April 15, 1924. 1,490,089

L. B. BRIDGES

AIR HEATER

Filed Sept. 28, 1921 2 Sheets-Sheet 1

Fig. 1.

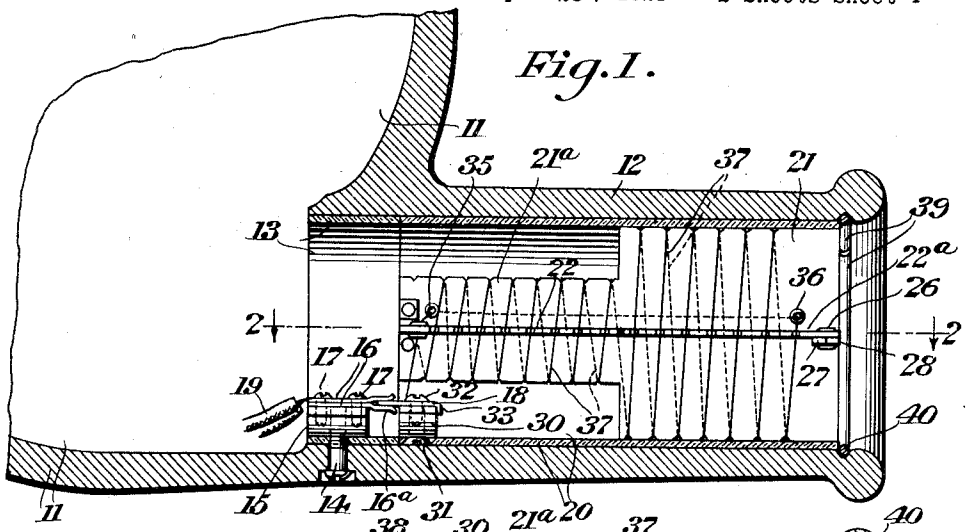


Fig. 2.

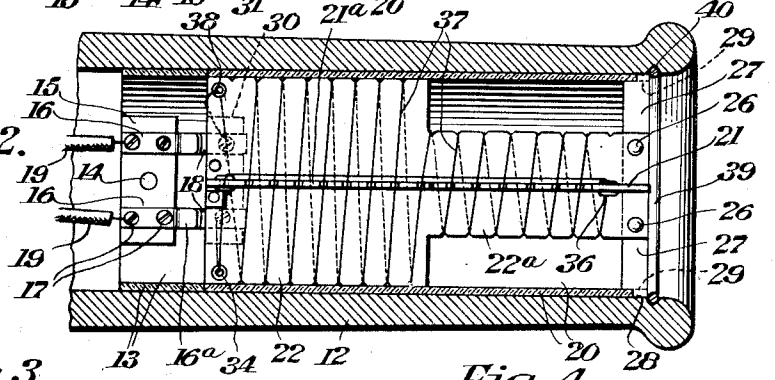


Fig. 3

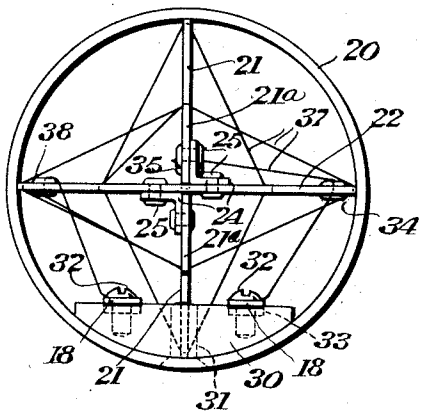
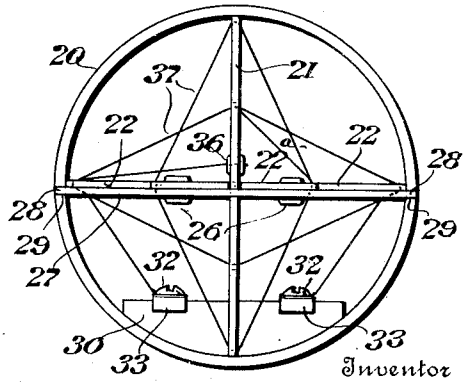


Fig. 4.



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Fig.5.

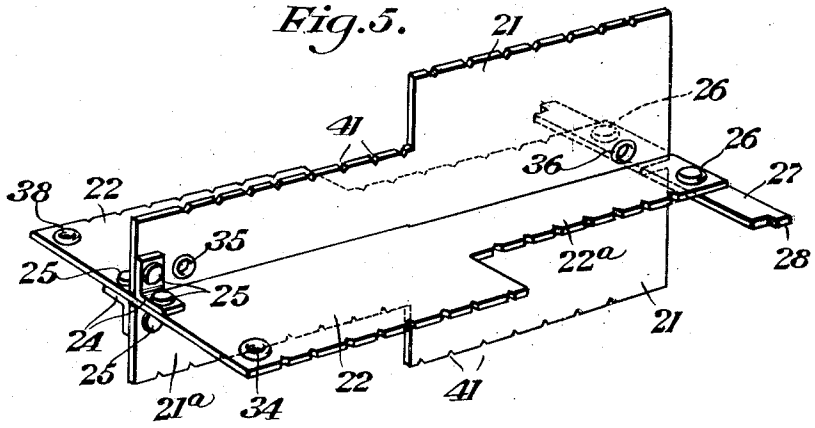


Fig.6.

