Jan. 6, 1942. R. F. ROPER 2,268,846

AIR CONDITIONING APPARATUS

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Fig. 1.

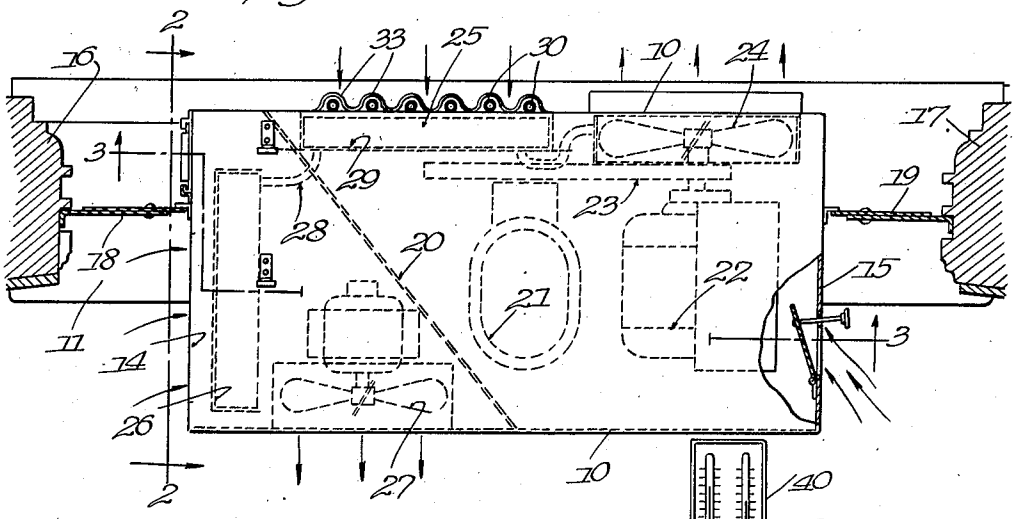


Fig. 2.

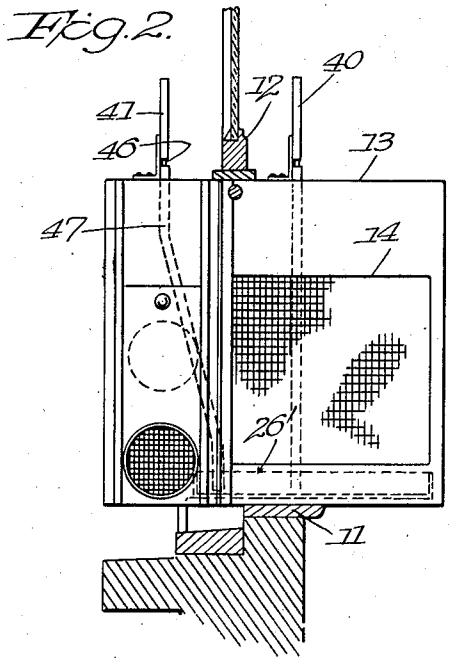
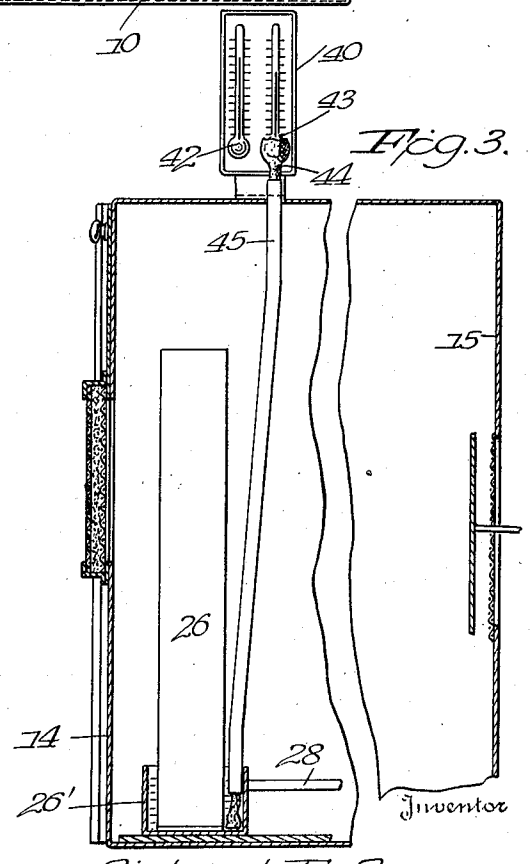


Fig. 3.



