July 9, 1935. H. A. SOVERHILL 2,007,222

ELECTRIC UNIT HEATER

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Fig. 1.

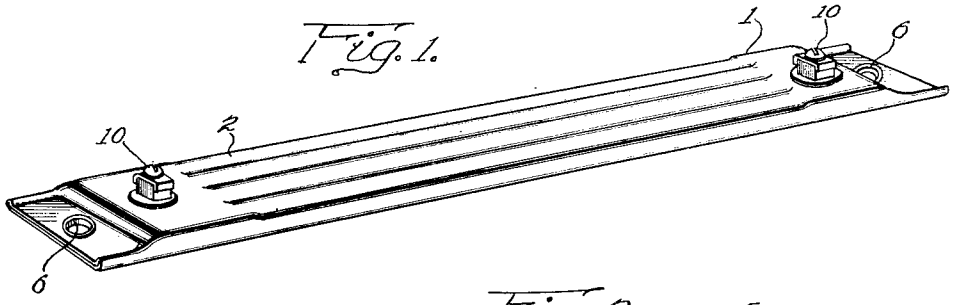


Fig. 2.

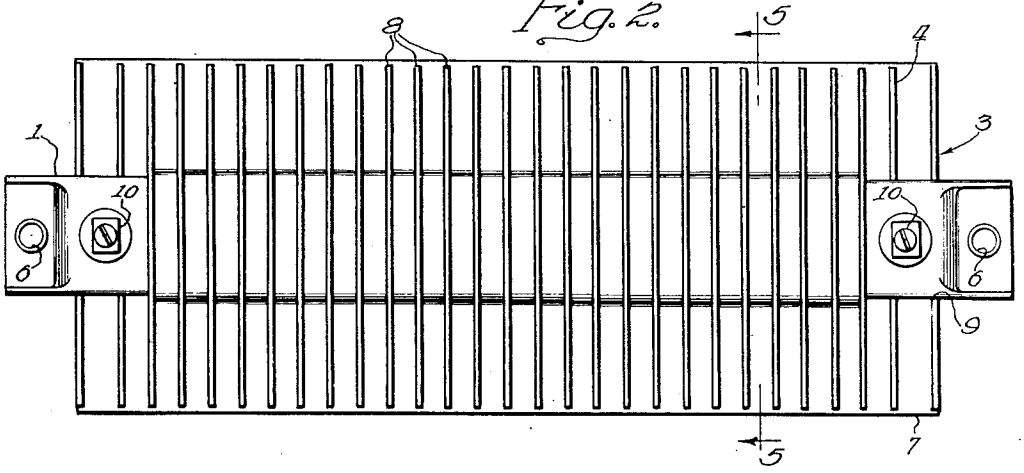


Fig. 3.

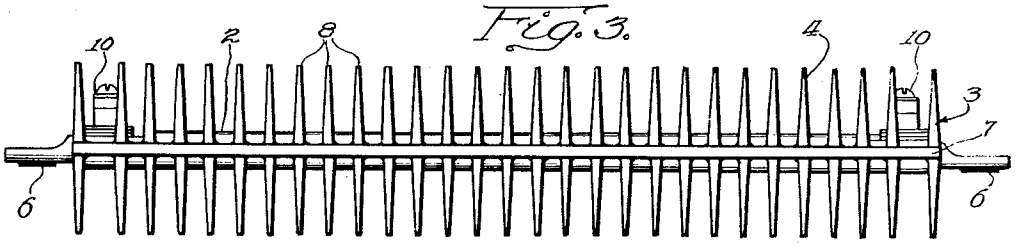


Fig. 4.

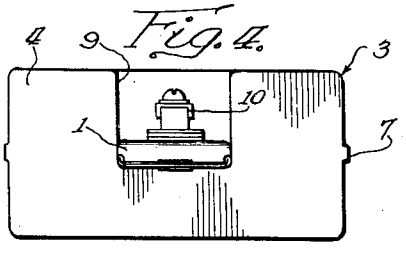
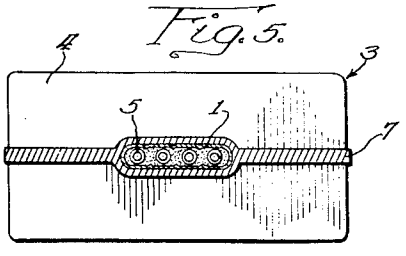


Fig. 5.



