

Aug. 27, 1963

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3,102,249

HEATING UNIT MOUNTING MEANS

Filed March 31, 1961

2 Sheets-Sheet 1

FIG. 1.

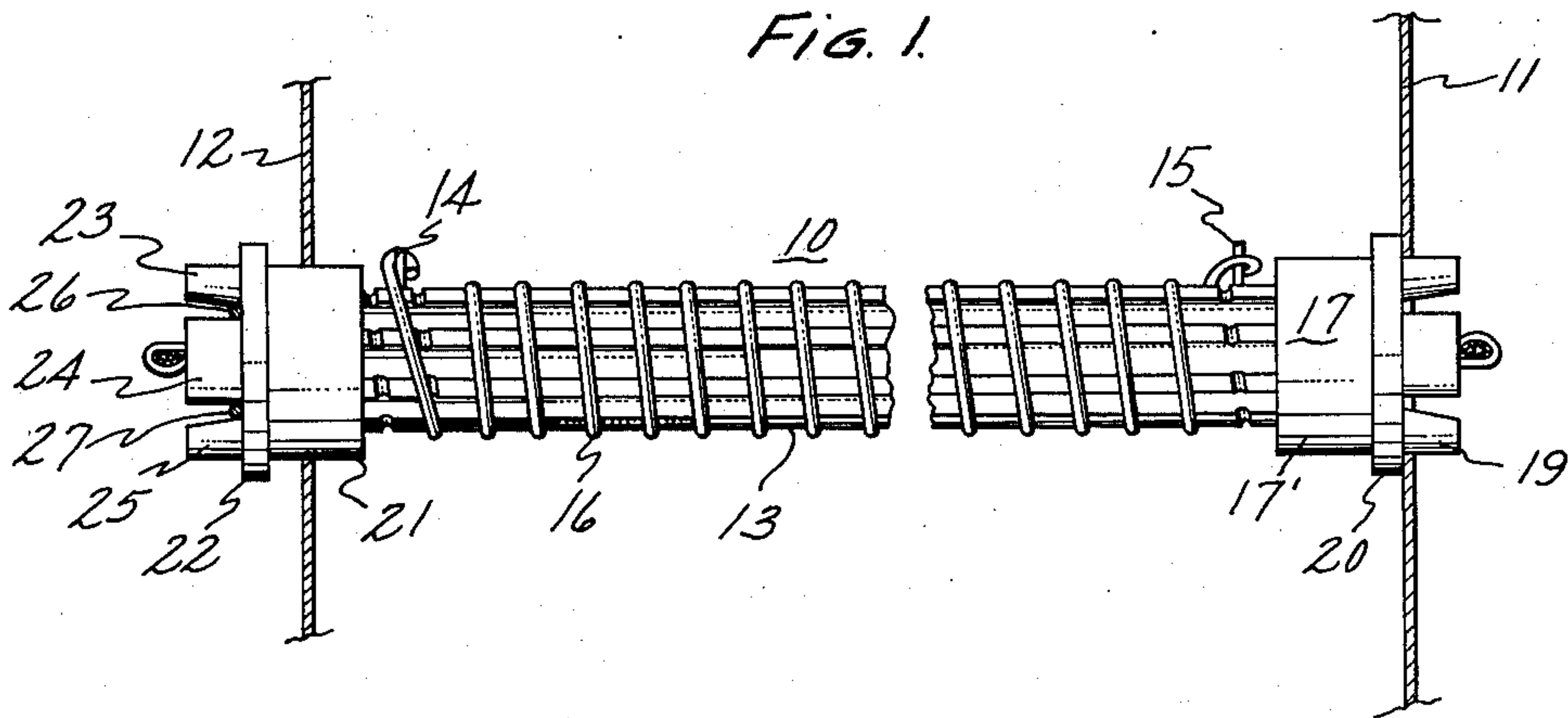


FIG. 2.

