Jan. 24, 1961 R. E. DU BOIS 2,969,516

RESISTOR STRUCTURE

Filed Oct. 27, 1959

2 Sheets-Sheet 1

FIG. 1.

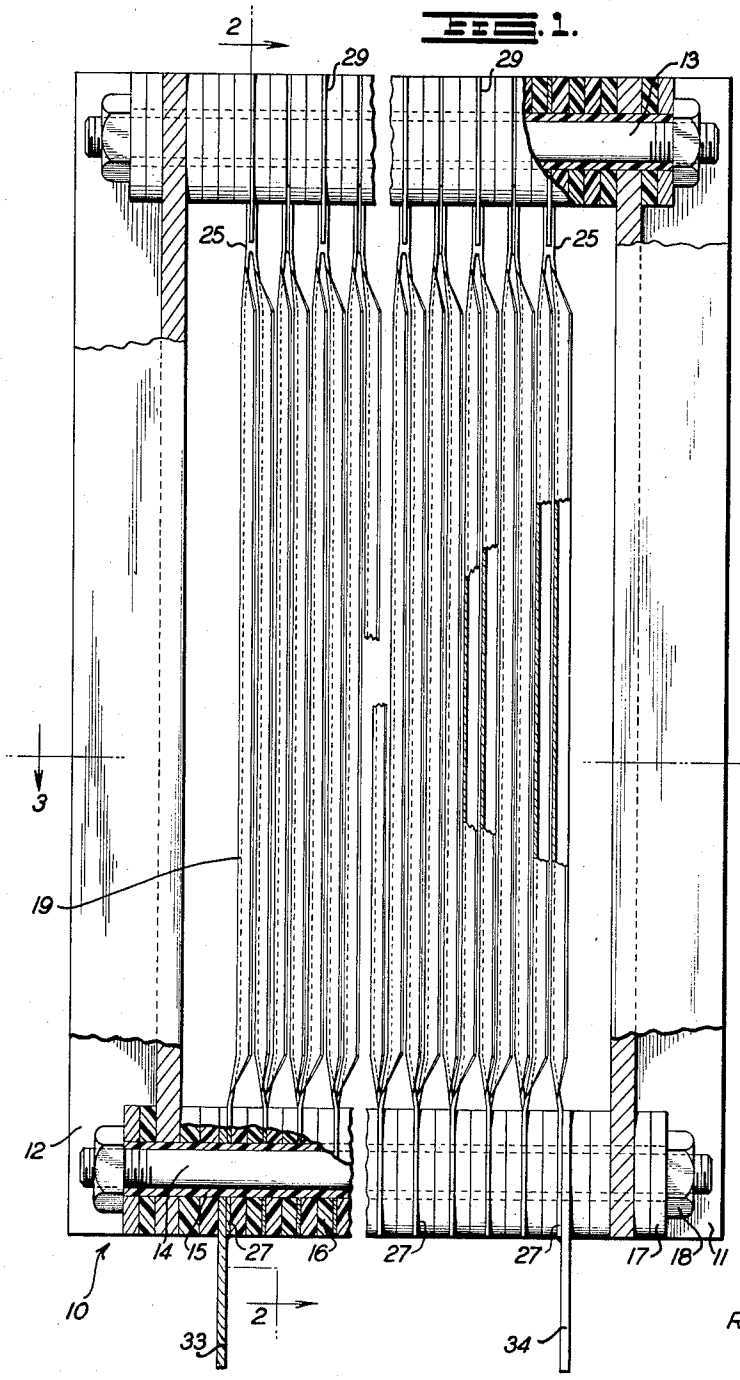
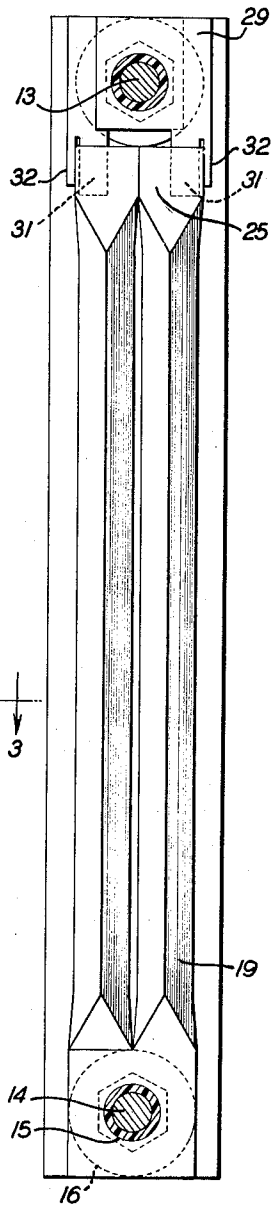


FIG. 2.



