Nov. 27, 1956 R. E. DU BOIS 2,772,337

RESISTOR STRUCTURE

Filed Nov. 12, 1953 4 Sheets-Sheet 1

Fig. 1.

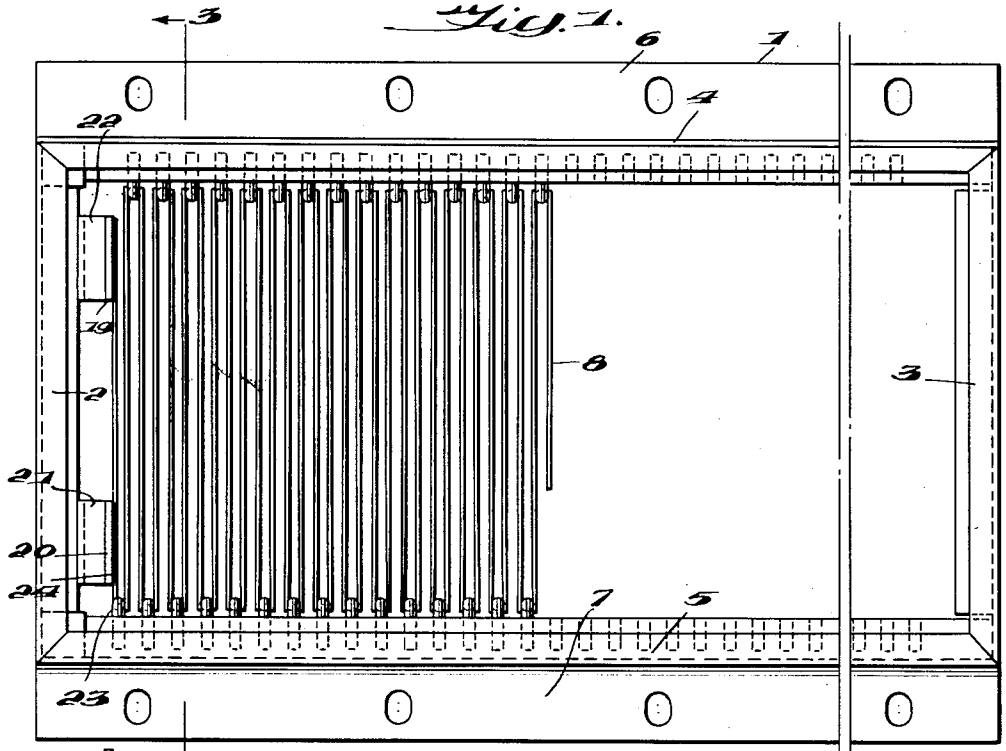
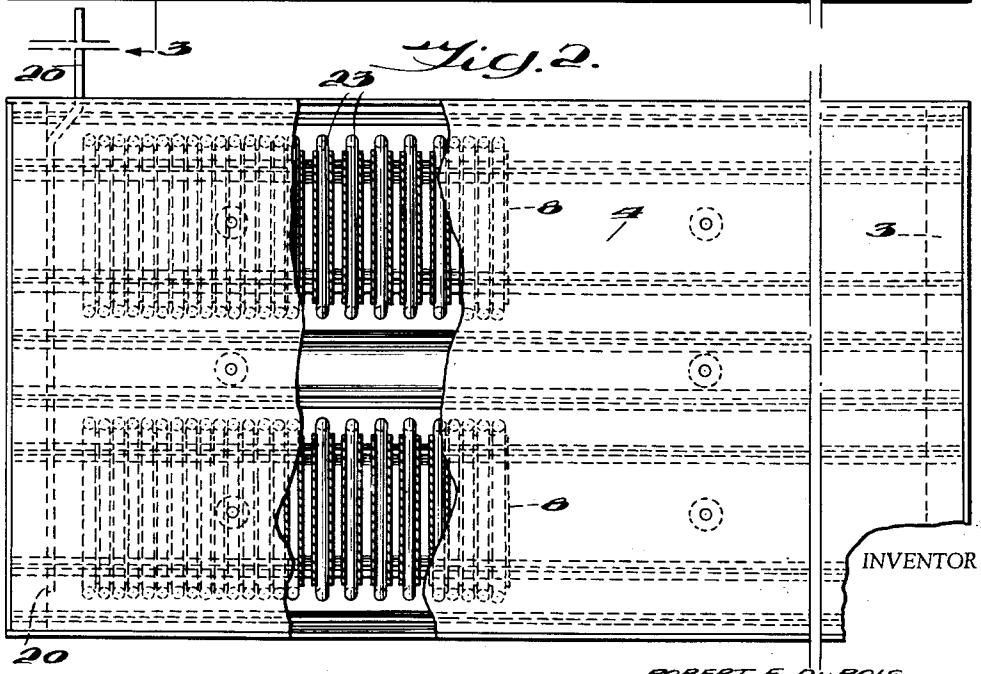