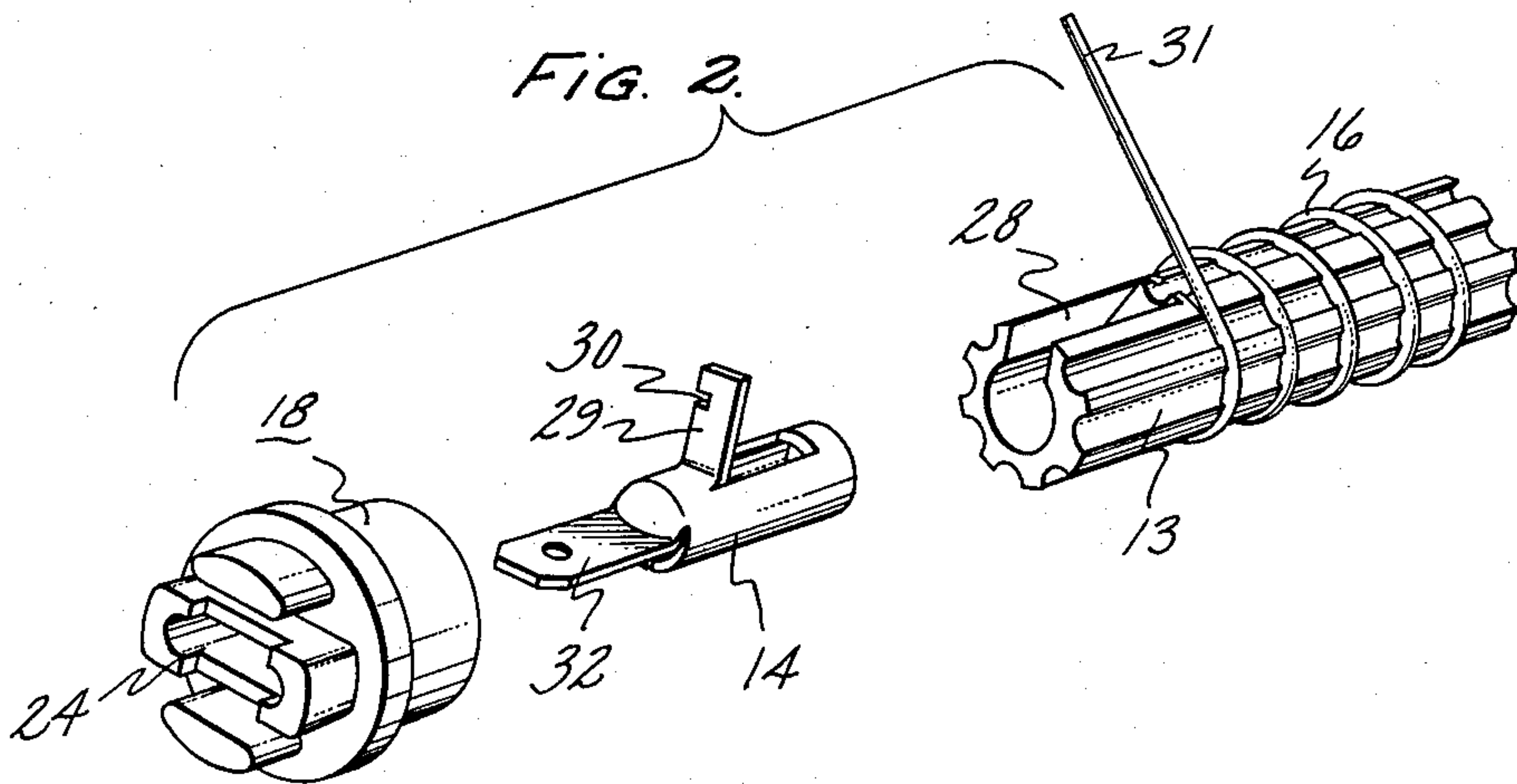