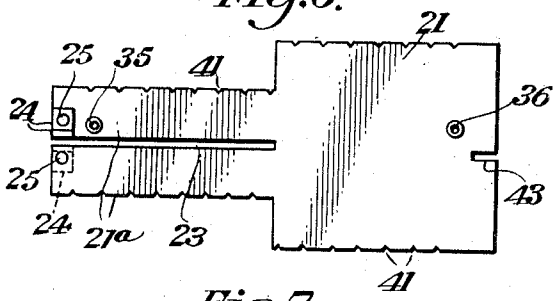


Fig.7.

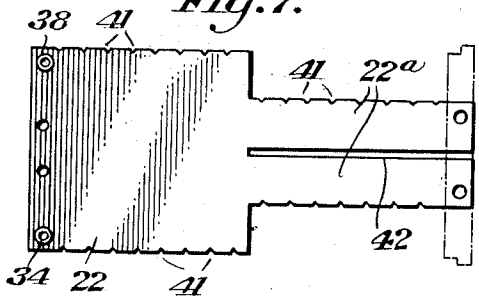


Fig.8.

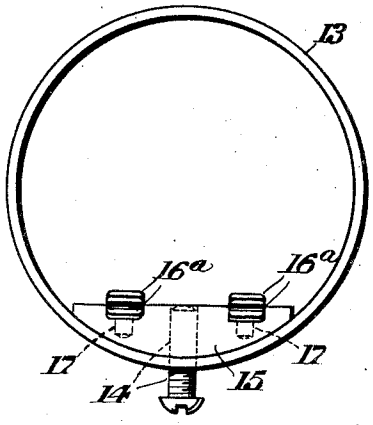


Fig.9.

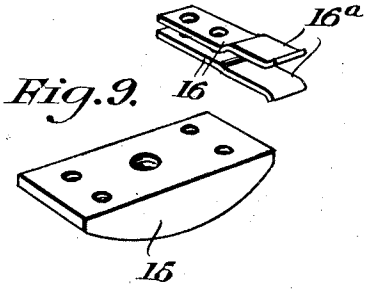
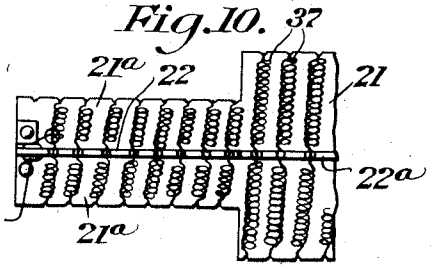


Fig.10.



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By

his Attorneys

Patented Apr. 15, 1924. 1,490,089

UNITED STATES PATENT OFFICE.

LEWIS B. BRIDGES, OF BROOKLYN, NEW YORK, ASSIGNOR TO AIRDRY CORPORATION, OF GROTON, NEW YORK, A CORPORATION OF NEW YORK.

AIR HEATER.

Application filed September 28, 1921. Serial No. 503,734.

To all whom it may concern:

Be it known that I, LEWIS B. BRIDGES, a citizen of the United States, and resident of the borough of Brooklyn, county of Kings, city and State of New York, have invented certain new and useful Improvements in Air Heaters, of which the following is a specification.

This invention relates to improvements in air heaters, and more particularly to electric air heating means. The improved electric heating device is especially adapted for use in connection with sanitary drying apparatus in which the drying is effected by means of a blast of heated air, and is preferably mounted in the discharge nozzle of the fan blower or other air-supplying means. It will be obvious, however, that the improved heating means is not limited in its application to the type of apparatus specified, but may be employed in flues, conduits and casings of various forms for heating air or gases.

The invention has for one of its objects to provide an inexpensive and effective electric heating means which will uniformly heat air flowing through a nozzle, conduit or casing. A further object of the invention is to provide a compact heating coil so constructed that a resistance wire of considerable length may be employed without interfering with the flow of air.

To the above and other ends, which will hereinafter appear, the invention consists in the features of construction, arrangements of parts, and combinations of devices hereinafter more fully described and particularly pointed out in the appended claims.

In the accompanying drawings, wherein the preferred embodiment of the invention is illustrated,

Figure 1 is a fragmentary vertical sectional view of a fan blower of ordinary construction having the improved air heating means mounted in the discharge nozzle thereof.