Fig. 2.



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Fig. 3.

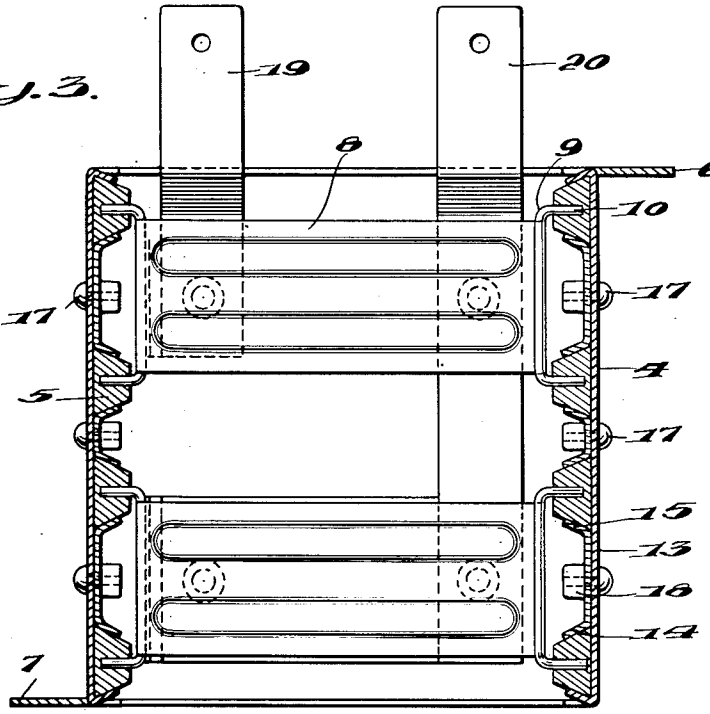


Fig. 4.

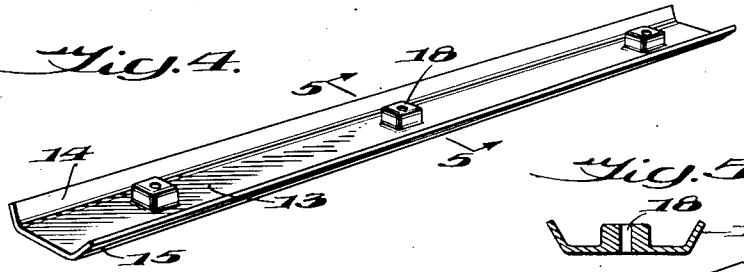


Fig. 5.

Fig. 6.

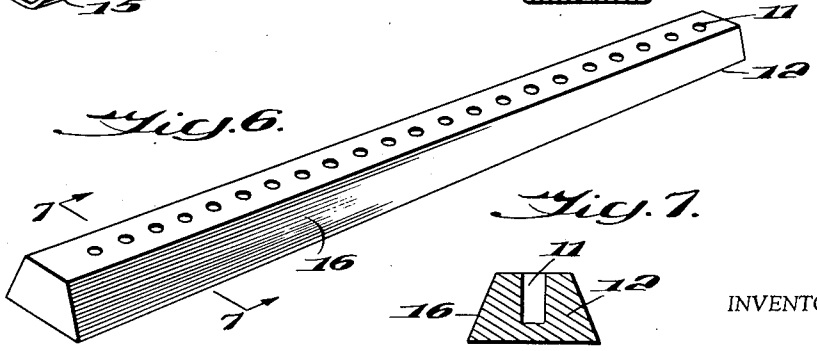


Fig. 7.