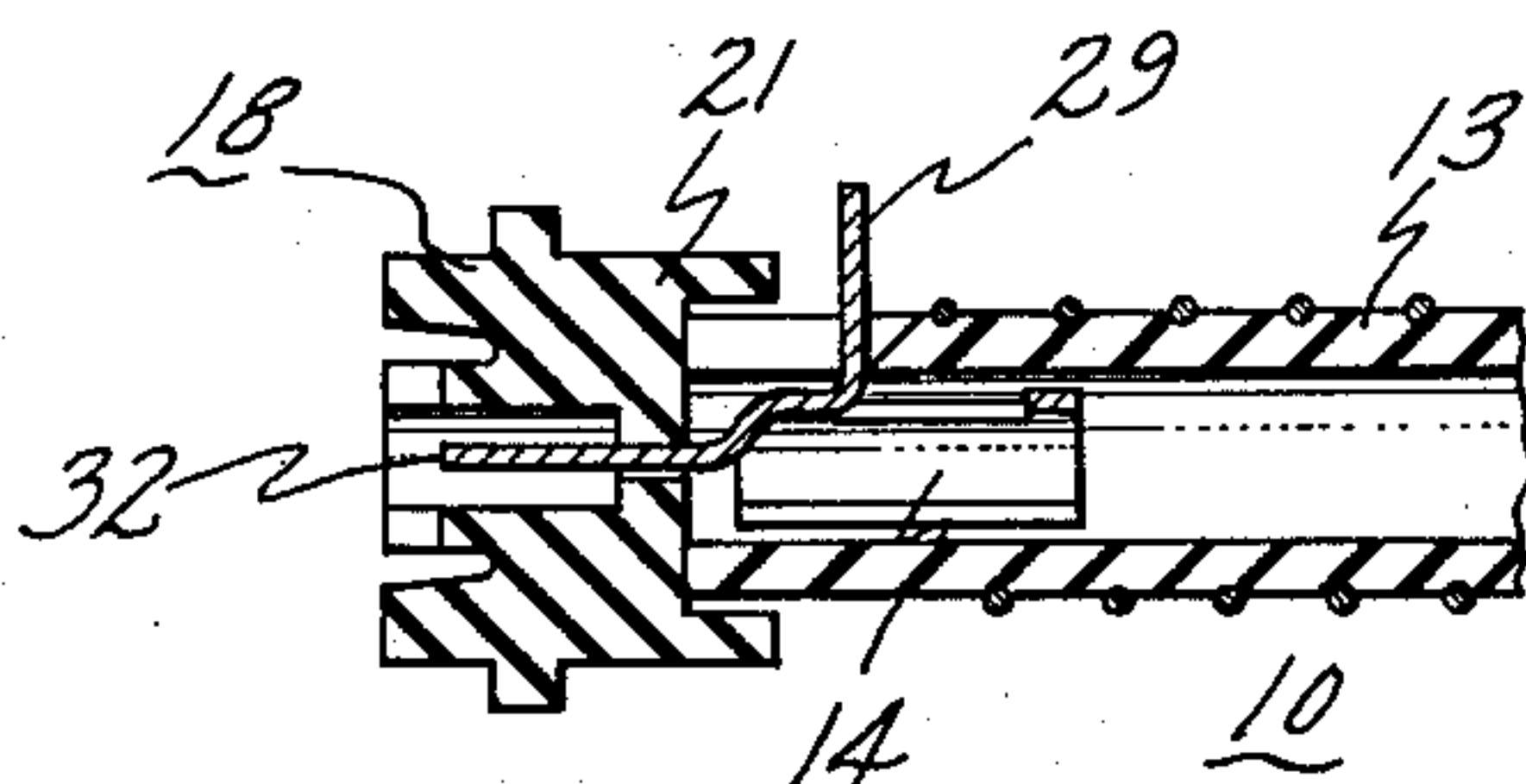