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Fig. 6.

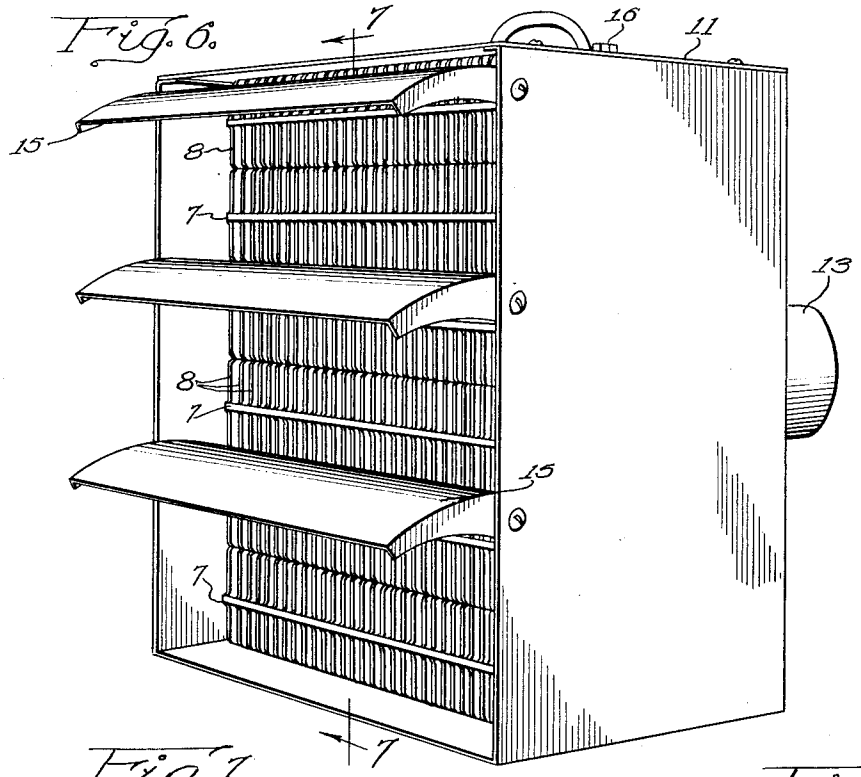


Fig. 7.

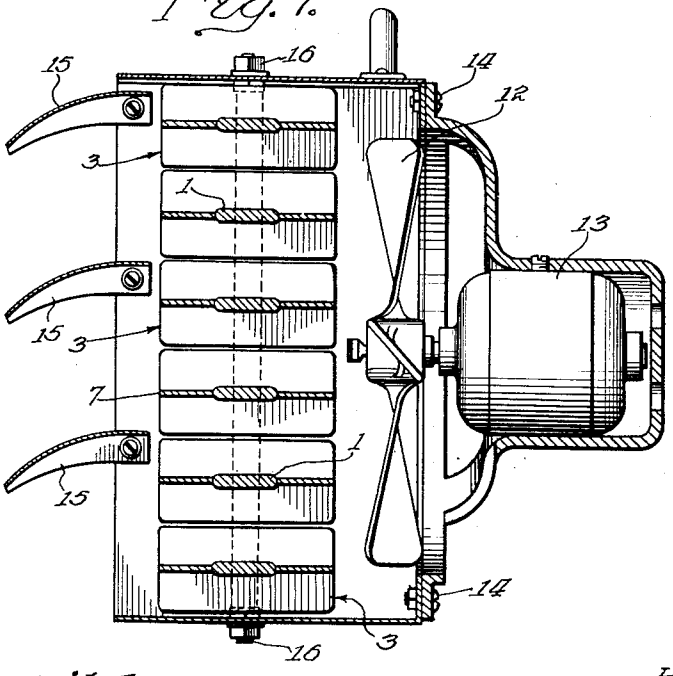
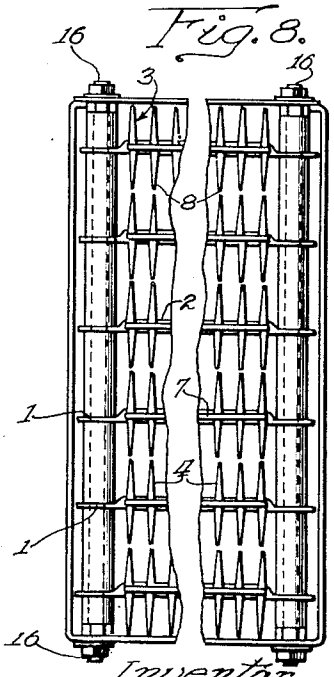


Fig. 8.