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Fig. 8.

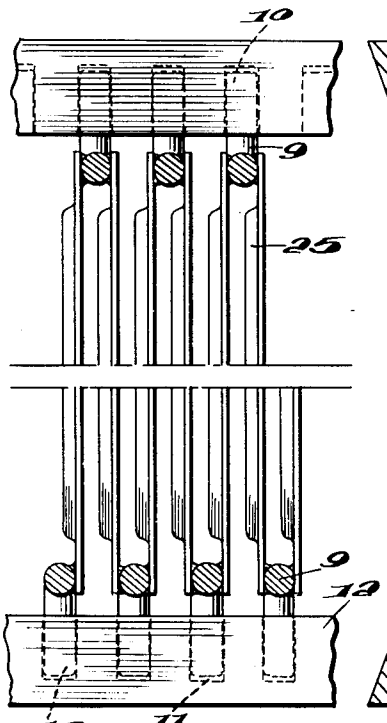


Fig. 9.

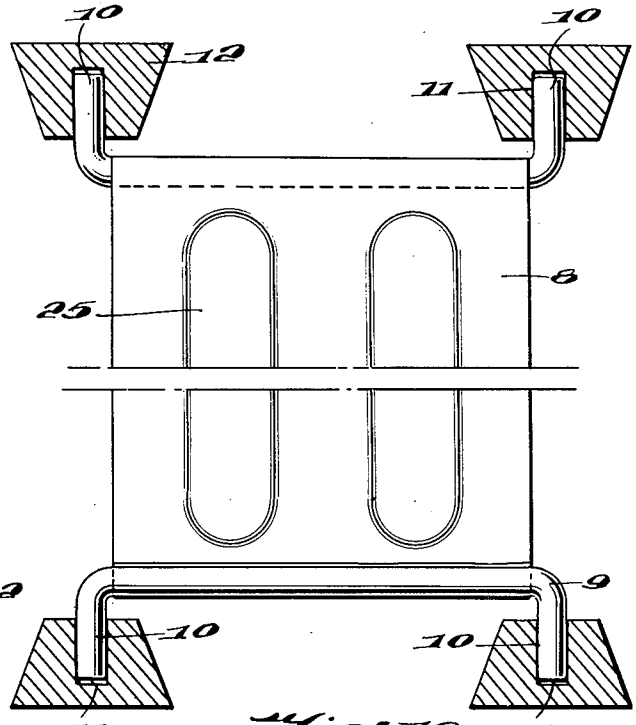
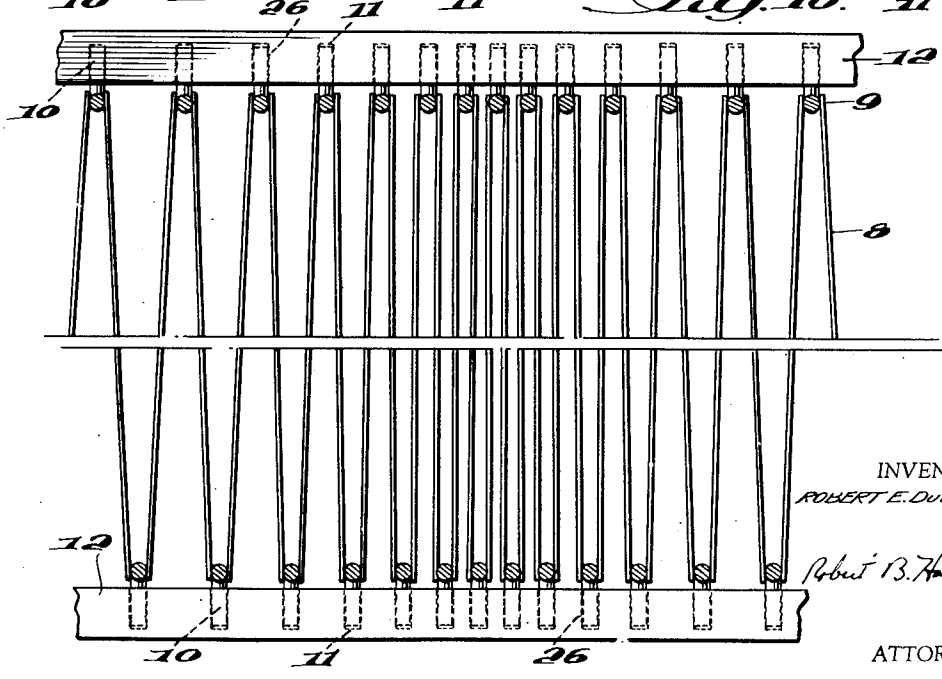


Fig. 10.