FIG. 3.



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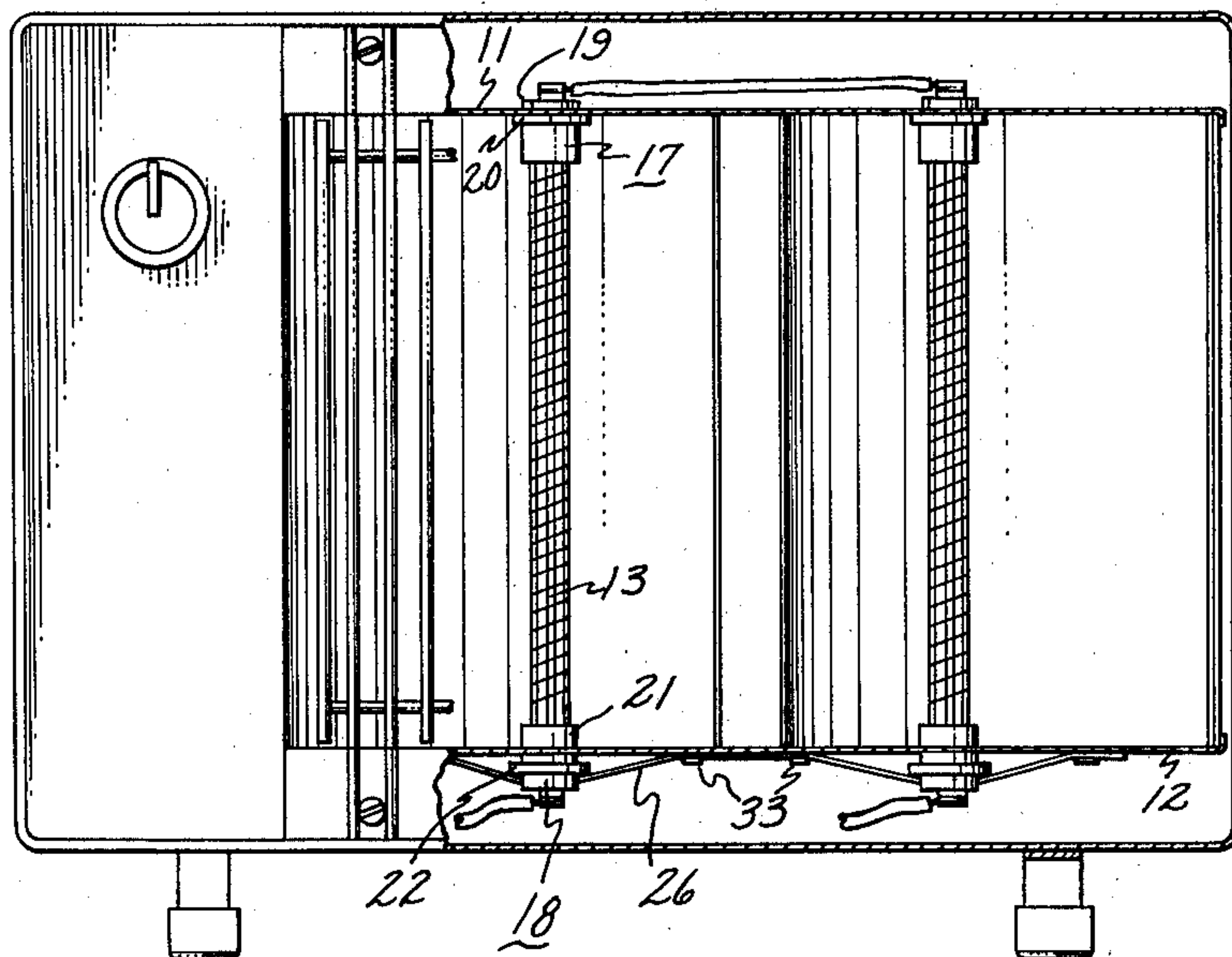
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Filed March 31, 1961

2 Sheets-Sheet 2

FIG. 4.



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3,102,249

HEATING UNIT MOUNTING MEANS

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Filed Mar. 31, 1961, Ser. No. 99,900

10 Claims. (Cl. 338-316)

The invention relates to an electric space heater and more particularly, it relates to the design and mounting of the resistance heating units within the space heater.

It is desirable that electric space heaters have a minimum number of parts and that these parts be inexpensive to manufacture. In line with this, it is also desirable that the parts can be quickly and easily assembled. Further, since electric space heaters are frequently moved, it is essential that the heater components, in general, and the mounting means for the heating units, in particular, be sufficiently resilient and rugged to withstand minor shocks caused by dropping and so forth. This requirement is also important with respect to handling and shipping.

Accordingly, it is a principal object of the invention to provide in an electric space heater an improved mounting arrangement for the resistance heating units such that they may be easily and rapidly assembled into the heater structure.

Another object of the present invention is to provide a room heater unit mounting assembly having a minimum number of different parts.

Yet another object of the invention is to provide a resistance heating unit assembly arrangement which is sufficiently rugged and resilient so that the heating units can withstand minor drops or shocks without breakage.

Briefly stated, the invention relates to an electric space heater having first and second spaced support elements with apertures therein, in which an electric resistance heating unit is mounted. The heating unit support core is provided with a pair of substantially identical end caps, one cap being received on each of the respective ends of said unit. The first end cap has a substantially cylindrical portion which extends through one of the apertures of the first support member, and the cap is provided with a flange which abuts the surface of the first support member surrounding the aperture. The second end cap also has a portion extending through one of the apertures of the second support member. A means such as a spring wire is provided to retain the second end cap on the end of the core in a manner to bias the core together with the first cap so that the flange of the first cap abuts the surface of the first support member.

