Aug. 11, 1942. G. T. GERLACH ET AL 2,292,372

STRUCTURAL ELEMENT

Filed July 28, 1941

Fig. 1

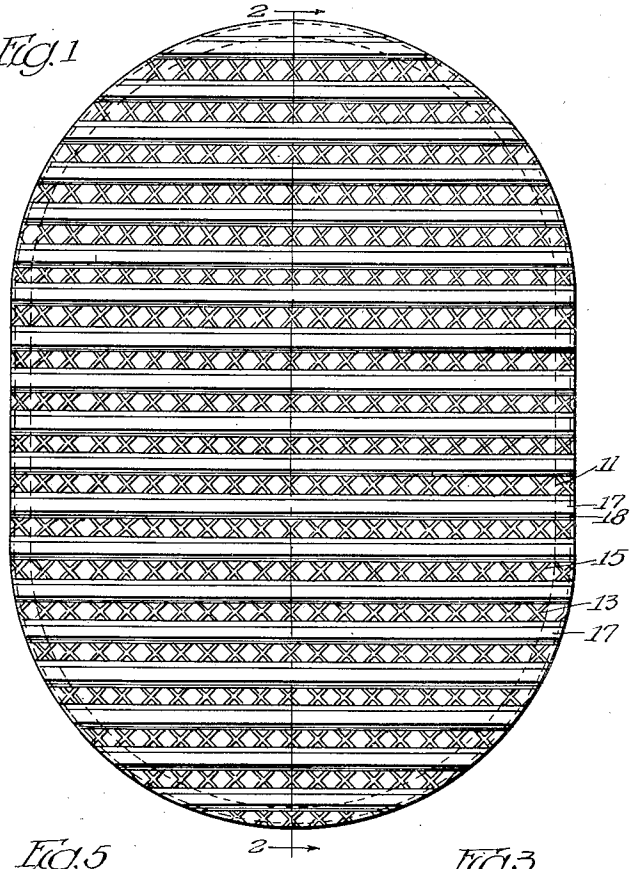


Fig. 2

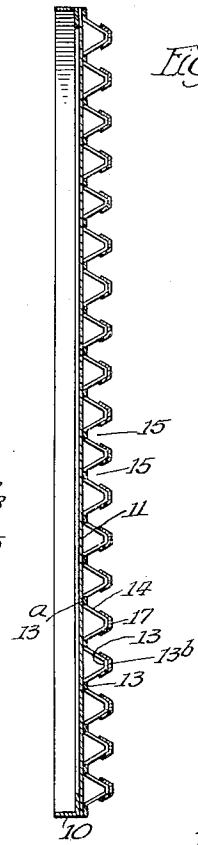


Fig. 5

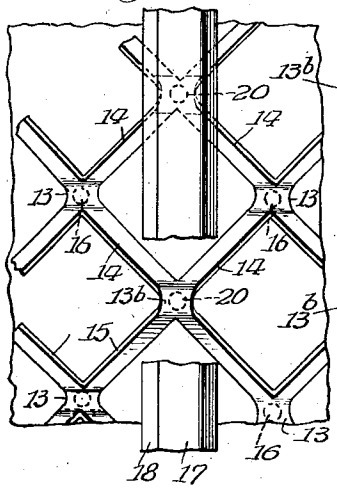


Fig. 3

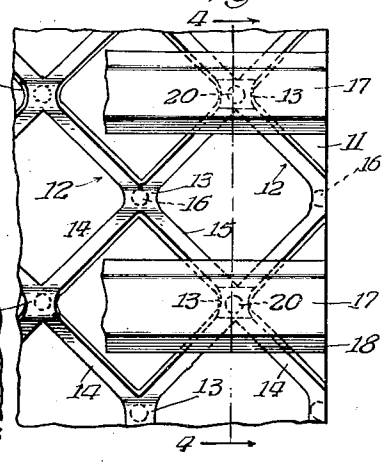
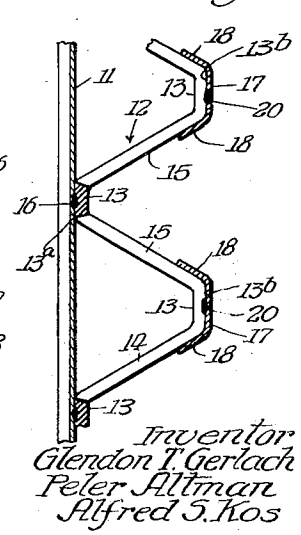


Fig. 4



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Patented Aug. 11, 1942 2,292,372

UNITED STATES PATENT OFFICE

2,292,372

STRUCTURAL ELEMENT

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Application July 28, 1941, Serial No. 404,380

5 Claims. (Cl. 189—34)

The invention relates to metal elements such as bulkheads.