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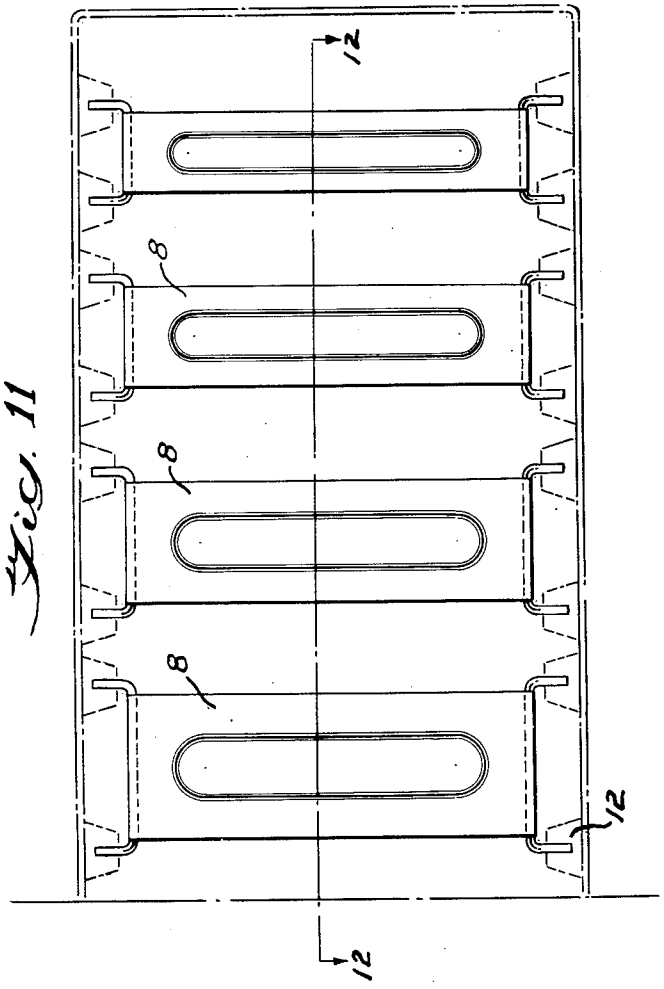


Fig. 11



Fig. 12

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United States Patent Office

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RESISTOR STRUCTURE

Robert E. Du Bois, Hammond, Ind.

Application November 12, 1953, Serial No. 391,566

12 Claims. (Cl. 201—69)

This invention relates generally to resistor structures and more particularly to improvements in mounting structures for relatively heavy duty resistor grids.

The primary object of this invention, therefore, is to provide an improved mounting frame for resistor grids.

A more specific object of this invention is to provide an improved mounting frame for a plurality of resistor grids connected together in a continuous resistor incorporating therein structure to permit expansion and contraction of the resistor over its length under varying temperature conditions of the resistor.

Another object of this invention is to provide novel insulator structure in a resistor frame for supporting a plurality of resistor grids in the frame.

A further object of this invention is to provide novel mounting elements for the insulators carrying the resistor grids of the improved resistor frame.

A general object of this invention is to provide a resistor structure and a mounting frame therefor which lend themselves to ready and economical manufacture.

