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AIR CONDITIONING SYSTEM HEATER ASSEMBLY

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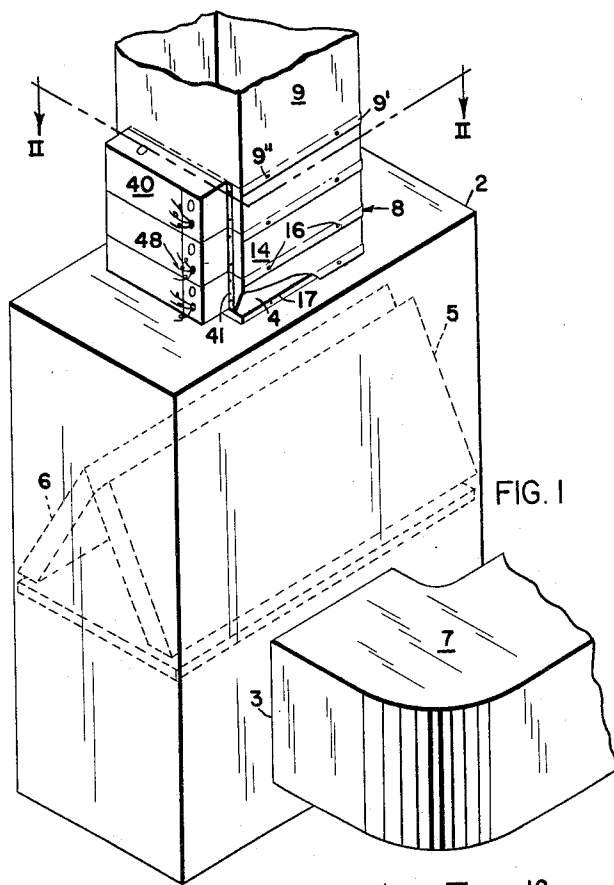


FIG. 1

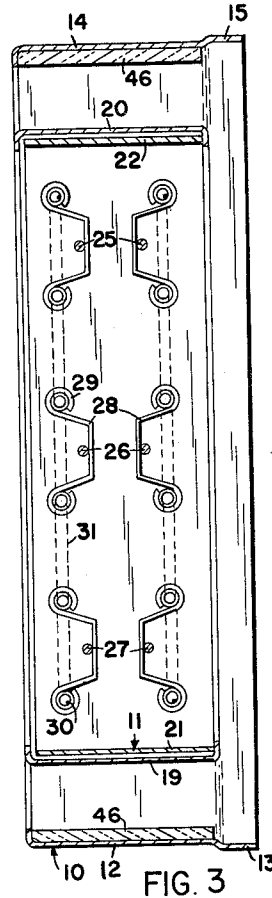


FIG. 3

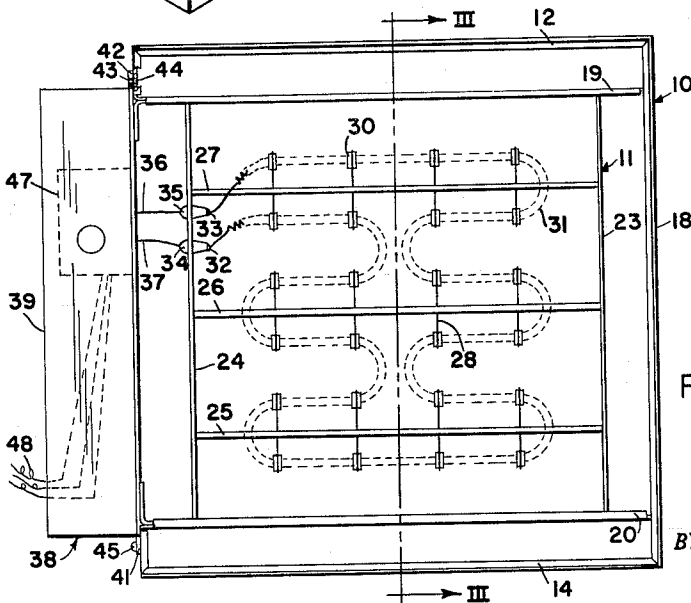


FIG. 2

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3,098,145 AIR CONDITIONING SYSTEM HEATER ASSEMBLY

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1 Claim. (Cl. 219-34)

This invention relates generally to air conditioning systems having reverse cycle refrigeration systems for heating and cooling indoor air and more particularly to a novel auxiliary heating assembly for improving the air heating performance of such air conditioning systems.