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UNITED STATES PATENT OFFICE

2,007,222

ELECTRIC UNIT HEATER

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Application March 3, 1930, Serial No. 432,877

8 Claims. (Cl. 219—39)

My invention relates to temperature controlling devices for household or commercial uses, and has to do especially with a novel form of heat transfer unit adapted to convert electrical energy into heat energy.

One of the objects of this invention is to provide a heat transfer unit which is simple in construction, easy to manufacture, and which is adapted to give maximum efficacy consistently over long periods of time, with a minimum of resistance to heat dissipation.

Another object is to provide a heat-transfer unit which is cast as an integral piece at a single operation, such unit including a plurality of thin extended and slightly spaced heat dissipating surfaces to which the air is subjected for heat-transfer. To this end, I employ in each transfer unit a suitable conduit having a plurality of thin, laterally projecting, parallel and closely locked fins or air contact plates between and over which the air passes; and in making such integral casting I employ a ductile metal of high heat conductivity and which is capable of withstanding distortion without breakage and which is of such character as to flow readily and uniformly during the casting operation.

Additional objects are to provide an integral unit which will not be structurally affected by heat changes; to provide an exceptionally light weight unit which may not only be employed in connection with stationary installations but may be used in portable sets which, for example, may be moved from room to room in the home or from office to office to regulate the air conditions as desired; to provide units which are also by the very nature of their construction strong and durable; and to provide for the flow of air through and against such units in a uniform manner and at a uniform velocity to insure a full and uniform heat transfer effect.

Another object is to provide an electric heat transfer unit which is made by casting and shrinking a plurality of thin extended and slightly spaced heat conducting surfaces to which the air is subjected for heat transfer, on to what is known as an electric strip heater or electric space heater. To this end I employ in each transfer unit a suitable electric heater on which is cast a plurality of thin, laterally projecting, parallel contact plates or fins between and over which air passes; and in making such fin castings I employ such metal as is best suited to the purpose.

An illustrative embodiment of this invention is shown in the accompanying drawings, in which:

Figure 1 is a perspective view of a strip heater.

Fig. 2 is a top view of a strip heater and casting forming a heat transfer unit.

Fig. 3 is a side view of Fig. 2.

Fig. 4 is an end view of Fig. 3.

Fig. 5 is a sectional view on the line 5—5 of Fig. 2.

Fig. 6 is a perspective view of the cabinet showing heat transfer units installed.

Fig. 7 is a vertical section taken on the line 7—7 of Fig. 6.

Fig. 8 is a front view of Fig. 6, parts broken away showing assembly.

The construction comprises the use of a space or strip sheath wire heater 1 having a metal sheath 2. In the form shown in Fig. 1, the sheath wire heater is of flat cross section and contains four helical resistance wires 5 embedded in the insulation as will be understood by those skilled in the art, but it will be understood that the invention is not limited to this particular cross section or number of resistance wires.

The heat transfer unit is constructed by symmetrically placing the strip heater 1 to form the center of a casting 3 formed by pouring a hot metal which shrinks on cooling to form a compression fit on the sheath 2.

The single casting or jacket 3 has a plurality of thin extended and slightly spaced contact conduction surfaces 4, which increases many fold the effective dissipating surface. The casting 3 forms an envelope around the sheath 2, extending beyond the location of the enclosed resistance wires 5, leaving only clearance for access to the mounting holes 6. The central main rib or fin 7 is cast in the plane of the strip heater and a plurality of ribs or fins 8 are placed transverse to the long axis of the strip heater. The end fins have cutouts 9 which provide access to the bus connecting terminal studs 10. A rectangular shaped frame or cabinet 11 forms the housing in which a plurality of the heat transfer units are enclosed. Air is forced through the heat transfer units by means of a fan blower 12 driven by an electric motor 13. The fan blower 12 is secured to the rear wall of the cabinet 11 by bolts 14. The front part of the cabinet frame is provided with adjustable shutters 15 which give directional control to the air stream. A locked relation between the heat transfer units and the cabinet is provided by bolts 16, which engage the mounting holes 6.