INVENTOR
ROBERT E. DUBOIS

BY Harman, Pierce & Kurz

ATTORNEY

Jan. 24, 1961 R. E. DU BOIS 2,969,516

RESISTOR STRUCTURE

Filed Oct. 27, 1959

2 Sheets-Sheet 2

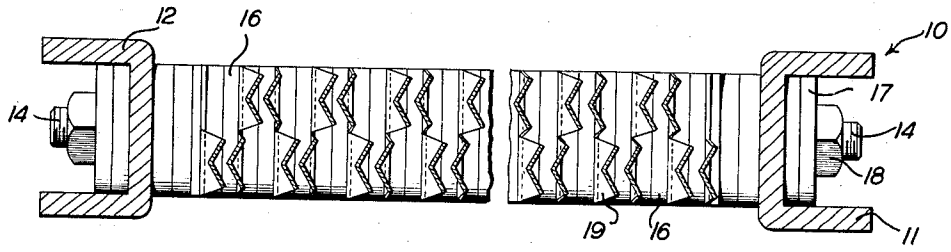


FIG. 3.

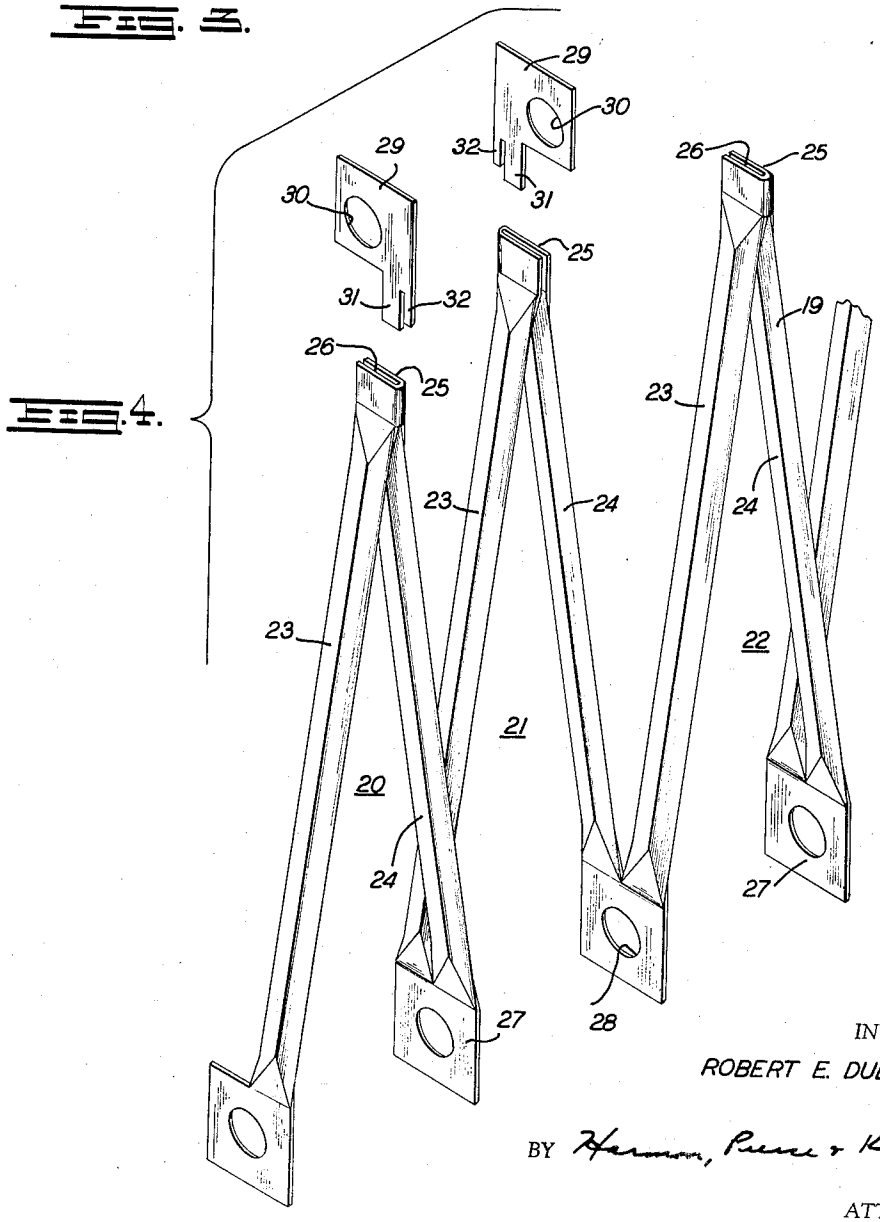


FIG. 4.

INVENTOR:
ROBERT E. DUBOIS

BY Harman, Pierce & Kurz

ATTORNEY

United States Patent Office 2,969,516 Patented Jan. 24, 1961

2,969,516

RESISTOR STRUCTURE

Robert E. Du Bois, 7541 Woodmar Ave., Hammond, Ind.

Filed Oct. 27, 1959, Ser. No. 848,960

4 Claims. (Cl. 338—284)

This invention relates generally to resistor grids and more particularly to zig-zag resistor grids formed in a novel manner from a single piece of resistance material.

The primary object of this invention is to provide a resistor grid of the zig-zag type in which practically no material loss is incurred during formation of the grid.

A specific object of this invention is to provide a novel resistor structure including an improved manner of connection between a grid element and the frame members of the structure.

A further object of this invention is to provide an improved zig-zag resistor grid which is economical to manufacture.

Another object of this invention is to provide a zig-zag resistor grid wherein adjacent sections of the grid are offset from each other transversely of the plane of the grid to obtain a more efficient temperature gradient control of the grid when circulating cooling air passes the grid sections.

With the foregoing and other objects in view, the invention resides in the following specification and appended claims, certain embodiments and details of construction being illustrated in the acompanying drawings in which:

Figure 1 is a fragmentary, partially sectioned view in front elevation of the resistor structure of this invention;

Figure 2 is an end view taken along the lines 2—2 of Figure 1;

Figure 3 is a plan view taken along the lines 3—3 of Figure 1; and

Figure 4 is an expanded and exploded perspective view of the grid element of this invention shown together with the frame mounting clips for the grid.