Further objects, features and the attendant advantages of the invention will be apparent with reference to the following specification and drawings in which:

FIG. 1 is a cross-sectional view of a portion of the heater showing a resistance heating unit mounted in accordance with the invention on the heater support members;

FIG. 2 is an exploded perspective view of one end of the resistance heating unit of the invention;

FIG. 3 shows a cross-sectional view of one end of the resistance heating unit;

FIG. 4 shows a front view, partially in section, of an electric space heater embodying the invention.

Referring to the drawings, FIG. 1 shows a resistance heating unit of the type according to the invention which is used in conjunction with an electric space heater and is shown mounted between a first support member 11 and a second support member 12. The heating unit is composed of a hollow cylindrical ceramic core 13, a terminal 14 positioned within one end of core 13 and a terminal 15 positioned within the opposite end of core 13, a resistance heating element 16 helically wound upon ceramic core

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13 and attached to the radial tabs of terminals 14 and 15 (only partially shown in FIG. 1), and substantially identical ceramic caps 17 and 18 received on each end of the core 13.

End cap 17 fits within an aperture in support wall 11. More specifically, a substantially cylindrical portion 17' of end cap 17, which is remote from core 13, fits through an aperture in support member 11. In so doing, flange 20 of cap 17 abuts against the left hand surface of support 11.

On the opposite end of core 13, cylindrical portion 21 of end cap 18 extends through an aperture in support member 12 causing the inside of cap 18 to abut the left end of core 13, as best seen in FIG. 3. Cylindrical portion 21 may be described as that portion of the end cap which is adjacent core 13, as distinguished from the opposite end of the cap, which may be described as remote from the core.

The portions of the end caps 17 and 18, which are remote from core 13 are formed of three axial projections as shown for end cap 18 at 23, 24, and 25. These three projections form two grooves, therebetween, as shown, in which a resilient holding means such as spring wires 26 and 27 can be received. These wires may be attached to support member 12 at 33, as best seen in FIG. 4. Spring wires 26 and 27 form a simple holding means to retain cap 18 on the end of core 13 and to bias core 13 together with cap 17 upwardly so that flange 20 of cap 17 abuts the surface of support member 11. It should be noted that flange 22 of end cap 18 does not abut support member 12 in that when cap 17 is positioned on one end of core 13 and flange 20 of cap 17 engages support member 11, the length of core 13 is such that it prevents flange 22 of cap 18 from contacting support member 12. Such design permits wide tolerance in the length of core 13 and also enables spring wires 26 and 27 to insure positive engagement between cap 18 and core 13. This arrangement keeps wires 26 and 27 under tension and allows for a certain amount of movement of the resistance unit 10 upon expansion and contraction due to heating and cooling and in the event it is subjected to blows or shocks by dropping or tipping.

It should be noted that end caps 17 and 18 serve both as electrical insulators and as mechanical support means. The unique design of these end caps, which caps are substantially identical, can be more fully understood from a description and examination of FIGS. 2 and 3.

In FIG. 2, an exploded perspective view of one end of the resistance heating unit is shown. As can be seen, cylindrical core 13 is provided with a longitudinal slot 28 for receiving the radial tab 29 of terminal member 14 as the terminal is inserted within the hollow core 13. Terminal 14 fits loosely within core 13, but is restricted in its movement by virtue of the tab 29 fitting within the slot 28. After terminal 14 is installed, the end 31 of heating element 16 is bent into notch 30 of tab 29 to thereby secure element 16 to terminal 14.

Terminal 14 is further provided with an axially extending tongue 32, which may be connected to lead wires. End cap 18 is provided with an opening or slot within projection 24 designed to receive tongue 32. This can be more clearly seen in the cross-sectional view of the heating unit 10 shown in FIG. 3. The opposite end cap 17 is also provided with a slot similar to end cap 18 to receive the tongue of its associated terminal.

An examination of FIG. 3 also points out the loose fitting relationship of the cap 18, terminal 14 and core 13. The outer diameter of terminal 14 is slightly smaller than the inner diameter of core 13, thus allowing for easy assembly. Likewise, the inner diameter of the cylindrical portion 21 of end cap 18 is slightly larger than the outer diameter of the core 13. Further, the

depth of the socket in cylindrical portion 21 is considerably less than the length of slot 28 in core 13. Consequently, terminal 14 is free to move axially a certain amount as determined by the position of tab 29 with respect to cylindrical portion 21 and the end of slot 28 in core 13. The overall loose fitting arrangement of these parts permits wide manufacturing tolerances and makes the assembly less rigid, and thus less susceptible to breakage.