A common type of air conditioning system employed for residential and commercial use includes a reverse cycle refrigeration system comprising a compressor, an indoor air heat exchange coil, expansion means, an outdoor air heat exchange coil and a valve for reversing the flow of refrigerant through the coils. Suitable duct work connects the indoor air heat exchange coil with the area to be conditioned. The indoor coil is used as an air cooling evaporator during the cooling cycle and as an air heating condenser during the heating cycle. The indoor air heat exchange coil under certain circumstances does not provide adequate heat during the heating cycle. As a consequence, electric resistance heaters have been provided adjacent the indoor air heat exchange coil to supply auxiliary heat to comfortably heat the room. These heaters have usually been placed within the indoor section of the heat pump. Often the indoor section is placed within a closet or other confined area and the heaters therein are relatively inaccessible for repair and maintenance. In some cases, the entire indoor section must be removed from the confined area and in other instances the covers must be removed from the indoor section.

The primary object of this invention is to provide an air conditioning system with an improved heating assembly in which the disadvantages or deficiencies in prior constructions are obviated.

A further object of this invention is to provide an air conditioning system having a reverse cycle refrigeration system with simplified means for mounting the auxiliary heater employed therewith.

Another object of the present invention is to provide an air conditioning system with a novel heating assembly adapted to be detachably mounted in the duct work of such system.

Still another object of the present invention is to provide an air conditioning system with a novel heating assembly including a drawer-type frame mounting the heater element to simplify the maintenance and repair of the heater element.

Another object of this invention is to provide an air conditioning system with an improved heating assembly that is of simple design and that can be fabricated easily and inexpensively.

This invention relates to an air conditioning system including a casing having an air inlet and an air outlet, means for cooling air passing through the casing, a duct for conducting air from the casing to an area to be treated and a heating assembly for heating air passing through the duct. The heating assembly comprises an outer frame and an inner frame. The outer frame connects one end of the duct with the air outlet in the casing. The outer frame includes a pair of inwardly-facing channel members extending in parallel relation one to the other. The inner frame includes side members slidably supported on said channel members and a long helical coil of resistance wires mounted on said inner frame, the helical coil adapted to be supplied with electric current. Means detachably connect the outer frame and the inner frame so that

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the inner frame may be easily removed from the outer frame for repair and maintenance of the helical coil.

In the accompanying drawing which illustrates a preferred form of the present invention, like numerals refer to like parts throughout the several views.

FIGURE 1 is a perspective view of a portion of the air conditioning system embodying the present invention; FIGURE 2 is a sectional view of the heating assembly of the present invention taken along the plane II-II of FIGURE 1, and

FIGURE 3 is a cross-sectional view of the heating assembly taken along the line III-III of FIGURE 2.

Referring to FIGURE 1, there is shown the indoor section of an air conditioning system. The indoor section comprises a casing 2 having an air inlet 3 and an air outlet 4. Within the casing are mounted a pair of heat exchange coils 5 and 6. These coils are connected in a conventional reverse cycle or heat pump refrigeration system comprising a compressor, an outdoor heat exchange coil, expansion means as, for example, a thermal expansion valve and a reversing valve for selectively directing refrigerant first through indoor heat exchange coil or the outdoor heat exchange coil. These elements of the heat pump system are not shown as they are conventional and do not form any part of the present invention.

Air inlet 3 is in communication with a duct 7 which supplies air to the casing from the room to be conditioned. A heating assembly 8 is in communication at one end with the air outlet 4 and at the other end with a duct 9 which conducts treated air to the room to be air conditioned.

The heating assembly shown more clearly in FIGURES 2 and 3 comprises an outer frame 10 and an inner frame 11. The outer frame includes U-shaped side members 12 and 14 and a rear member 18, suitably connected thereto as, for example, by spot welding. Extending from the lower extremity of the central portion of each side member 12, 14 is a flange 13, 15. Each flange 13, 15 is connected to the side member next below by suitable connecting means, as for example, screws 16 and the flanges on the lowermost outer frame engage a raised lip 17 defining the air outlet 4 in casing 2. The ends of each U-shaped side member are connected together by support members 19 and 20. The support members are preferably inwardly-facing channel members as shown in FIGURE 3, though other configurations as, for example, angle members may be satisfactorily used.

