April 5, 1960 A. C. SCRIBNER 2,931,997

MOUNTING FOR TUBULAR RESISTORS

Filed Dec. 23, 1957

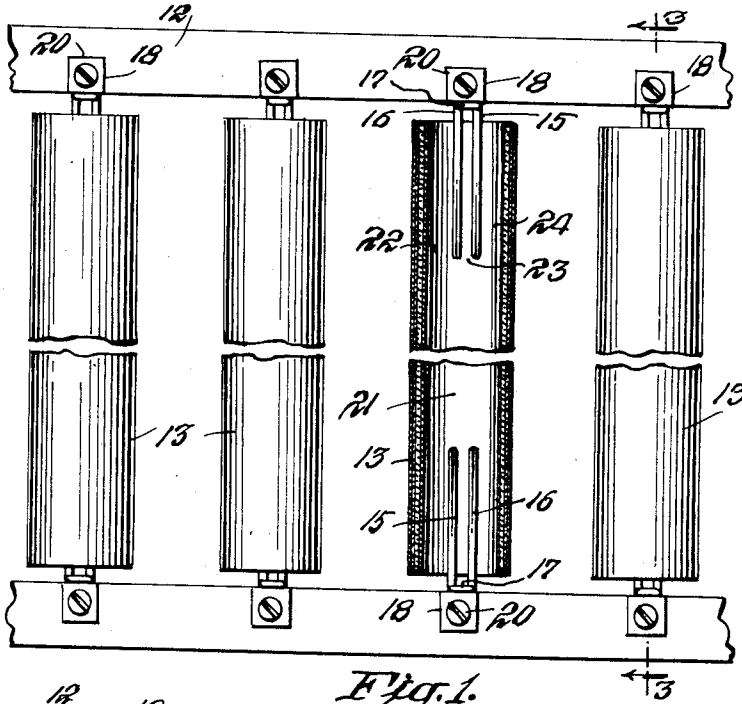


Fig. 1.

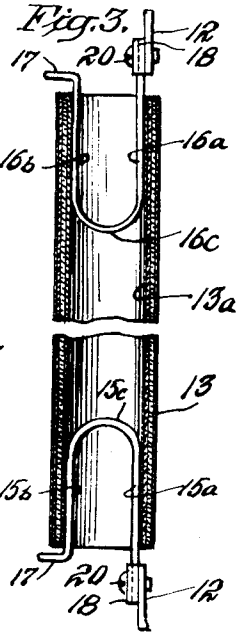


Fig. 3.

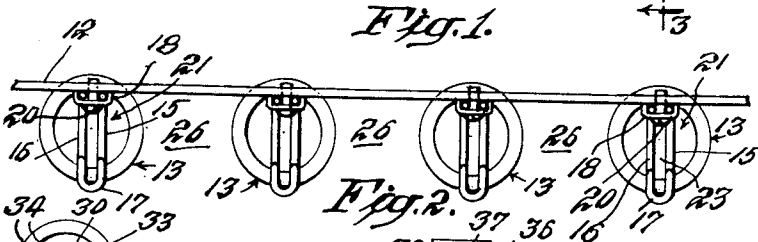


Fig. 2.

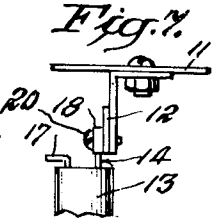


Fig. 7.



Fig. 8.

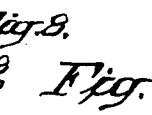


Fig. 9.

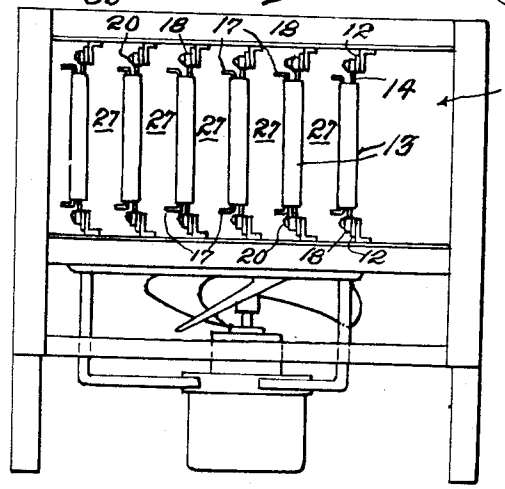


Fig. 6.

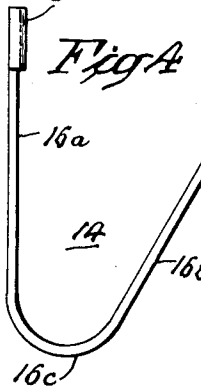


Fig. 4

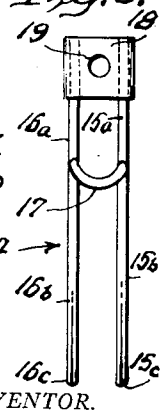


Fig. 5.

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United States Patent Office 2,931,997 Patented Apr. 5, 1960

2,931,997

MOUNTING FOR TUBULAR RESISTORS

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Application December 23, 1957, Serial No. 704,670

4 Claims. (Cl. 338—315)

This invention relates to tubular resistor mountings and the mounting of a plurality of resistors in compact relation.

