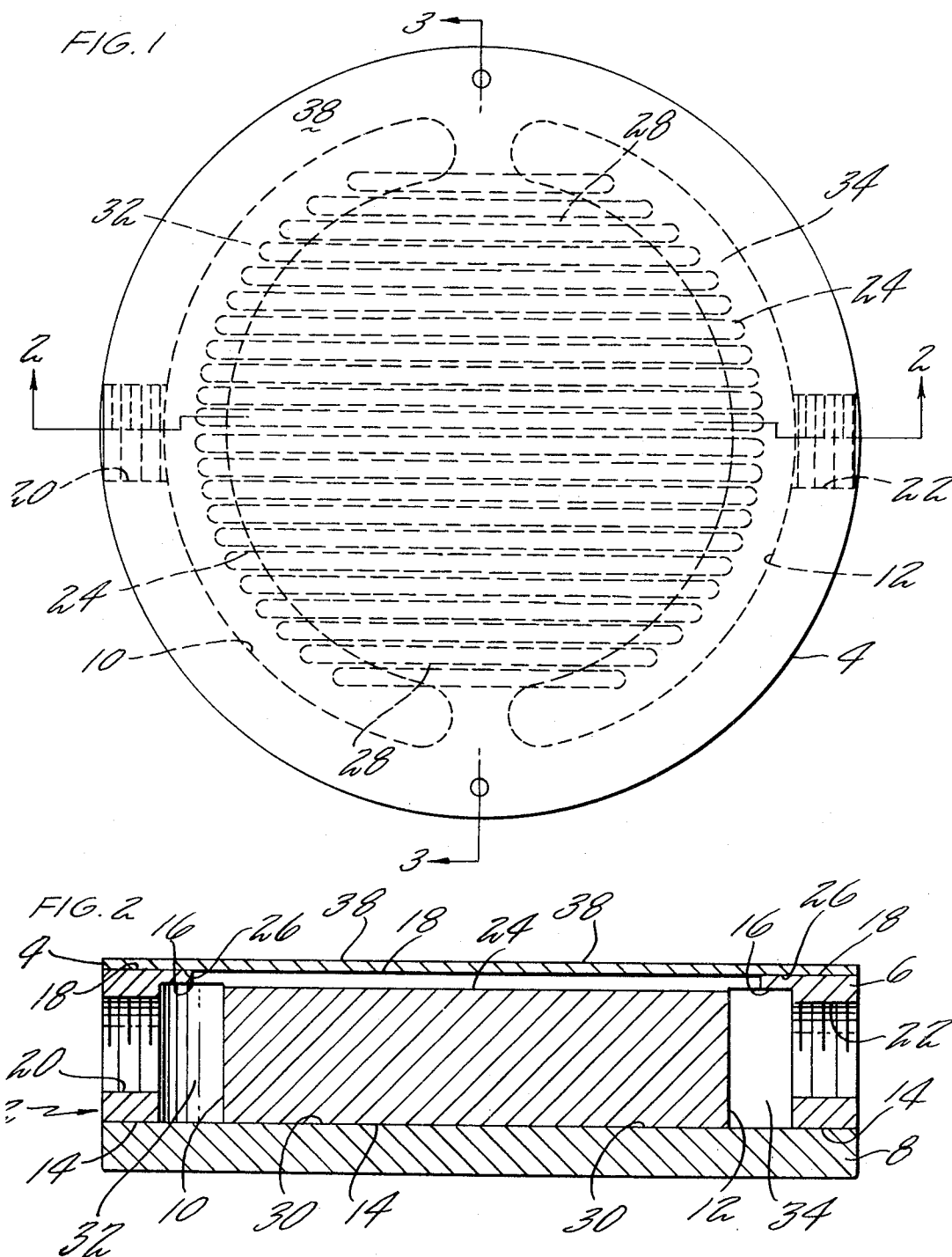
[57]