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

Figure 1 is a broken view in side elevation of the resistor structure of the invention;

Figure 2 is a partially cutaway plan view of Figure 1;

Figure 3 is a view taken along the lines 3—3 of Figure 2;

Figure 4 is a view in perspective of the mounting element for securing the resistor elements to the mounting frame;

Figure 5 is a view taken along the line 5—5 of Figure 4;

Figure 6 is a view in perspective of an insulator for carrying the grids of the resistor structure on the mounting frame;

Figure 7 is a view taken along the lines 7—7 of Figure 6;

Figure 8 is an enlarged broken view of a portion of the resistor and frame illustrated in Figure 1;

Figure 9 is an enlarged broken end view of one of the resistor grids and the insulators carrying the grid;

Figure 10 is a partial view in side elevation of a modified form of the invention;

Figure 11 is partially sectioned end view of another modified form of the invention; and

Figure 12 is sectioned view of the grids taken along the lines 12—12 of Figure 11.

Referring more particularly to the drawings, a resistor mounting frame 1 is illustrated including end members 2 and 3 and top and bottom members 4 and 5, respectively. The members 4 and 5 are provided with integral mounting flanges 6 and 7 respectively. Mounted within the frame elements, by means to be described, are a plurality of resistor grids 8 connected to each other to form a continuous resistor.

Referring now to Figures 3, 8 and 9 particularly, it

will be seen that each grid 7 is welded at its extremity to a mounting pin 9. The mounting pins 9 are U-shaped in structure with the base portions thereof acting as electrical bridging connectors between adjacent grids 8. The ends 10 of pins 9 extend upwardly from the grids 8 and are received in guide holes 11 of mounting insulators 12. The holes 11 are of slightly greater diameter than the diameter of the pin ends 10 and are of such a depth as to provide for free sliding movement of the said pin ends therein, as the grids 8 expand and contract under varying temperature conditions of the said grids.

The insulators 12 extend over substantially the length of the top and bottom members 4 and 5, and the holes 11 therein are normally spaced to provide for even plural grid mounting. As best seen in Figures 3, 4 and 5, channel-shaped mounting clips 13, having outwardly flared flanges 14 and 15 are utilized to attach the insulator strips 12 to the top and bottom frame members 4 and 5. These flared or tapered flanges 14 and 15 cooperate with the tapered sides 16 of the insulator 12 to hold the insulators tightly against the frame members. Bolts 17 extend through frame members 4 and 5 and the clips 13, and nuts 18 threaded thereon hold the clips 13 firmly in position against the insulator strips.

It will be more apparent from Figures 2 and 3 that the present invention contemplates more than one row of grids 8. However, it is obvious that terminals and jumpers may be positioned at any desirable points over the length of the resistor structure so that the number of rows or length of the unit is not critical to this invention.

In the presently illustrated structure of the invention it will further be apparent that the resistor is provided with two terminals 19 and 20. Terminal 19 is suitably secured to a mounting block 22 secured to the inner wall of end frame member 2. Terminal 20 is likewise secured to a block 21. As shown in Figure 1 the last grid pin 23 is adjacent to the inner end of terminal 20 and a jumper 24 is provided therebetween. The upper end of the last grid in the other row is welded directly to terminal 19. This is not illustrated in Figure 1 in order to avoid confusing the drawing. Suitable jumpers (not shown) may be provided on end member 3 to complete a circuit through the grids 8 from terminal 19 to terminal 20.

In the enlarged detail views, Figures 8 and 9, the grids 8 are illustrated as being provided with stiffening dimples 25 for strengthening purposes. The dimpling assists in preventing sagging or warping of the grids with the possible shorting-out of resistance material.

In Figure 10 the grids 8 are shown increasing in concentration toward the center of the structure, the mounting holes 26 therefor being more closely spaced in the insulators 12 toward the center. The purpose of the unequal spacing and concentration of resistance material is to provide for a more even dissipation of heat from the resistor under forced draft cooling conditions.

The modified form of the invention illustrated by Figures 11 and 12 represents the manner by which even heat dissipation may be obtained in a resistor unit having a plurality of rows of series or parallel connected resistor grids.

As will be obvious from Figure 11, the grids 8 of adjacent rows are of decreasing width from left to right with the blast cooling coming from the left. Whether the cooling air is directed over the grids from one side or the other depends on whether they are connected in parallel or series, as indicated.

Figure 12 represents the grids 8 as being of varied thickness as well as widths. This is a matter of design choice and the grid rows may not be of varied thickness. By correct designing, however, in such multiple row re-

sistors, the avoidance of hot spots is attained by utilizing grids of varying widths and, or thicknesses.

