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ELECTRIC HEATER

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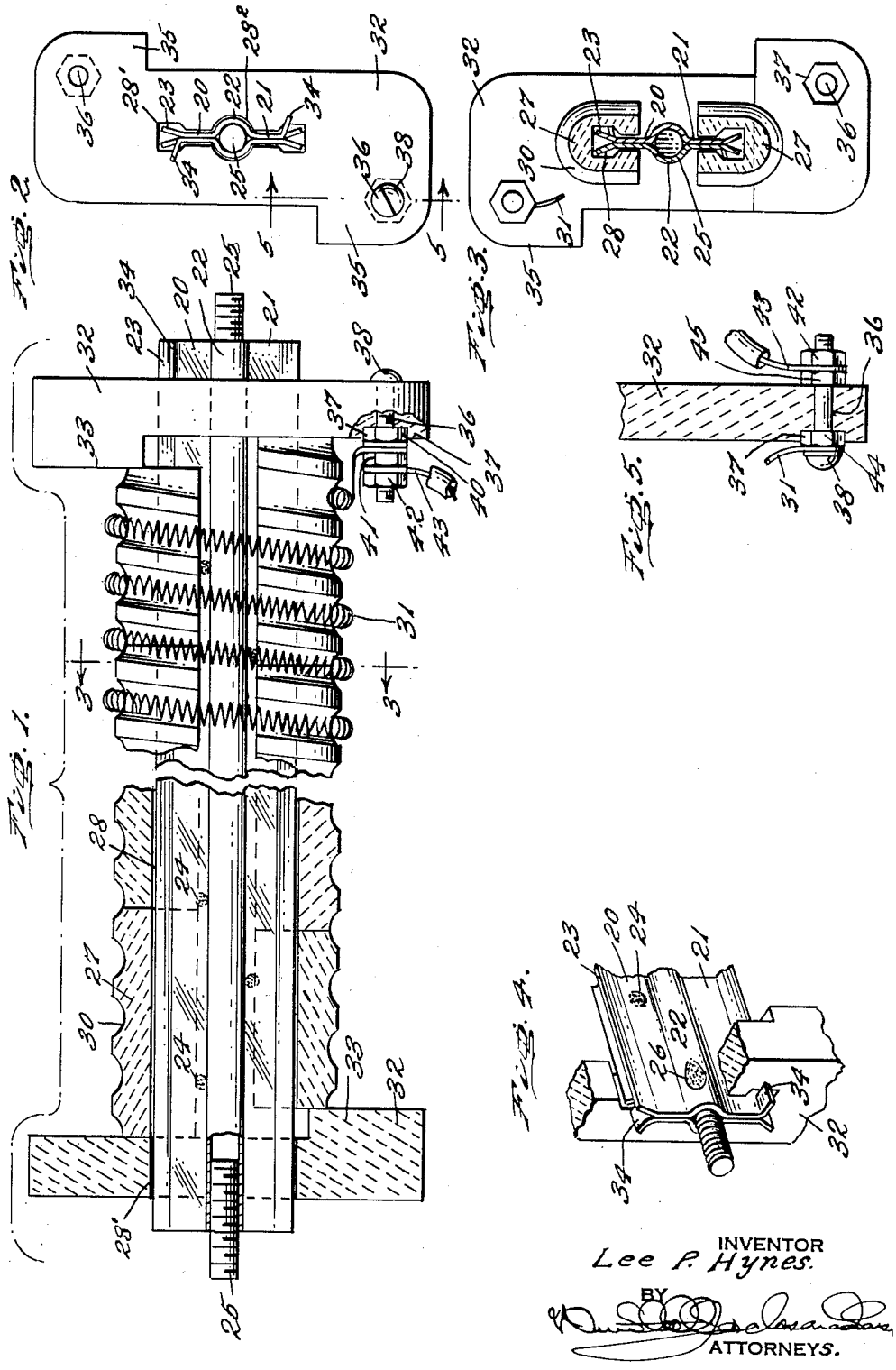


Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

INVENTOR
Lee P. Hynes.
BY
ATTORNEYS.

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ELECTRIC HEATER

Lee P. Hynes, Haddonfield, N. J., assignor to Turbine Equipment Company, New York, N. Y., a corporation of New Jersey

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4 Claims. (Cl. 219—19)

The present invention relates to electric heaters of the character which are particularly suited for space heating and the like.

A purpose of the invention is to simplify and reduce the cost of electric heaters suited for space heating.