An object of this invention is to mount tubular electrical resistor units with high heat dissipation from the resistors.

Another object of the invention is to increase the flow of the cooling medium passing through and over a number of closely mounted tubular resistors.

Another object of the invention is to provide a mounting for tubular resistors that does not obstruct the flow of air around and through the resistors.

Another object of the invention is to increase the wattage dissipation of heat from a bank of resistors while maintaining resistors within the operative temperatures.

Another object of the invention is to provide a mounting for tubular resistors that is inexpensive and on which it is easy to mount resistors.

Another object of the invention is to provide for thermal changes in the dimensions of the mounting and resistor and to maintain the stress on the tubular resistor at a minimum.

Other and further objects will become apparent from the following description taken in connection with the drawings, in which—

Fig. 1 is a fragmentary view of a bank of tubular resistors mounted in accordance with the invention.

Fig. 2 is a fragmentary top view of a plurality of rows of tubular resistors.

Fig. 3 is a sectional view of the tubular resistor and the mounting taken along lines 3—3 of Fig. 1.

Figs. 4 and 5 illustrate the spring mounting brackets.

Fig. 6 illustrates a portable rheostat utilizing the invention.

Fig. 7 is a fragmentary sectional view of the mounting of the supporting strip to the frame; and

Figs. 8 and 9 are fragmentary views of another embodiment of the mounting.

In Fig. 6 a rheostat unit is illustrated in which a plurality of rows of resistors is provided which may be connected in and out of the circuit to vary the resistance of the circuit for various purposes. A frame **10** is provided for supporting the units of the rheostat and has cross members **11** spaced on opposite sides of the frame for supporting the cross supporting strips **12** upon which the resistors are mounted in rows. Each resistor row comprises a plurality of individual resistors **13**, each separately mounted on the cross supporting strips **12** by clips **14**. The cross strips **12** are thin, flat steel pieces with the plane of the strip extending parallel to the axes of the resistors so as to present a minimum resistance to the flow of air. The strips **12** are secured at each end to the cross members **11** by means of angles **12***b* welded to the strips **12** and bolted to the cross pieces **11** (Fig. 7).

The strips **12** are arranged to support a plurality of rows of resistors as illustrated in Figs. 1, 2 and 7. The resistors are solely secured to the strips **12** by means of

the spring mounting brackets **14**. The resistors **13** are spaced to provide room for the radiation and dissipation of heat by convection current passing around and between the resistors.

The brackets **14** (Figs. 4 and 5) are formed from a resilient steel wire formed with legs **15** and **16** connected at one end by a U-shaped member **17** and at the other end by a clip **18**. The legs **15** and **16** are preferably spot welded to the clip **18** on opposite sides of the mounting opening **19** to secure the end of the legs **15** and **16** together and to provide a mounting for the bracket **14**. The legs of the bracket are parallel and formed in a generally U-shape with the legs **15** and **16** extending generally parallel to the plane through the clip **18** along the portions **15***a* and **16***a* and then having portions **15***b* and **16***b* at an angle thereto connected by the U-shaped portions **15***c* and **16***c*. The mounting bracket **14** is resilient and the leg portions **15***b* and **16***b* may be pressed towards the leg portions **15***a* and **16***a* under pressure.

The brackets **14** are mounted in opposite ends of the tubular member **13** with the bracket in a compressed condition to fit in the end of the tube. Under the compresssive force applied to the bracket **14**, the legs **15***a*, **16***a* and **15***b*, **16***b* engage the inner wall **13***a* of the tubular member along a substantial portion of their respective lengths. The expansive force of the bracket friction holds the resistor in place. The U-shaped portion **17** is bent at an angle to the legs **15***b* and **16***b* to provide a means for preventing the tubular resistor from sliding off the end of the brackets and engaging the strips **12**. As indicated in Fig. 7, the bracket is fastened to the strip **12** so that the member **17** is positioned between the strip **12** and the end of the tubular resistor. Normally the frictional force of the legs of the bracket is sufficient to hold the resistor in place, however, under extreme vibration slippage may occur. The U-shaped portion **17** connecting the other ends of the wires **15** and **16** engages the end of the tubular resistor so that the resistor is held against axial movement by the U-shaped portion **17**.

With the clip **18** in a plane parallel to the legs **15** and **16**, the clip extends parallel to the axis of the tubular resistor, so that the clip is extending in the direction of the air flow through and over the tubular resistor. The clip **18** is secured to the strips **12** by means of machine screws **20** fitting snugly in the openings **19** and threaded into openings in the strips **12**. The strips extend in a plane parallel to the axis of the tubular resistor so that each of the mounting members presents the portion of the member having the smallest dimension to the air flow, and thereby reduces the resistance to the air flow to a minimum. The wire brackets **14** form openings **22**, **23** and **24** in the bore **21** of the tubular members through which air may readily flow, thus permitting substantial quantities of air to flow up through the center of the tubular resistor to remove heat from the inner walls.