Fig. 2 a horizontal section on the line 2—2 of Fig. 1;

Figs. 3 and 4 are end elevations on an enlarged scale of the inner and outer ends, respectively, of the heating coil;

Fig. 5 a perspective view on an enlarged scale of the support or core upon which the resistance wire is wound;

Figs. 6 and 7 are plan views of the vertical and horizontal members, respectively, of which the core is formed;

Fig. 8 is an end elevation on an enlarged scale of the outer end of the line terminals and the insulating and supporting means therefor;

Fig. 9 a detail perspective view showing the line terminal supporting block and one of the line terminals; and

Fig. 10 a fragmentary side elevation of the core showing a slightly modified form of resistor wound thereon.

Referring to the various parts by numerals, 11 designates the fan or rotor chamber of a fan blower of ordinary construction and 12 the discharge nozzle of the blower. At the inner end of the nozzle 12 a ring 13 of insulating material is rigidly but detachably held by means of a screw 14 which also serves to hold a segmental block 15 of insulating material within the ring 13. A pair of line terminals or slip contacts 16 are mounted on the flat upper surface of block 15, each of said contacts comprising a pair of superposed strips of spring metal held to block 15 by a pair of screws 17 and having their outer ends 16^a projecting beyond the outer edge of the block and slightly spread apart to facilitate the insertion of one of the knife contacts or terminals 18 of the heating element therebetween. A pair of line wires 19 are connected with contacts 16, said wires being bent around the shanks of the two innermost screws 17 and clamped against the contacts by the heads of said screws. Wires 19 lead to a suitable source of current, not shown.

The heating element or coil is removably mounted in the nozzle 12 and comprises generally a tubular insulating and protecting casing 20 having a core or support detachably secured therein upon which is wound the resistor or length of resistance wire. The resistor core or support comprises two sheets of mica 21 and 22 each of which is cut away at opposite edges for substantially one-half its length and one-fourth the width of the wider portion of the sheet. The narrower portions 21^a and 22^a of the sheets of mica are slotted longitudinally from end to end midway the side edges of said portions as shown at 23 and 42, and the side edges of both the wide and narrow portions are parallel with the lon-

gitudinal center line of the sheet. Sheets 21 and 22 are permanently interlocked, as shown more clearly in Fig. 5, with the wider portion of sheet 21 engaged in slot 42 in sheet 22 and the wider part of sheet 22 engaged in slot 23 in sheet 21, said sheets being arranged in planes intersecting each other at right angles so as to form a skeleton core having four radially extending blades, fins or wings each of which has a stepped outer edge. The outer ends of the two halves of the slotted portion 21[a] of sheet 21 are rigidly held to the outer end of the wide portion of sheet 22 by angular metal braces 24 and rivets 25, while the ends of the narrow portion 22[a] of sheet 22 are held by rivets 26 to a rigid metal locking bar 27 which passes through a notch 43 in the outer end of the wide portion of sheet 21. Braces 24 and bar 27 hold the sheets 21 and 22 against relative movement, and bar 27 also serves to hold the core against rotary movement relatively to the casing 20, said bar being formed with projections or lugs 28 at its opposite ends engaging in notches 29 in the outer end of the casing when the core is passed endwise into the casing. Lugs 28 also hold the core against endwise movement in one direction when the core is assembled in the casing, while ring 13 limits the extent of inward movement of the casing 20 in nozzle 12.

Contacts 18 consist of metal strips held by screws 32 to the flat upper face of a segmental block 30 of insulating material which is held within the inner end of casing 20 by a screw 31. One end of each contact 18 projects beyond the outer edge of block 30 and is adapted to engage between the resilient blades 16[a] of one of the contacts 16, while the other end of each contact 18 is bent downwardly against the inner edge of block 30 as shown at 33 to prevent lateral swinging of the contacts. One end of the resistor, which consists of a length of resistance wire 37, is clamped against one of the contacts 18 by the head of one of the screws 32 and passes thence through an eyelet 34 in sheet 22 and eyelets 35 and 36 in sheet 21 to the outer end of the core. The wire 37 is then wound spirally around the core as shown from the outer to the inner end of the core where it passes up through an eyelet 38 in sheet 22 and thence downwardly over the inner end of said sheet to the other contact 18 against which it is clamped by the head of the screw 32.

The core with the resistor wound thereon may be removed from casing 20 by disconnecting the ends of the resistor wire from screws 32. Casing 20 and the core are removably held in the nozzle by a divided locking ring 39 adapted to be sprung into and out of a circumferential groove 40 in nozzle 12. When ring 39 is removed casing 20, the core, the resistor, and block 30 with contacts 18 thereon, may be removed from the nozzle as a unit. Casing 20, ring 13, and segmental blocks 15 and 30 are formed of rigid insulating material, such as vulcanized fiber. The side edges of the mica sheets 21 and 22 are preferably provided with notches 41 in which the resistance wire 37 engages to maintain the several convolutions of the wire in properly spaced relation.