A further purpose is to avoid the necessity of upsetting the edge of a heater bar to form a T construction as in the prior art.

A further purpose is to make the heater bars readily adjustable in length to meet slight variations in insulator dimensions.

A further purpose is to form the heater bars from stampings.

A further purpose is to provide heater bars of indefinite length which can be used without special machining in any length to which they are cut.

A further purpose is to hold the terminal insulators at the ends of the heaters by deforming sheet.

A further purpose is to simplify the anchorages of the terminal insulators and avoid the necessity of drilling or slotting the heater bar to make the terminal connections.

A further purpose is to make the electric heater elements angularly adjustable by providing studs to secure the same at the ends.

Further purposes appear in the specifications and in the claims.

In the drawings I have chosen to illustrate one only of the numerous embodiments in which my invention may appear, selecting the forms shown from the standpoints of convenience in illustration, satisfactory operation and clear demonstration of the principles involved.

Figure 1 is a fragmentary side elevation partly in central longitudinal section showing an electric heater according to the invention.

Figure 2 is an end elevation of Figure 1.

Figure 3 is a section of Figure 1 on the line 3—3.

Figure 4 is a fragmentary perspective showing the end construction.

Figure 5 is a section on the line 5—5 of Figure 2, but showing a modification.

Describing in illustration but not in limitation and referring to the drawing:

My U. S. Patent No. 2,235,764, granted March 18, 1941, for Heater, illustrates a prior art electric heater construction which has been used successfully. T-slotted insulators and terminals have been strung on a heater bar having T-ribs at the edges, and a resistor was wound around the insulators between the terminals. The T-ribs at the edges of the heater bar intermediate the ends were formed in the prior art by upsetting, leaving the ends free from the ribs. Beyond the terminal insulators the heater bars were slotted and keys were inserted to hold the structure together. The ends of the heater bars were mounted on transverse sleeves, and it was difficult or impossible to angularly turn individual heaters differently from others of the set.

Since the tolerance on the insulators is necessarily wide, difficulty was encountered where the slots in the insulators were near the limits of tolerance, since it was sometimes necessary to machine the heater bars specially to fit.

On many occasions due to variations in the tolerances of the insulators, the keys at the ends did not produce a tight structure, and it was necessary in such cases to employ spacers and keep on hand a wide variety of spacers of different sizes.

In accordance with the present invention, the construction of the heater has been simplified, the cost has been

reduced, and the structure has been made much more flexible with respect to variations in insulator dimensions.

With the present invention it is possible to make heaters of a wide variety of lengths, using insulators of wide tolerance variation without any increased expense, and in fact with a reduction in over-all cost.

The present invention employs a heater bar which is made up of opposed metallic strips, joined as by spot welding, and diverging at the edges to form a Y construction to hold the insulators. The T slots have been provided not only on the intermediate insulators but on the terminal insulators also, and the insulators are held together by staking or otherwise deforming the ends of the Y portions of the heater bar.

Furthermore the middle of the heater bar has been made into a tube by forming each of the strips as a half tube, and studs are secured in the ends of the heater bar, so that the heater bar can be secured by nuts in any angular position on transverse brackets.

Considering now the structure as shown in the invention, I provide a metallic heater bar **20**, suitably made up in indefinite lengths and cut to the desired length for the heater. The bar **20** comprises opposed metallic strips **21** suitably of sheet steel or the like. Each of the strips has a half tubular portion **22** near the middle opposed to a similar portion on the other strip to make a tube. At the edges each of the strips diverges from the other at **23** to form a Y construction which runs clear to the end. The strips are united together in any suitable way in their opposed relationship, as by spot welding at **24** at intervals along the length. Thus the structure by virtue of the tubular arrangement, the Y and the cross support by the spot welding has considerable lateral stiffness and of course great strength in the direction of the major transverse axis.

At the ends the tubular portion receives studs **25** which are held to the heater bar in any suitable way as by spot welding at **26**.

Intermediate the ends, T-slotted intermediate insulators **27** are slid on the heater bar, the Y portions **23** engaging in T portions **28** of the slots through the intermediate insulators. The insulators may be of porcelain or other suitable material. The intermediate insulators have spiral grooves **30** which throughout the set extend endlessly from end to end. At a position opposite the middle of the heater bar the intermediate insulators are discontinued, and a suitably spiral or other electric resistor **31** is wound in the spiral groove **30** from one end to the other of the heater bridging the gap between the insulators at a safe distance away from the heater bar.