Referring more particularly to Figure 1, the resistor structure of this invention generally indicated at **10** is illustrated as including end frame members **11** and **12**. Interconnecting members **11** and **12** to effect a rigid frame structure is a pair of spaced bolts **13** and **14**. Each bolt is surrounded by an insulating sleeve **15** and a plurality of spacing and insulating washers **16**. External to members **11** and **12** the projecting threaded ends of bolts **13** and **14** are capped with suitable washers **17** and nuts **18**. It is obvious that upon tightening nuts **18** a rigid frame **10** is assured.

Referring to Figure 4, a zig-zag resistor grid **19** is illustrated as being formed from a single piece of resistor material. Grid **19** includes a plurality of longitudinally spaced grid sections **20**, **21** and **22** with each section including a pair of legs **23** and **24** and all the legs being of the same length. In each section as **20** the legs **23** and **24** are joined by a bridging section **25**. Bridging section **25** is folded upon itself to leave a gap **26**, for a purpose to be described, during the forming stages of the grid. The section **20** is joined to the section **21**, for example by a planar bridging section **27**. Each section **27** is provided with a hole **28** through which bolt **14** may pass to secure one side of the grid to the frame **10**. As illustrated, the bridging sections **25** are alternately folded in opposite directions. In this manner the sections **20**, **21** and **22** are

arranged in a lateral offset relationship to the central longitudinal plane of the grid **19**. The only waste material resulting from the formation of this grid arises from the punching of holes **28**. It will be readily obvious to a metal worker that no other material is lost in taking a flat piece of resistor material, slitting the material in alternately opposite directions to form legs **23** and **24** and then reversely folding the bridging sections **25** in order to achieve the offset adjacent sections **20**, **21** and **22** as illustrated.

