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HEAT EXCHANGE UNIT

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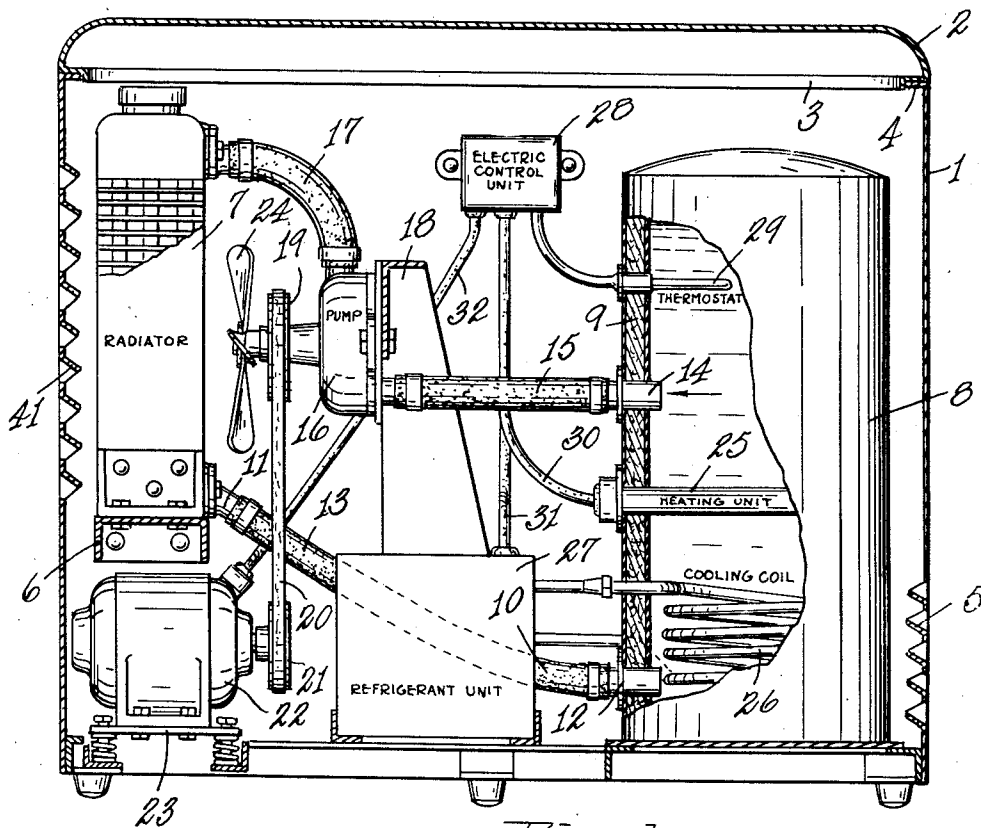


Fig. 1.

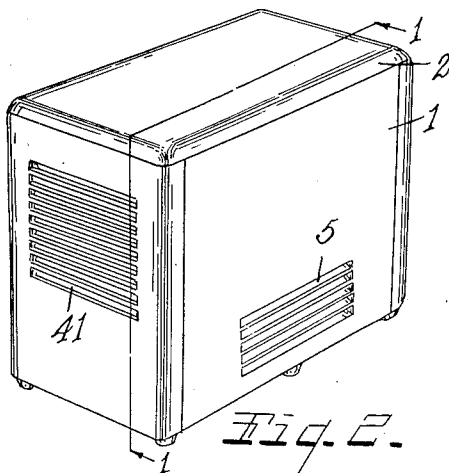


Fig. 2.

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HEAT EXCHANGE UNIT

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6 Claims. (Cl. 257—3)

This invention relates to improvements in heat exchange unit.

The main objects of this invention are:

First, to provide a heat exchange unit which is entirely self-contained and incased in a compact attractive housing well adapted to be disposed in a room of a dwelling to heat or cool the same as desired.

Second, to provide a space heating or cooling unit of the type described incorporating means for circulating air in a room and means associated with said means for heating or cooling the air prior to circulation thereof, as the circumstances warrant.