It will be observed from the foregoing description of the cruciform core that the convolutions of the resistance wire wound thereon are formed of the same length of wire and are of the same general diamond shape, but that the convolutions of wire on one half of the core are wide vertically and narrow horizontally while the convolutions on the other half are narrow vertically and wide horizontally. This arrangement permits the use of a maximum length of resistance wire in a coil of given length and diameter, affords a highly effective distribution of the wire in the path of the air whereby the air is rapidly and uniformly heated, and avoids choking of the air passage through the heating element and excessive concentration of heat at one point.

It will be observed also that the core is so constructed that it cannot be laterally deflected or canted in the casing 20, the side edges of the wider portions of sheets 21 and 22 having a long bearing or contact with the casing at four circumferentially spaced points. When contacts 18 are engaged in contacts 16 they assist bar 27 in preventing rotation of the core.

In Fig. 10 a slightly modified form of resistor is shown, the portions of the resistance wire 37 between the wings of the core being coiled in helical form, thus greatly increasing the length of wire in a heater of given diameter and length. It will be obvious that the relative widths and lengths of the two halves of the sheets may be varied and that each sheet may be formed with more than two stepped edges at each side if desired.

What I claim is:

1. An electric heating coil comprising a conductor wound spirally in symmetrical convolutions elongated transversely of the axis of the coil, said convolutions being arranged in successive groups with the convolutions in each group in register and the different groups of convolutions stepped around the axis of the coil.

2. An electric heater comprising a tubular casing, a support extending longitudinally of the casing, and a resistor spirally wound on the support, said support having radial wings with stepped side edges upon which the resistor is wound.

3. An electric heater comprising a cruciform support having wings with stepped outer edges, the narrower portions of the two pairs of parallel wings being located at opposite ends of the support, and a resistor wound spirally around the support.

4. An electric heater comprising a pair of interlocked sheets of insulating material having stepped longitudinal edges, the edges of the two sheets being stepped in opposite directions, and a resistor wound spirally around the stepped edges of the interlocked sheets.

5. An electric heater comprising a cruciform core having its two pairs of parallel wings reduced in width for a portion of their length adjacent opposite ends of the core, and a resistance wire wound spirally around the core and supported by the longitudinal edges of the wings.

6. An electric heating coil comprising a conductor wound spirally in a plurality of series of diamond-shaped convolutions, all of said convolutions being of the same size and symmetrical with respect to the axis of the coil, and the different series of convolutions being staggered with respect to each other around the axis of the coil.

7. An electric heater comprising a core having four radially extending wings with stepped outer edges, the narrower portions of one pair of parallel wings being located at one end of the core and the narrower portions of the other pair of parallel wings being located at the opposite end of the core, a resistor wound spirally around said core and supported by the outer edges of the wings, and a casing surrounding the core and resistor and engaged along its inner side by the wider portions of the four wings of the core.

8. An electric heater comprising four resistor supports arranged radially around a common axis, the two pairs of oppositely disposed supports having their outer resistor supporting edges stepped in opposite directions, a spirally wound resistor supported by the stepped edges of said supports, said stepped edges of the supports being notched to receive the resistor, and a tubular casing enclosing said supports and resistor and engaged at four circumferentially spaced points by said supports.

9. An electric heater omprising four resistor supports arranged radially around a common axis, the two pairs of oppositely disposed supports having their outer resistor supporting edges stepped in opposite directions, a spirally wound resistor supported by the stepped edges of said supports, said stepped edges of the supports being notched to receive the resistor, a tubular casing enclosing said supports and resistor and engaged at four circumferentially spaced points by said supports, and means for holding the supports against rotation in the casing.

10. An electric heater comprising a core having four radially extending wings with stepped outer edges, the narrower portions of one pair of parallel wings being located at one end of the core and the narrower portions of the other pair of parallel wings being located at the opposite end of the core, a resistor wound spirally around said core and supported by the outer edges of the wings, a casing surrounding the core and resistor and engaged along its inner side by the wider portions of the four wings of the core, and means connecting the core and casing for holding the core against rotation in the casing.

11. An electric heater comprising a resistor wound spirally in a plurality of series of symmetrical convolutions non-circular in end view, the convolutions of each series being in register and the different series of convolutions being stepped around a common axis, and means for supporting said resistor.

12. An electric heater comprising a skeleton core, and a resistor wound spirally on said core in two series of convolutions, said convolutions being diamond-shaped in end view and the two series of convolutions being staggered around a common axis.

In testimony whereof I hereunto affix my signature.

LEWIS B. BRIDGES.