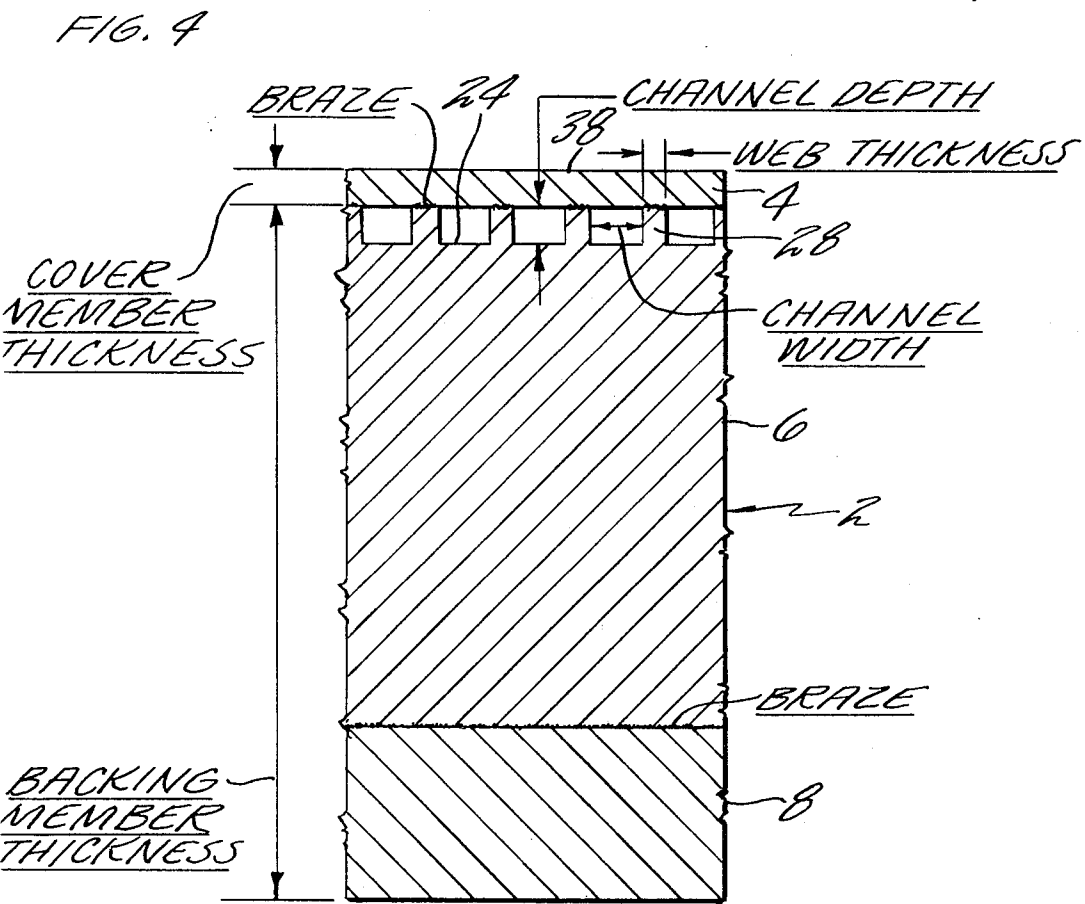
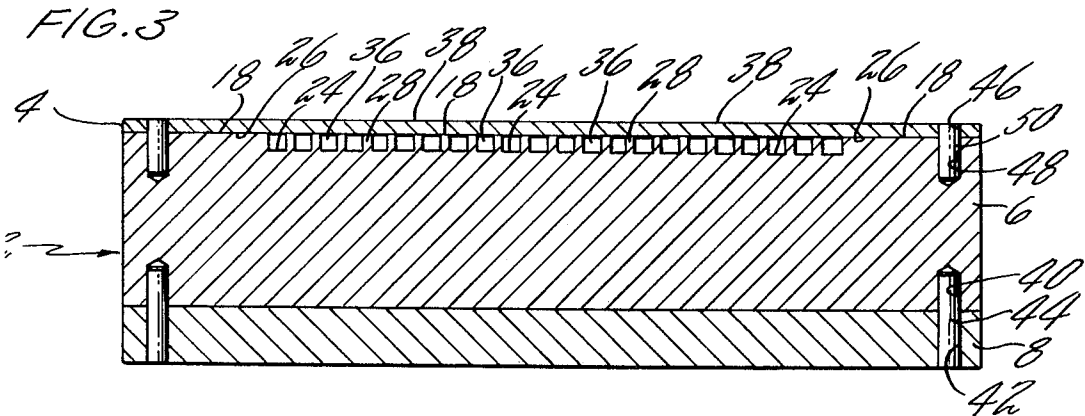
ABSTRACT

This reflecting device is for use wherein the reflecting surface is subjected to heat and includes a thick backing member with channels on one surface thereof with one surface of a cover member fixed to said channeled surface forming passages. A reflecting surface is formed on the other surface of the cover member and a manifold system directs a coolant through the passages formed by the channels of the backing member and the mating surface of the cover member. The manifold system includes an inlet and an outlet which can be connected to any desired control means to achieve the proper flow. This cooling arrangement not only provides the cooling necessary to maintain the reflecting device in an operating condition but also maintains the high quality of the reflecting surface.

10 Claims, 4 Drawing Figures







COOLING MEANS FOR REFLECTING DEVICE

CROSS-REFERENCE TO RELATED APPLICATIONS

Application Ser. No. 34,672, filed May 5, 1970, which is a continuation of application Ser. No. 804,386, filed Mar. 3, 1969 for "Cooling Means for Reflecting Device," contains subject matter which is an improvement to the subject matter herein.

BACKGROUND OF THE INVENTION

Reflecting surfaces have been made by having passages drilled radially into a block adjacent the reflecting surface; however, this method was not satisfactory due to difficulty in manifolding the passages and having the passages follow a curved surface. The passages also would have to be large and the material thickness from the surface of the cooling channel would be excessive.

SUMMARY OF THE INVENTION

This reflecting device permits close dimensional tolerance passages and simplified manifolding. The coolant passages can also be formed of complex contours with the same tolerance. This construction also gives flexibility of materials in that the requirement for thermal stability of the material can be relaxed in favor of other requirements if necessary. The method of making a reflecting device such as this is greatly simplified and the quality greatly increased. Quality means that the reflecting surface is maintained to produce diffraction limited optics.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a top view showing the location of the inlet and outlet along with the manifolds and the cooling passages.