Third, to provide a unit of the foregoing type which is made up of elements associated in a novel self-contained and highly simple and compact structure adapted to be sold at relatively low price for domestic use or for use in regulating the temperature of offices, household rooms and the like.

Further objects relating to details and economies of my invention will appear from the description to follow. The invention is defined in the claims.

A structure embodying the features of my invention is illustrated in the accompanying drawing, wherein:

Fig. 1 is a view in longitudinal section through the heat exchange unit of my invention, being taken along a line corresponding to line I—I of Fig. 2.

Fig. 2 is a perspective view illustrating the compact and attractive exterior appearance of the unit.

Referring to the drawing, the reference numeral 1 designates a compact, attractive, suitably finished sheet metal casing made up of stampings which houses the operating parts of the heat exchange unit of the present invention. The top 2 of this casing is adapted to be removed, being provided with a depending flange 3 which fits onto an opening 4 in the top of the casing body. By removing the cover, access may be had to the interior of the casing through an opening of substantial size. The casing 2 is provided with discharge louvers 41 at one end thereof through which air to be circulated is discharged and intake louvers 5 on the opposite end and sides of the casing adjacent the bottom thereof through which air to be conditioned is drawn into the casing.

Mounted on a transverse channel-like support 6 secured to the opposed walls of the casing, I provide a radiator or heat exchange element 7,

that illustrated being of the type commonly employed in automotive cooling systems. For simplicity, member 7 is hereinafter referred to as a "radiator," though it will be appreciated that it is more than just a radiating member, it also functions to absorb heat units from the air stream in one phase of operation of the unit. Specific details of the radiator are not illustrated inasmuch as similar structures are conventional and readily available on the market. One of the primary advantages of the present invention is that it is made up in large degree of just such readily and inexpensively available parts.

Adjacent the opposite end of the housing or casing 1, I mount a tank 8 of suitable capacity having well insulated walls 9. The bottom of radiator 7 is placed in liquid communication with the bottom of the tank by means of a connection 10 including suitable fittings 11, 12 communicating with the radiator and tank, respectively, and an elongated hose 13 connecting said fittings. At a substantially elevated point, the tank has a similar fitting 14 in its wall which is connected by a hose 15 with the intake of a liquid circulating pump 16, and the discharge of this pump is connected by a hose 17 with the radiator 7 adjacent the top thereof. The above connections constitute a closed water circulating system.

Pump 16 is mounted on a rigid pedestal or support 18 disposed centrally of housing 1 and its shaft is provided with a pulley 19 by which the impeller of the pump (not illustrated) is driven. For this purpose a belt 20 trained over pulley 19 and over a pulley 21 on the driving shaft of an electric motor 22 is employed. The motor is mounted directly beneath the radiator 7 on a resiliently supported base, to absorb vibration and enable silent operation.

The shaft of pump 16 also has an air circulating fan 24 secured thereto, fan 24 being disposed behind radiator 7 so as to force air to be heated or cooled through the radiator in sufficient quantities for the desired purpose.

The above described structure constitutes the fluid circulating system of the present unit, by which the air heating or cooling medium, water, is circulated through the radiator and by which the atmosphere heating or cooling medium, air, is circulated in heat transfer relation to the radiator so as to absorb heating units therefrom or yield heating units thereto.

For the purpose of heating the water in the event it is desired to raise the temperature of the room in which the unit is disposed, I provide a

heating element 25 mounted in the wall of the tank and extending substantially into the liquid therein. This heating unit, an electrical unit in this embodiment, is conventionally illustrated. For the purpose of cooling the water, a cooling coil 26 of considerable length is disposed in the tank adjacent the bottom thereof in the path of the water entering the tank from connection 10. The heating element 25 is preferably a conventional resistance element such as is readily obtainable on the market, while coil 26 may circulate any desired refrigerant, being supplied for this purpose from an electrically energized and actuated refrigerant unit 27 mounted on the bottom of the housing 1. Details of this unit are not illustrated inasmuch as it may be any suitable type of the desired capacity.