The supporting strip has its narrow dimensions across the air flow and the brackets are mounted on the channel so that as each strip crosses the end ceramic portion of the resistor it does not cross the bore **21**. Thus, the obstruction to the air flow through the center of the resistor and around the outer surface is reduced to a minimum permitting a more rapid flow of air past the resistor and reducing the effect of pocketing or stagnant areas adjacent to the resistor which would create local overheating due to the non-convection of air currents past the heated portions of the resistor.

The bracket **14** is made of a resilient spring steel or suitable resilient material and provides a resilient mounting for the tubular resistor, isolating the resistor from shocks and vibrations that may be applied to the frame of the rheostat. The bracket forms a firm attachment so that the resistor does not vibrate or move on the

mounting. Also, the mounting provides for readjustment to the variations in temperature of the frame members and mounting brackets without applying strain to the resistors. Thus, the resistors are isolated from vibrational and thermal changes, thereby reducing the susceptability of the resistors to break down from physical forces applied to the frame.

The top framework of the cross strip portions **12** and the brackets **14** forms air spaces **26** and **27** between the resistors to permit the easy flow of cooling air in a direction parallel to the inner spaces **22**, **23** and **24** within the tubular resistors. This increased air flow increases the heat dissipation from each resistor and from the resistors assembled in a group in accordance with the teachings of this invention. In the previously described embodiment the rows of resistors are parallel. However, the invention provides for the arrangement of the rows with the resistors end to end. With the strip **12** parallel to the air flow, the spaces **27** between the resistors are unobstructed and the air can flow smoothly past one resistor and on to the next resistor to remove the heat dissipated. Also, the air can flow through and out of the end of the bore to impinge on the succeeding resistor.

This increase in heat dissipation permits a reduction in the number of resistors or an increase in the wattage of a given bank of resistors. Thus, a higher load capacity and a structurally superior rheostat may be provided without an increase in cost. The mounting, in addition to increasing the heat dissipation, also reduces the failure of resistors due to physical forces applied thereto, and thus reduces the maintenance and replacement of parts in the rheostat.

Although the form of the clip shown in Figs. 4 and 5 is the preferred embodiment, the invention may be practiced in other forms. In Figs. 8 and 9 a clip **30** is formed from resilient sheet material, such as steel, and is bent in a V-shaped to form portions **31** and **32**. These portions have a common edge **33** and end edges **34** and **35**, respectively, which press against the inner bore **13***a* of the resistor under the resilient compression of the clip. The portion **31** is extended to form a mounting means **36** with a hole **37** for a fastening bolt. The portion **32** has an angular extension **38** similar to the portion **17** of the clip **14** to prevent the resistor from slipping against the mounting strip under undue vibration. Also, types of resistors other than ceramic resistors may be mounted in this manner.

Although in the foregoing description of the apparatus the resistors have been described as being cooled by air, it is understood that any suitable cooling medium may be used other than air and it is not intended to restrict the application to air cooling.

Other modifications and changes may be made in this invention without departing from the invention as set forth in the appended claims.

I claim:

1. Mounting means for a tubular resistor having a central bore extending therethrough and comprising two resilient U-shaped wire members extending in parallel planes, said U-shaped wire members engaging the walls of the bore of the resistor at opposite sides thereof under compression to frictionally support the resistor, and narrow strip-like means positioned adjacent the end of the resistor and extending in a plane parallel to the tubular resistor, said wire members secured to said strip-like means to support said resistor with the strip-like means overlapping the resistor along the edge of the wall of the resistor to minimize the obstruction of the flow of air around and through the resistor.

2. Mounting means for a tubular resistor having a central bore extending therethrough comprising a single-piece resilient wire member having a U-shape and forming two legs and a connecting portion, each leg bent in a U-shape to form leg portions, said member fitting in the end of the bore with the leg portions in engagement with the wall of the tubular resistor and supporting said resistor under resilient pressure, strip-like means extending parallel to the axis of the tubular member, fastening means on the other end of said wire member to secure said resistor with the narrow edge passing the end of the wall of said tubular member to facilitate the air flow through and around the resistor.

3. A supporting means for a resistive member comprising a tubular member supporting said resistive member and having a central axial bore formed by a generally tubular shaped wall with an outer surface, strip-like means for supporting said tubular member at each end thereof, two resilient substantially V-shaped plate members fitting in a respective end of said tubular member, each plate member having two thin plate portions extending longitudinally in said bore parallel to the axis and wall of said bore and secured along a common longitudinally extending edge, said plate portions having longitudinally extending side edges generally parallel to the common edge, said common and side edges engaging the wall of said bore along spaced contact lines under the resilient pressure of said plate member to frictionally support said tubular member, and fastening means on said plate member for securing said tubular member on said strip-like means with said strip-like means extending across said tubular member between the bore and the outer surface to permit the ready flow of air through and around the tubular member supporting the resistive member to remove the heat therefrom.

4. Mounting means as set forth in claim 2 in which said connecting portion is U-shaped and at an angle to said leg portions and positioned in relation to said strip-like means so as to prevent said resistor from engaging said strip-like means.

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