Bus bars or lead wires not shown may be connected to the several units by connection with the terminal studs 10, and by proper arrangement may be so connected as to arrange the different

units in series, or parallel, or series parallel to control the intensity or volume of heat.

It will be understood that while I have shown the fan or blower arranged in close proximity to the transfer units, it is to be understood that such fan or blower may be located at a remote point and associated with the transfer units by means of a suitable conduit, or otherwise: and, if desired, the fan or other blower means may be driven by any desired motive means other than the electric motor, the main purpose being to provide some efficient means for causing the air to be conditioned to pass to and through the heat transfer units.

The unit comprises a central strip heater, flat, or round or any suitable shape. A plurality of thin and flat fins are cast entirely around the strip heater so that there is a heat transfer portion on the opposite sides of the heater. These fins for the purpose of strength, conductivity and ease of manufacture have a cross-section tapering outwardly from the strip heater and are equally or unequally spaced in parallel relation. To aid in the heat transfer effect these fins are preferably located rather close together as is indicated.

The foregoing construction is made by using any metal that has high heat conductivity, and which during the casting operation will flow readily in the formation of thin, laterally projecting and slightly spaced fins. The great number of slightly spaced fins provides a considerable thermal area with which the air must pass in contact.

The operation of the structure so far described is as follows: If the air, say in a room, is to be heated, electricity is passed from a source (not shown) through wires through the heating elements; and back to the source or some other point. As this action is taking place, the fan forces the air through the assembled units, from the fins toward and past the deflectors. The electricity which is passed through the elements quickly heats the strip heaters, such heat being rapidly conducted from the resistance wires 5 to the fins due to the excellence of the heat transfer path, and the continuous application of the electricity maintains these parts in the desired heated condition. The fins divide the unit into small compartments, each receiving a portion of the air to be treated, and as the air passes through these compartments between the fins, the heat from the fins and jacket is transmitted thereto, and by the time the air is passed entirely through it is heated to the desired extent.

It will be readily appreciated that if desired, the structure above described may be readily converted to the form of a portable or transportable unit which may be wheeled or carried from room to room with suitable connections for plugging into electric wall sockets, so that the device may be used to great advantage in regulating room temperatures under all conditions.

Different forms may be given the fins. They may be waved, corrugated or curved to provide an irregular passage through and between the fins to create a turbulence which causes a stirring action of the air so as to more thoroughly, evenly and quickly heat the entire volume of air through the entire space between the fins. In fact the fins may be given any desired shape without departing from the spirit and scope of my invention.

Certain metals may be employed in casting that are of such character that the fins may be cast with straight sides as shown and thereafter formed to irregular shapes or they may be formed in the latter shapes during the casting operation.

Experience has proven that commercial electric heating strips when built into a heat transfer unit are continuously operatable at several times their present normal rated wattage, and that the heat transfer is so rapid that the conductors never rise above their normal rated temperature, and that the air delivered at normal fan velocity is always below the scorching or devitalizing temperature.

It is to be noted that by utilizing a metal which will shrink when cast, the fin structure is brought into intimate contact with the sheath and is caused to remain in intimate contact regardless of the subsequent contraction and expansion caused by the heat of operation of the unit. A high thermal efficacy is accordingly obtained which is conducive to rapid heat dissipation and increases the thermal capacity of the unit.

I claim:

1. In an electric air heater unit, an electric heating element comprising a comparatively long, narrow, thin, flat sheath of conducting material, a plurality of resistance wires disposed side by side within said sheath, electric insulating, heat conducting material packed within said sheath around said wires, a comparatively long, narrow, thin, flat jacket of heat conducting material cast around and shrunk on said sheath, said jacket having cast integral therewith a long, thin rib on each side in substantially the plane of the jacket and a large number of annular ribs surrounding said jacket and having a substantially rectangular external contour, and means for passing over said jacket a current of air parallel to the planes of said jacket and of said ribs.