Grid mounting clips **29** are clamped between the washers **16** on bolt **13**. Each clip includes a bolt receiving hole **30** and a pair of outwardly extending, spaced legs **31** and **32**. The spacing between the legs **31** and **32** permits the relatively free reception of the material at the base of the fold of a bridging section **25**. Leg **31** enters into the gap **26** in section **25** to achieve a sliding joint while restraining the section **25** against longitudinal movement relative to the plane of the grid. The leg **32** rides along the outer surface of the section **25** as is clearly shown in Figure 2, and restrains the section against transverse movement relative to the plane of the grid. The clips **29** illustrated in Figure 4 are identical; they are simply alternately, reversely mounted on bolt **13** during assembly of the resistor to agree in position with the positions of the alternately offset bridging sections **25**.

With the grid **19** mounted in the frame **10** in the manner described, the bridging sections **27** are fixed against movement. However, the bridging sections **25**, having a sliding fit or joint relationship with fixed clips **29**, may move with the expansion and contraction of legs **23** and **24** under varying temperature conditions to avoid warping and/or breaking of the grid. Thus as viewed in Figure 1, the grid **19** is movably connected with the frame **10** along the upper side, and is fixedly connected with the frame along the lower side.

Terminal pieces **33** and **34** are secured about bolt **14** to make contact with two selected bridging sections **27**.

Preferably the legs **23** and **24** of the grid **19** are angled throughout most of their length to add strength to the grid. Another manner of securing this additional strength is to form an arc in each leg by any suitable means.

By having the adjacent sections such as **20**, **21** and **22** offset, better cooling of the grid **19** is attained under air draft conditions, since the displacement of the sections assists in the avoidance of hot spots. Thus a more uniform cooling of grid **19** is possible.

Thus it is seen that this invention provides a new and useful grid element and resistor structure having structural and functional advantages over the prior art in the form of economies of production, form of erection and the adaptability to better cooling.

It is realized that the invention may be subject to numerous obvious structural modifications well within the purview of this inventor who intends only to be limited to a liberal interpretation of this specification and the appended claims.

I claim:

1. A resistor structure comprising spaced frame members, plural spaced means interconnecting said frame members to complete a rigid frame, a zig-zag resistor grid formed from a single piece of resistor material, said grid including a plurality of connected, spaced adjacent grid sections of similar length with each section being offset oppositely from adjacent sections to either side of a central plane through the longitudinal axis of the grid, each said grid section including a pair of legs integrally joined together by a folding bridging section along one side of the grid with the direction of fold of said bridging sections alternating from one grid section to the next, means connecting said folding bridging sections to one of said frame interconnecting means, said grid further including

a plurality of planar bridging sections along the other side of the grid with one leg from each of a pair of adjacent grid sections terminating in one of said planar bridging sections, and means to connect the planar bridging sections to a second of said spaced frame member interconnecting means.

2. The invention according to claim 1 wherein the means to connect the folded bridging sections to a frame member interconnecting means constitutes a sliding joint so as to permit relative movement between the grid sections and the frame in the plane of each grid section.

3. The invention according to claim 1, wherein the means to connect the folded bridging sections to a frame member interconnecting means includes a clip with an outwardly extending leg, said clip being rigid with the frame and said leg entering into the folded portion of

each of said folded bridging sections to thereby connect the bridging sections to the frame in a manner so as to permit relative movement between the grid sections and the frame in the plane of each grid section.

4. The invention according to claim 3 wherein each clip is provided with a second outwardly extending leg spaced from said first leg and being adapted to engage the exterior of a folded bridging section to restrain the grid sections against transverse movement.

References Cited in the file of this patent

UNITED STATES PATENTS

1,719,179	Hayden	July 2, 1929
2,856,496	Fisher	Oct. 14, 1958
2,858,402	Griffes et al.	Oct. 28, 1958