Duct 9 has a flange 9' depending from opposite sides thereof affixed by screws 9'' to the uppermost outer frame 10 (FIGURE 1).

The inner frame comprises side members 21, 22, rear member 23 and a transverse brace member 24. The side members are slidably supported on the support members 19 and 20.

Rods 25, 26 and 27 are secured to the inner frame and extend from front to rear thereof between transverse brace member 24 and rear member 23. Mounted on each rod are a plurality of supports 28. These supports, which may be of generally U-shaped configuration, have eyes 29 defined on each end. Within each eye is supported a ceramic insulator 30. A helical coil 31 of resistance wire is circuitously supported within the insulators 30. The ends of the long helical coil 31 are connected to terminal stems 32 and 33. Each terminal stem is mounted within a separate electrical insulator 34 and 35, respectively, secured to the transverse brace member 24. Leads 36 and 37 extend forwardly from the terminal stems 32 and 33 and are approximately connected to an electric control within control box assembly 38 which forms the front portion of the inner frame. Control box assembly 38 comprises a casing 39 which is connected to the side members of inner frame 11. Removable cover 40 closes the front of

casing 39. Mounted to each side of casing 39 and forming a part thereof are the flanges 41 and 42. Openings 43 are provided in flanges 41 and 42. These openings are adapted to be aligned with suitable openings 44 in the forward portion of the U-shaped side members 12 and 14 of outer frame 10. The means for detachably connecting the inner frame and the outer frame preferably comprise screws 45.

Heat insulation 46 may be affixed to the inside portions of U-shaped side members 12 and 14 and rear member 18 to minimize heat transfer losses through the walls of heating assembly 8. The helical coil 31 lies in a plane generally transverse to the path of the air flowing through the duct 9 to the room to be treated. During the heating cycle when additional heat may be required to comfortably heat the area, a suitable control 47 mounted in the control box assembly 38 may be actuated to permit electrical current to flow through the helical coil resistance wires and heat the same. Lines 48 connect control 47 to a source of electrical current (not shown).

As is apparent, the inner frame is of a drawer-type construction that may be readily removed from and replaced within duct 9. Heating assembly 8 may comprise the connecting means between air outlet 4 of casing 2 and duct 9 or the heating assembly may be placed within the duct at a point more remote from the casing.

By virtue of my simple heating assembly construction, it is now possible to expeditiously remove the heater element for repair in the event that the helical coil 31 is broken or burned through. This is accomplished by removing the screws 45 and sliding the inner frame 11 from the outer frame 10. The repairman can substitute a new drawer or inner frame for the damaged one. Thus, even if the indoor section of the heat pump system is placed within a closet or other confined place, the heater element or coil 31 is readily accessible. The air conditioning system employing the novel heating assembly is much enhanced and the indoor section thereof can be placed in locations heretofore not considered to be desirable.

While I have shown only a preferred embodiment of the present invention, it is obvious that changes may be made by those persons having skill in the art without

departing from the principles of the invention and I desire that the scope of my invention be limited only by the appended claim.

I claim:

In an air conditioning system, the combination of a casing having an air inlet and an air outlet therein, said casing having a raised lip surrounding the air outlet; a duct for conducting air from the casing to an area to be treated, said duct having a flange thereon; and a heating assembly for heating air passing through the duct, said heating assembly comprising an outer frame including U-shaped side members and a rear member, a flange extending from each side member engaging the lip surrounding the air outlet, support members connecting the ends of each U-shaped member and forming channels to slidably receive an inner frame; an inner frame including side members, a rear member and a transverse brace member, said side members being slidably supported on the support members, rods extending between the transverse brace member and the rear member, insulators, supports mounted on said rods carrying the insulators, and a helical coil supported by said insulators; a control box connected to the inner frame side members including a casing having flanges adapted to be connected to the U-shaped members, means for detachably connecting the casing flanges to the U-shaped members, and means for securing the flange of the duct to the outer frame.

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