2. In an electric air heater unit, an electric sheath-wire heating element comprising a comparatively long, narrow, thin, flat sheath of conducting material, a plurality of resistance wires disposed side by side within said sheath, granular electric insulating, heat conducting material packed within said sheath around said wires, a comparatively long, narrow, thin, flat jacket of heat conducting material cast around and shrunk on said sheath, said jacket having cast integral therewith a long, thin rib on each side in substantially the plane of the jacket and a large number of annular ribs surrounding said jacket and having a substantially rectangular external contour, the ends of said sheath projecting from said jacket and having assembly openings, said annular ribs being interrupted at each end to provide open spaces, and binding posts on said sheath in said open spaces for said conductors.

3. In an air heater, a sheath wire heating unit comprising a metal sheath, resistance wire disposed within said sheath, electric insulating, heat conducting material packed within said sheath around said wire, a thin, metal, heat conducting jacket cast around and shrunk onto said sheath, said jacket having cast integral therewith a large number of thin ribs to greatly increase the heat dissipating surface of the jacket, means for passing a sufficiently large volume of air over said jacket to maintain the extended surface of the jacket at a comparatively low temperature, whereby with the low resistance heat transfer path between resistance wire and jacket surface large electrical energy may be dissipated at low temperatures.

4. In a blower type electric air heater, a sheath wire heating unit comprising a metal sheath, re-

sistance wire within said sheath, electric insulating, heat conducting material packed within said sheath around said wire, a thin walled metal, heat conducting jacket body cast around and shrunk onto said sheath, said sheath wire heating unit extending a substantial distance in both the length and breadth of said body, said body having a large number of heat dissipating members to greatly extend the dissipating surface of the jacket, means for passing a sufficiently large volume of air over said jacket to maintain the extended surface at a comparatively low temperature, whereby with the low resistance heat transfer path between resistance wire and jacket surface large electrical energy may be dissipated at low temperatures.

5. In an air heater, a sheath wire heating unit comprising a thin, flat strip, metal sheath, a plurality of resistance wires disposed side by side in said sheath and running lengthwise of the sheath, electric insulating, heat conducting material packed within said sheath around said wires, a jacket comprising a thin walled metal, heat conducting, thin body cast around and shrunk onto said sheath, said jacket body having cast integral therewith a plurality of thin ribs on opposite sides to greatly extend the heat dissipating surface of the jacket, means for passing over said jacket a sufficiently large volume of air in a direction parallel to the planes of said jacket body and of said ribs to maintain the extended surface of the jacket at a comparatively low temperature.

6. In an air heater, a casing, means for passing a current of air through said casing, a honeycomb radiator grid disposed in said casing across the air path, said radiator grid comprising a stack of heater elements, each element comprising an electric heating unit, a jacket surrounding said unit and comprising a flat extended body having flat, extended fins on opposite flat sides of the body, said elements having their bodies in spaced parallel planes and their fins aligned, said bodies and aligned fins being parallel to the air path.

7. In an air heater, an electric sheath-wire heating unit comprising a resistance enclosed within a metal sheath with electric insulating material packed tightly therebetween, a jacket cast around said unit and into close thermal relation to said sheath, said jacket having a greatly extended heat dissipating surface, and means for maintaining a forced blast of air across said jacket.

8. In an air heater, a jacket comprising a plate-like body having its thickness comparatively small as compared with its length and width, an electric, sheath-wire, strip heating unit comprising a helical resistance wire enclosed within a metal sheath with electric insulating, heat conducting material packed tightly therebetween, said jacket surrounding said heating unit and cast to said sheath, said heating unit extending both the length and width of said body, a plurality of heat dissipating fins cast to said body to greatly extend the heat dissipating surface thereof, means for establishing a forced blast of air, said body being disposed edgewise in said blast and the planes of said fins being parallel to the direction of said blast whereby maximum surface is exposed to said blast with minimum impedance thereto and whereby a low resistance heat transfer path between said resistance wire and jacket surface is established so that large electrical energy may be dissipated at low temperatures of the jacket surface.

HARVEY A. SOVERHILL.