Terminal insulators **32** are provided at the ends and these have T slots **28'** which are similar to the T slots in the intermediate insulators **27** except that the T slots in the terminal insulators are of double or dumb-bell form since the terminal insulators extend clear across. Also the slots **28'** have a hole **28²** at the center for the tubular portion of the bar. Each terminal insulator has at one side an offset extension **33** which displaces the adjoining intermediate insulator by a distance corresponding to the pitch of the resistor coil, and the intermediate insulators **27** may suitably vary in length as required to produce the correct over-all relationship.

Each of the terminal insulators is positioned somewhat short of the end of the heater bar, and the wide portion of the heater bar beyond the terminal insulators suitably at opposite edges is deformed or staked at **34** as well shown in Figure 4 to engage beyond the end of the terminal insulator, thus holding the insulators together without the necessity of using keys and spacers as in the prior art.

The method of deforming the Y portion allows for variations in length of individual insulators and enables the adjustment to be made readily at assembly. Each of the terminal insulators at opposite corners has an off-set **35** in the plane of the insulator and the off-set has a hole **36** extending therethrough and surrounded at one side with a bolt or nut socket **37** to hold the appropriate bolt or nut of the terminal. Various arrangements may be used, Figure 1 showing a terminal bolt **38** passing inwardly through the hole **36** and carrying a positioning nut **40** in the nut socket, then a nut **41** anchoring the

end of the resistor and then a nut **42** anchoring the end of a lead **43**. Where it is desired to make the connections at opposite sides of the terminal insulator, as shown in Figure 5, the bolt **38** is reversed, a nut **44** immediately adjoining the head anchors the resistor **31** and rests in the nut socket, and on the other side of the terminal insulator a nut **45** holds the bolt in place and a nut **42** secures the lead **43**.

It will be understood that where the divergence of the Y **23** is not correct for the particular insulators, the Y can readily be bent wider or narrower to suit the particular insulators.

In operation it will be understood that the assembly is accomplished by threading the insulators on the heater bar, and then staking or deforming the Y portions beyond the terminal insulators. The resistor is then wound around the intermediate insulators and secured to the terminals.

The heater, after assembly, is readily mounted in its brackets and set at any desired angle by securing nuts on the studs **25** beyond the brackets at the two ends.

In view of my invention and disclosure variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art, to obtain all or part of the benefits of my invention without copying the structure shown, and I therefore claim all such insofar as they fall within the reasonable spirit and scope of my claims.

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

1. In an electric heater, opposed strips extending longitudinally side by side and diverging away from one another throughout their length at the edges to produce a Y, means for fastening the strips together, T-slotted intermediate insulators extending over the strips and held by the Y, terminal insulators having T-slots extending around the strips at the ends of the intermediate insulators, the strips beyond the terminal insulators being bent into engagement with the ends of the terminal insulators and an electric heater element wound around the insulators between the terminal elements.

2. In an electric heater, opposed strips which together form a tube at the center and diverge into a Y formation throughout their length at the edges, means for fastening the strips together, studs in the ends of the tubes secured to the strips and permitting the structure to turn in assembly, T-slotted intermediate insulators strung on the opposite edges of the strips and having the Y formations at the opposite edges engaged in the T-slots, T-slotted terminal insulators engaged around the strip on the opposite ends of the intermediate insulators and having the Y formations in their T-slots, the Y formations of the strips beyond the terminal insulators being formed into engagement with the ends of the terminal insulators and an electric resistor wound around the intermediate insulators between the terminal insulators.

3. An electric heater according to claim 1, in which the terminal insulator at one end is thick at one side and thin at the other side, the terminal insulator at the other end is thin at said one side and thick at said other side, and the intermediate insulators on the two sides of the Y are respectively longitudinally off-set by engagement with the thick and thin sides of the respective terminal insulators.

4. In an electric heater, spaced terminal insulators provided with T-slots, intermediate insulators arranged in line between the terminal insulators and provided with T-slots in line with the T-slots of the terminal insulators, opposed metallic strips extending through the T-slots of the terminal insulators and the intermediate insulators and beyond the same, the strips being deformed beyond the terminal insulators to engage the terminal insulators, the strips diverging from one another at their outer edges throughout their lengths and united together at intervals along their lengths, the opposed strips having cooperating half tubular portions at opposite ends which form tubes, and studs secured in the half tubular portions of the strips and permitting angular adjustment of the heater at assembly.

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