One object of the invention is to provide a bulkhead which comprises expanded metal and a thin skin-forming sheet, the expanded metal having arched deformed portions and strips spaced from the sheet and connecting the arched portions so the bulkhead will have a high strength-weight ratio and transverse rigidity and which can be substituted for elements of light weight metal, such as aluminum.

Other objects of the invention will appear from the detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawing: Fig. 1 is a face view of a bulkhead embodying the invention. Fig. 2 is a section on line 2—2 of Fig. 1. Fig. 3 is a face view of a portion of the bulkhead on a somewhat larger scale. Fig. 4 is a section taken on line 4—4 of Fig. 3. Fig. 5 is a view of a modified form of the invention.

The invention is exemplified in a bulkhead of oval contour which may be used in airplane structures. The bulkhead comprises a rim 10, angular in cross-section and bent to the desired contour of the margin of the bulkhead. A sheet 11 of thin skin-forming metal, such as steel, has its margin spot-welded to one of the flanges of the rim 10. Diamond-mesh expanded metal 12 is spot-welded at spaced points throughout the entire area of the sheet 11. The expanded metal is of the diamond-mesh type which has been flattened so that the faces of the bonds and strands will be coplaner and comprises diagonal strands 14 joined by bonds 13. The strands of the flattened expanded metal are bent, before said metal is spot-welded to sheet 11, to form a succession of rows of arched or substantially V-shaped portions 15. This results in coplaner faces 13a in the alternating rows of bonds which fit against one face of the sheet 11. The faces 13b of the intermediate rows of bonds 13 are coplaner and spaced transversely away from the sheet. The rows of arched portions extend entirely across the sheet. The faces 13a of alternate rows of bonds 13 are spot-welded to the sheet, as at 16. Channelled strips comprise a web 17 which fits the faces 13b of the bonds and inclined divergent flanges 18 which fit against the outer portions of the strands in alternating rows of arched portions 15. These strips are spot-welded to the bonds of the expanded metal as at 20.

In fabricating the bulkhead the strips 17 are welded to the faces 13b of the bonds before the faces 13a are welded to the sheet 10.

In practice, it has been found that a bulkhead composed of a sheet .007" in thickness and diamond-mesh expanded metal with a long axis of 3.25" and a short axis 1.56" (before the arched portions are formed therein) and the strands approximately .050" in thickness, without regard to the reinforcement formed by the arched portions of the expanded metal and the ridge-strips, has greater transverse strength under compression than aluminum .032" in thickness and that the weight of the bulkhead will be no greater than when formed of aluminum. The arched portions of the expanded metal and the strips provide adequate transverse strength for predetermined loads.

The strips may extend across transverse rows of the arched portions of the expanded metal, as illustrated in Fig. 3, or may extend across longitudinal rows of the arched portions, as illustrated in Fig. 5.

The invention exemplifies a structural element, such as a bulkhead, having a high strength-weight ratio and in which a thin skin-forming sheet is adequately reinforced to resist transverse stresses or deflections.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what we claim as new and desire to secure by Letters Patent is:

1. A structural element comprising a thin skin-forming sheet, expanded metal having a substantially continuous succession of rows of arched portions between alternate rows of the bonds of the expanded metal extending transversely away from the sheet, the portions between the arched portions being bonded to the sheet, and strips extending across and bonded to the rows of the arched portions of the expanded metal and spaced transversely from the sheet.

2. A structural element comprising a thin skin-forming sheet, flattened expanded metal having a substantially continuous succession of rows of arched portions between alternate rows of the bonds of the expanded metal extending transversely away from the sheet, the portions between the arched portions being bonded to one

face of the sheet, strips extending across and bonded to the rows of the arched portions of the expanded metal and spaced transversely from the sheet, and a rim secured to the other face of the sheet.

3. A structural element comprising a thin skin-forming sheet, flattened expanded metal having a substantially continuous succession of rows of arched portions between alternate rows of the bonds of the expanded metal extending transversely away from the sheet, the portions between the arched portions being bonded to the sheet, and strips extending across and bonded to the rows of the arched portions of the expanded metal and spaced transversely from the sheet, said strips having divergent flanges extending toward the sheet.

4. A structural element comprising a thin skin-forming sheet of metal and diamond-mesh expanded metal having a substantially continuous succession of rows of arched portions with the bonds in alternate rows coplaner and bonded to the sheet and the bonds of intermediate rows coplaner and spaced apart transversely from the sheet, and strips extending along and welded to the bonds in the intermediate rows.

5. A structural element comprising a thin skin-forming sheet of metal and diamond-mesh expanded metal having a substantially continuous succession of rows of arched portions with the bonds in alternate rows coplaner and bonded to the sheet and the bonds of intermediate rows coplaner and spaced apart transversely from the sheet, and strips extending along the welded to the bonds in the intermediate rows, the strips having flanges extending toward the sheet.

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