The electric circuits for refrigerant unit and heating element are intended to be automatically controlled, for example, by a relay, in a well known fashion and in general I have designated the means for performing these functions as an electric control unit, indicated by the reference numeral 28. This preferably incorporates a thermostatically controlled switch actuated by a thermostat 29. The thermostat may be located in the tank 8 preventing overheating of the tank in the event that either the pump 16 or fan 24 fails to operate while the motor 22 is running. An expanding fluid type thermostat will serve well for this purpose.

I have not illustrated details of the electric control unit 28 in detail since the invention is concerned only broadly with its operation. The thermostatically controlled switch referred to above should be double acting so that in one position thereof, through a relay or otherwise, it completes an energizing circuit through cable 30 to heat element 25, said cable containing feed and return wires, and in another position completes a similar electrical energizing and actuating circuit to refrigerant unit 27 through a similar cable 31. A third circuit in parallel with these circuits is simultaneously made through cable 32 to motor 22 when the control unit is in circuit making condition, in order that the pump and fan shall operate in either of the operating phases of the system. Obviously when the switch of the control unit is in an intermediate inoperative position with the refrigerant unit and heating element cut off, motor 22 is also de-energized and idle.

The foregoing is a highly compact and efficient unit for heating or cooling the atmosphere of a room or rooms by a flow of heating or cooling air. The parts thereof are very simple and efficient and, per se, may be conventional and reliable in type so that the unit as a whole is not subject to faulty operation attributable to shortcomings of any of the component parts thereof. Likewise because of the simplicity of the connections, which is apparent to anyone skilled in the art, there is no likelihood of faulty operation from this source. It is sufficiently attractive in appearance and compact to constitute an acceptable article of furniture in any room.

An embodiment of the invention which incorporates the principles of the invention in a highly desirable manner has been illustrated and described, though I am aware that other embodiments within the intent of the invention will suggest themselves to those skilled in the art. It should be understood that the foregoing terminology is used only descriptively rather than in a limiting sense, and with full intention to in-

clude equivalents of the features shown and described, within the scope of the following claims.

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

- 5 1. In a heat exchange unit, in combination with a liquid circulating system comprising a tank, a heat exchange member through which liquid is circulated and through which air may be forced to effect thermal transfer to or from the air, connections between said tank and member constituting with the same a closed liquid circulating line, including a rotary liquid pump having its intake connected to the tank and its discharge connected to the member, a refrigerating unit having a heat exchange surface disposed in said tank to cool the liquid therein, a heating element disposed in the tank to heat the liquid therein, and means for actuating said refrigerating unit and heating element, comprising a thermostatically controlled device operatively connected to the refrigerating unit and heating element to actuate the same, an air circulating fan on the shaft of said pump disposed adjacent said heat exchange member to force air therethrough, and means for driving said pump and fan comprising a motor and belt drive therefrom to the pump shaft, said motor being electrically connected to and energized by said device when said heating element or refrigerating unit are actuated, the foregoing parts being entirely disposed as a unit on and in a compact casing provided with air intake and discharge louvers.
- 35 2. In a heat exchange unit, in combination with a liquid circulating system comprising a tank, a heat exchange member through which liquid is circulated and through which air may be forced to effect thermal transfer to or from the air, connections between said tank and member constituting with the same a closed liquid circulating line, including a rotary liquid pump having its intake connected to the tank and its discharge connected to the member, a refrigerating unit having a heat exchange surface disposed in said tank to cool the liquid therein, a heating element disposed in the tank to heat the liquid therein, and means for actuating said refrigerating unit and heating element, comprising a thermostatically controlled device operatively connected to the refrigerating unit and heating element to actuate the same, an air circulating fan adjacent said heat exchange member to force air therethrough, and means for driving said pump and fan actuated by said device when said heating element or refrigerating unit are actuated, the foregoing parts being entirely disposed as a unit on and in a compact casing provided with air intake and discharge louvers.
- 55 3. In a heat exchange unit, in combination with a liquid circulating system comprising a tank, a heat exchange member through which liquid is circulated and through which air may be forced to effect thermal transfer to or from the air, connections between said tank and member constituting with the same a closed liquid circulating line, including a rotary liquid pump having its intake connected to the tank and its discharge connected to the member, a refrigerating unit having a heat exchange surface disposed in said tank to cool the liquid therein, a heating element disposed in the tank to heat the liquid therein, and means for actuating said refrigerating unit and heating element, comprising a thermostatically controlled device operatively connected to the refrigerating unit and heating element to actuate the same, an air circulating fan adjacent said heat exchange member to force air therethrough, and means for driving said pump and fan actuated by said device when said heating element or refrigerating unit are actuated, the foregoing parts being entirely disposed as a unit on and in a compact casing provided with air intake and discharge louvers.
- 75 4. In a heat exchange unit, in combination with a liquid circulating system comprising a tank, a heat exchange member through which liquid is circulated and through which air may be forced to effect thermal transfer to or from the air, connections between said tank and member constituting with the same a closed liquid circulating line, including a rotary liquid pump having its intake connected to the tank and its discharge connected to the member, a refrigerating unit having a heat exchange surface disposed in said tank to cool the liquid therein, a heating element disposed in the tank to heat the liquid therein, and means for actuating said refrigerating unit and heating element, comprising a thermostatically controlled device operatively connected to the refrigerating unit and heating element to actuate the same, an air circulating fan adjacent said heat exchange member to force air therethrough, and means for driving said pump and fan actuated by said device when said heating element or refrigerating unit are actuated, the foregoing parts being entirely disposed as a unit on and in a compact casing provided with air intake and discharge louvers.