FIG. 4 shows an electric heater having electric heating units of the type described heretofore and mounted in the manner described in the preceding paragraphs. In the particular embodiment shown, two resistance heating units are mounted in accordance with the invention in a spaced vertical relationship. It should be understood, however, that the embodiment is merely an example and that the number of heating units utilized and the position of such units is not restricted to that illustrated.

To complete the understanding of the invention, the steps of assembly will be summarized. Initially, terminals 14 and 15 are installed in each end of the cylindrical ceramic support core 13, and the heating element 16 is wound around the core and attached to the radially extending tabs of the terminals. In installing the heating unit into the heater, end cap 17 is first placed over the end of core 13 and then placed within an aperture in support member 11. End cap 18 is then placed in position by inserting cylindrical portion 21 of cap 18 into an aperture in support member 12, and received on the end of core 13. Spring wires 26 and 27 are then installed in the grooves formed between the axial projections on the end of cap 18 which is remote from core 13. The wires are attached to support member 12 by suitable means such as tabs 33. These wires hold end cap 18 in engagement with core 13, and cause it to bias cap 17 and its flange 20 into engagement with support member 11.

The particular embodiment described is merely an example of the invention, and it will be obvious to those skilled in the art that various changes and modifications may be made without departing from the invention in its broader aspect. For example, the mounting means shown could be utilized for mounting other elements instead of resistance heating units. Further, such units could be mounted in a variety of electric heaters, and it is not intended that the invention be limited to heaters of the type shown in FIG. 4.

Therefore, it is intended in the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What we claim is:

1. In an electric heater having first and second spaced substantially fixed support members with apertures therein, a resistance support core, means to mount said core between said first and second support members comprising a first end cap received on one end of said core and a second end cap received on the other end of said core, said first end cap having a portion extending through the aperture of said first support member and having a flange abutting the surface of said first support member surrounding the aperture, said second end cap having a portion extending through the aperture of said second support member, said portion of said second end cap being smaller than the aperture formed in said second support member so that said portion of said end cap may be freely inserted into the aperture formed in said second member, said portion being large enough to prevent substantial transverse movement of said second end cap with respect to said second support member, and means cooperating with said second cap for urging said core and said first end cap longitudinally toward said first support so that the flange of said first end cap is resiliently held against the surface of said first support member.

2. In an electric heater having first and second spaced substantially fixed support members with apertures there-

in, a resistance support core, means to mount said core between said first and second support members comprising a pair of substantially identical caps each received on a respective end of said core, a first one of said caps having a portion extending through the aperture of said first support member and having a flange abutting the surface of said first support member surrounding the aperture, the second one of said caps having a portion extending through the aperture of said second support member, said portion of said second end cap being smaller than the aperture formed in said second support member so that said portion of said end cap may be freely inserted into the aperture formed in said second member, said portion being large enough to prevent substantial transverse movement of said second end cap with respect to said second support member, and means cooperating with said second cap for urging said core and said first end cap longitudinally toward said first support so that the flange of said first end cap is resiliently held against the surface of said first member.

3. In an electric heater having first and second spaced substantially fixed support members with apertures therein, a resistance support core, means to mount said core between said first and second support members comprising a first end cap received on one end of said core and a second end cap received on the other end of said core, said first end cap having a substantially cylindrical portion extending through the aperture of said first support member and having a flange abutting the surface of said first support member surrounding the aperture, said second end cap having a cylindrical portion extending through the apertures of said second support member, said cylindrical portion of said second end cap being smaller than the aperture formed in said second support member so that said second portion of said end cap may be freely inserted in the aperture formed in the second member, said cylindrical portion of said second end cap being large enough to prevent transverse movement of said second end cap with respect to said second support member, and means cooperating with said second end cap for resiliently urging the flange of said first end cap against the surface of said first support member.

4. In an electric heater having first and second spaced substantially fixed support members with apertures therein, a resistance support core, means to mount said core between said first and second support members comprising a pair of substantially identical caps each received on a respective end of said core, a first one of said caps having a substantially cylindrical portion extending through the aperture of said first support member and having a flange abutting the surface of said first support member surrounding the aperture, the second of said caps having a cylindrical portion extending through the aperture of said second support member, said portion of said second end cap being smaller than the aperture formed in said second support member so that said portion of said end cap may be freely inserted into the aperture formed in said second member, said portion being large enough to prevent substantial transverse movement of said second end cap with respect to said second support member, and means cooperating with said second end cap for urging said core and said first cap longitudinally toward said first support so that the flange of said first end cap is resiliently held against the surface of said first member.