It will now be obvious that as the resistor heats up when in use, the individual grids acting in adjacent pairs will expand longitudinally, forcing the bridging pins further into the holes **11** of the insulators **12**. Thus a complete means for temperature compensation is provided over the entire length of the structure. The provision of the dimple **25** acts to assist in creating turbulence in air passing over the grids to obtain increased dissipation of heat to the air.

Thus it will be seen that this invention provides a compact, economical self-temperature compensating resistor structure which will lend itself to many varied forms depending on a particular commercial application.

I claim:

1. A resistor structure comprising a mounting frame including top and bottom frame members, a plurality of insulator strips, said strips being provided with a plurality of spaced holes, clip means cooperating with said strips to secure the strips to the top and bottom frame members, and resistor means with a plurality of grid elements carried by said insulator strips, the said resistor means cooperating with the spaced holes along said insulators to permit longitudinal expansion and contraction of the grid elements under varying grid temperature conditions.

2. A resistor structure comprising a mounting frame; insulators carried by the frame, said insulators being provided with holes, a plurality of resistor grids arranged side by side within said frame, U-shaped pins connecting alternate ends of adjacent grids together, said pins cooperating with the holes in the insulators to carry the grids for free relative movement to the frame.

3. A resistor structure comprising a mounting frame, insulator strips carried by the frame, said strips being provided with a plurality of spaced holes, a plurality of resistor grids arranged side by side within said frame, U-shaped pins connecting alternate ends of adjacent grids together, said pins cooperating with the holes in the insulator strips to carry the grids for free relative movement to the frame.

4. A resistor structure comprising a mounting frame, a plurality of insulators, said insulators being provided with holes, clips means cooperating with said insulators to secure the insulators to the frame, a plurality of resistor grids arranged side by side within said frame, U-shaped pins connecting alternate ends of adjacent grids together, said pins also cooperating with the holes in the insulators to carry the grids for free relative movement to the frame.

5. A resistor structure comprising a mounting frame, a plurality of insulators, said insulators being provided with holes, clips means cooperating with said insulators to secure the insulators to the frame, a plurality of resistor grids arranged side by side within said frame, pins connecting alternate ends of adjacent grids together, said pins also cooperating with the holes in the insulators to carry the grids for free relative movement to the frame.

6. A resistor structure, comprising a mounting frame, a plurality of insulator strips, said strips having tapered side walls and being provided with a plurality of spaced holes, clip means having flared side flanges cooperating with the tapered walls of the insulators to secure said insulators to the frame, a plurality of resistor grids arranged side by side within said frame, and means connecting alternate ends of adjacent grids together, said connecting means cooperating with the holes in the insulator strips to carry the grids for free relative movement within the frame.

7. A resistor structure comprising a mounting frame, insulators carried by the frame, a plurality of rows of continuous resistors carried by said insulators for free movement relative to the frame under varying grid temperature conditions, said continuous resistors being of decreasing thickness and width in adjacent rows from one side of the structure to the other.

8. A resistor structure comprising a mounting frame, insulators carried by the frame, a plurality of rows of continuous resistors carried by said insulators for free movement relative to the frame under varying grid temperature conditions, said continuous resistors being of decreasing thickness in adjacent rows from one side of the structure to the other.

9. A resistor structure comprising a mounting frame, insulators carried by the frame, a plurality of rows of continuous resistors carried by said insulators for free movement relative to the frame under varying grid temperature conditions, said continuous resistors being of decreasing width in adjacent rows from one side of the structure to the other.

10. A resistor structure comprising a mounting frame and a plurality of rows of continuous resistors carried by the frame, said continuous resistors being of decreasing width in adjacent rows from one side of the structure to the other.

11. A resistor structure comprising a mounting frame and a plurality of rows of continuous resistors carried by the frame, said continuous resistors being of decreasing thickness in adjacent rows from one side of the structure to the other.

12. A resistor structure comprising a mounting frame and a plurality of rows of continuous resistors carried by the frame, said continuous resistors being of decreasing thickness and width in adjacent rows from one side of the structure to the other.

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