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

FIG. 3 is a view taken along the line 3—3 of FIG. 1.

FIG. 4 is an enlarged view of a portion of FIG. 3 showing the cooling passages in detail.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The reflecting device shown includes a backing member 2 and a platelike cover member 4. While members 2 and 4 are shown as substantially circular in shape (see FIG. 1), other contours desired can be used, such as rectangular. The backing member 2 is shown as being constructed from two parts, 6 and 8.

Part 6 is relatively thick and has arcuate slots 10 and 12 cut into one end surface 14. These slots, 10 and 12, extend inwardly to an inner surface 16 adjacent the other end surface 18 of part 6, and are formed having the same radial distance from the center of the part 6 of the circular backing member 2. Each slot, 10 and 12, is adjacent the outer edge of the part 6 and extends substantially through an arc of 180°.

A passage 20 extends in a radial direction within part 6 and connects the midpoint of the arcuate slot 10 with the exterior of the backing member 2. A passage 22 extends in a radial direction within part 6 and connects the midpoint of the arcuate slot 12 with the exterior of the backing member 2. These passages 20 and 22 are positioned at diametrically opposed locations.

Channels, or grooves, 24 are formed in the surface 18 of part 6. This surface 18 is shaped to receive one surface 26 of the platelike cover member 4. The channels 24 are rectangular in cross section with webs 28 being formed therebetween. The channels are positioned in a parallel relationship with one end of each channel being connected to the slot 10 at its inner surface 16 and the other end of each channel being connected to the slot 12 at its inner surface 16.

Part 8 is a manifold cover having a surface 30 which covers the open ends of slots 10 and 12 and forms two manifolds 32 and 34 therewith, respectively. This surface 30 of part 8 is fixed to surface 14 of part 6 so as to have a leakproof attachment. Any fixing means can be used which will provide

this leakproof attachment, such as brazing.

Platelike cover member 4 has its surface 26 fixed to surface 18 of part 6 which includes the tops of the webs 28. This surface 26 forms a plurality of passages 36 with channels 24. These surfaces 18 and 26 are also fixed together so as to have a leakproof attachment. Any fixing means can be used which will provide this leakproof attachment, such as brazing. The outer surface 38 of platelike cover member 4 is made into a reflecting surface.

To align the part 8 and the platelike cover member 4 with part 6 for fixing them together aligning pin means are shown. To position the part 8 with part 6 holes 40 and 42 are aligned and pins 44 are pressed into place. To position the platelike cover member 4 with part 6 holes 46 and 48 are aligned and pins 50 are pressed into place.

In operation, as shown in FIG. 1, a coolant can enter passage 22, flow into manifold 34 and be directed into one end of all the passages 36. The coolant flows through the passages 36 adjacent the reflecting surface 38 to the manifold 32 where it exits through passage 20. Any control means desired can be used to control the flow of coolant liquid through the reflecting device which will maintain the flow at a rate which will prevent the temperature difference between the reflecting surface 38 and the surface 18 of part 6 from contributing to thermal distortions.

In a reflecting device, or mirror, constructed in this manner, the thickness of the backing member 2 was made approximately 16 times the thickness of the platelike cover member 4. The material used to form the backing member 2 and the platelike cover member 4 was copper. This material was used since it has a high rate of conductivity. While other coolants can be used, water was used. The reflecting surface formed on surface 38 can be made in many ways. In the construction referred to, the copper platelike cover member 4 was coated with electroless nickel, which was then coated by vapor deposited gold-chromium, and polished.

We claim:

1. An optical reflecting device for operating under heat comprising a thick backing member having a metallic surface of a predetermined shape, a second relatively thin metallic platelike member fixed to the surface thereof, one of said members having channels on the side facing the other member, said channels forming webs therebetween, the free faces of the webs being fixed to the other member, said channels forming passages with the other member, a coolant manifold system comprising at least two manifolds, said manifold system being connected to said passages, said free face of said second member being treated to form a reflecting surface.

2. A reflecting device as set forth in claim 1 wherein the manifold system is formed within the device.

3. A reflecting device as set forth in claim 2 wherein said thick backing member has a manifold formed in each side thereof with said channels being connected therebetween.

4. A reflecting device as set forth in claim 1 wherein the contour of the channels is rectangular.

5. A reflecting device as set forth in claim 1 wherein means directs a coolant into said manifold system for flow through said passages.

6. A reflecting device as set forth in claim 1 wherein the ratio between the thickness of said backing member and the thickness of the second member thickness is large.

7. A reflecting device as set forth in claim 1 wherein the free face of the second member has a layer of reflective material thereon.

8. A reflecting device as set forth in claim 1 wherein the channels are formed on the surface of said thick backing member.

9. A reflecting device as set forth in claim 3 wherein the channels are formed on the surface of said thick backing member, each end of said channels intersecting one of said manifolds.

10. A reflecting device as set forth in claim 1 wherein the free faces of the webs are brazed to the other member.

* * * * *