5. In an electric heater having first and second spaced support members with apertures therein, a resistance support core, means to mount said core between said first and second support members comprising a first end cap received on one end of said core and a second end cap received on the other end of said core, said first end cap having a portion extending through the aperture of said first support member and a flange abutting the surface surrounding the aperture in said first support member, said second end cap having a portion extending through the aperture of said second support member, said

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second end cap having a groove on the end of said cap opposite from said cap portion extending through said aperture, and a spring wire attached to said second support and fitting within said groove to retain said second end cap on the end of said core in a manner to longitudinally bias said core together with said first cap so that the flange of said first end cap is resiliently held against the surface of said first support member.

6. In an electric heater having first and second spaced support members with apertures therein, a resistance heating unit comprising an insulating support core, two terminals, a respective one of said terminals being positioned in a respective end of said core, each of said terminals provided with a radially extending tab for connection to a heating element wound around said core and a tongue axially extending beyond the associated end of said core, means to mount said core between said first and second support members comprising a first end cap received on one end of said core and a second end cap received on the other end of said core, said end caps each provided with an opening which fits over said axially extending tongue of the respective terminal, said first end cap having a portion extending through the aperture of said first support member and having a flange abutting the surface surrounding the aperture in said first support member, said second end cap having a portion extending through the aperture of said second support member, said second end cap having a groove on the end of said cap opposite from said cap portion extending through said aperture in said second support member, and a spring wire attached to said second support and fitting within said groove to retain said second end cap on the end of said core in a manner to longitudinally bias said core together with said first cap so that the flange of said first end cap is resiliently held against the surface of said first support member.

7. In an electric heater having first and second spaced support members with apertures therein, a resistance heating unit comprising an insulating support core, two terminals, a respective one of said terminals being positioned in a respective end of said core, each of said terminals provided with a radially extending tab for connection to a heating element wound around said core and provided with a tongue axially extending beyond the associated end of said core, means to mount said core between said first and second support members comprising a first end cap received on one end of said core and a second end cap received on the other end of said core, said end caps each having an opening which fits over said axially extending tongue of the respective terminal, said first end cap having a portion extending through one of the apertures of said first support member and having a flange abutting the surface surrounding the aperture in said first support member, said second end cap having a portion extending through one of the apertures of said second support member, and means to retain said second cap on the end of said core in a manner to longitudinally bias said core together with said first cap so that the flange of said first end cap is resiliently held against the surface of said first support member.

8. In an electric heater having first and second spaced

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support members with apertures therein, a resistance support core, means to mount said core between said first and second support members comprising a first end cap received on one end of said core and a second end cap received on the other end of said core, said first end cap having a portion extending through the aperture of said first support member and a flange abutting the surface of said first support member surrounding the aperture, said second end cap having a portion extending through the aperture of said second support member, a spring wire having its ends connected to said second support member, said second end cap having means for receiving said spring wire to retain said second end cap on the end of said core and for resiliently biasing the flange on said first end cap against the surface of said first support member.

9. In an electric heater having first and second spaced support members with apertures therein, a resistance support core, means to mount said core between said first and second support members comprising a first end cap received on one end of said core and a second end cap received on the other end of said core, said first end cap having a portion extending through one of the apertures of said first support member and a flange abutting the surface of said first support member surrounding the aperture, said second end cap having a portion extending through one of the apertures of said second support member, said second end cap having a groove on its end opposite from said cap portion extending through said aperture, and means cooperating with said groove to retain said second end cap on the end of said core in a manner to bias said core together with said first cap and the flange thereof against the surface of said first support member.

10. In an electric heater having first and second spaced support members with apertures therein, a resistance support core, means to mount said core between said first and second support members comprising a first end cap received on one end of said core and a second end cap received on the other end of said core, said first end cap having a portion extending through one of the apertures of said first support member and a flange abutting the surface of said first support member surrounding the aperture, said second end cap having a portion extending through one of the apertures of said second support member, and a spring wire connected at spaced locations to said second support member to retain said cap on the end of said core in a manner to bias said core together with said first cap and the flange thereof against the surface of said first support member.

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