tively connected to the refrigerating unit and heating element to actuate the same, an air circulating fan adjacent said heat exchange member to force air therethrough, and means for driving said pump and fan actuated by said device when said heating element or refrigerating unit are actuated.

4. In a heat exchange unit, in combination with a liquid circulating system comprising a tank, a heat exchange member through which liquid is circulated and through which air may be forced to effect thermal transfer to or from the air, connections between said tank and member constituting with the same a closed liquid circulating line, including a rotary liquid pump having its intake connected to the tank and its discharge connected to the member, a refrigerating unit in heat exchange relation to cool the liquid circulating in said line, a heating element in heat exchange relation to said line, and means for actuating said refrigerating unit and heating element, comprising a thermostatically controlled device operatively connected to the refrigerating unit and heating element to actuate the same, an air circulating fan adjacent said heat exchange member to force air therethrough, and means for driving said pump and fan and actuated by said device when said heating element or refrigerating unit are actuated.

5. In a heat exchange unit, in combination with a liquid circulating system comprising a tank, a heat exchange member through which liquid is circulated and through which air may be forced to effect thermal transfer to or from the air, connections between said tank and member constituting with the same a closed liquid circulating line, including a rotary liquid pump having its intake connected to the tank and its discharge connected to the member, a refrigerat-

ing unit in heat exchange relation to the interior of the tank to cool the liquid circulating in the interior of the tank, a heating element in heat exchange relation to the interior of the tank, and means for actuating said refrigerating unit and heating element, comprising a thermostatically controlled device operatively connected to the refrigerating unit and heating element to actuate the same, an air circulating fan on the shaft of said pump disposed adjacent said heat exchange member to force air therethrough, and means for driving said pump and fan, comprising a motor and belt drive therefrom to the pump shaft, said motor being electrically connected to and energized by said device when said heating element or refrigerating unit are actuated, the foregoing parts being entirely disposed as a unit on and in a compact casing provided with air intake and discharge louvers.

6. In a heat exchange device, the combination with a casing having air inlet and discharge openings, a heat exchange element operatively associated with said air discharge opening, a tank having a closed circulating connection with said heat exchange element, a circulating pump operatively associated with said circulating connection to deliver to the said heat exchange element, a fan operatively associated with said heat exchange element and said discharge opening, a motor having driving connection with said pump and fan, a heating element in said tank, a refrigerating unit in said tank, and thermostatically controlled means operatively associated with and automatically controlling said heating element, motor and refrigerating unit whereby the device is selectively and automatically operated as a heating unit or as a cooling unit.

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