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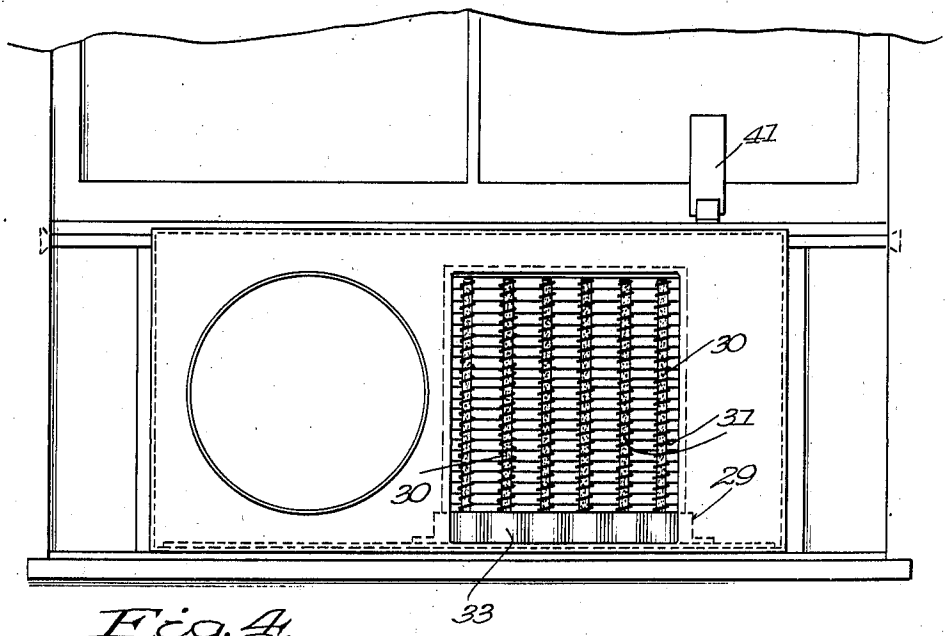


Fig. 4.

Fig. 6.

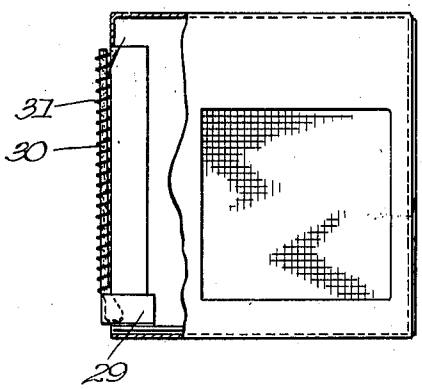
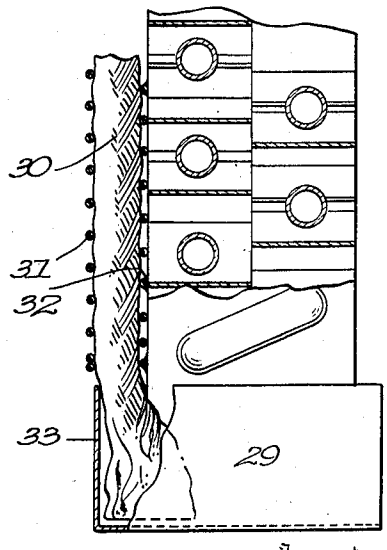


Fig. 5.



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UNITED STATES PATENT OFFICE

2,268,846

AIR CONDITIONING APPARATUS

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Application July 25, 1938, Serial No. 221,225

9 Claims. (Cl. 62—140)

The present invention relates to air conditioning apparatus. More particularly, it relates to specific improvements in portable, self-contained, air conditioning units adapted to cool and dehumidify the air of a single room.

It is an object of the invention to provide improved means for disposing of the water of condensation, extracted from the indoor air during the process of lowering its humidity.

It is a further object of the invention to utilize the water of condensation to facilitate cooling of the condenser of the refrigerating apparatus. To this end, the apparatus comprises improved means for performing the dual functions of disposing of the water condensation by evaporation and, by that evaporation, lowering the temperature of the air utilized to cool the refrigerant condenser, whereby the cooling effect of that air on the condenser is enhanced and increased.

It is a further object of the invention to provide novel means for indicating the interior and exterior temperatures and the interior and exterior relative humidities, to enable a user of the apparatus to determine accurately the effectiveness of the apparatus in cooling the room and in lowering the relative humidity of the indoor air. To this end, the invention provides means for constantly maintaining indoor and outdoor wet bulb thermometers in the wet condition by utilizing the water of condensation deposited on the evaporator.

As shown in the accompanying drawings, the invention is applied to an apparatus of the type shown, described and claimed in United States Patent 2,120,208, Paschal, June 7, 1938, and reference is made to that patent for the general arrangement of parts of the air conditioning unit, the present case being directed to specific improvements on the apparatus of the patent. It must be understood, however, that the invention may be applied to other types of air conditioning units and is not limited to the details of construction shown in the accompanying drawings and described below.

In the drawings,

Figure 1 is a top plan view of the air conditioning unit, with portions of the casing broken away for the sake of clarity.

Figure 2 is an end elevation, taken substantially on line 2—2 of Figure 1.

Figure 3 is an enlarged fragmentary, vertical section taken on line 3—3 of Figure 1.

Figure 4 is a rear elevation.

Figure 5 is an end elevation, partly in section, showing the condenser in end elevation, and

Figure 6 is a vertical, sectional view on an enlarged scale, showing a detail of the condenser.

As pointed out in the aforesaid patent, the invention comprises a casing 10 adapted to be positioned in a window opening above the sill 11 and to have the sash 12 closed downwardly upon the top surface 13 of the casing. The spaces between the end walls 14, 15 and the side posts 16, 17 of the window opening are closed by adjustable fins or vanes 18, 19 associated with the casing. The casing is divided into two compartments by a vertical partition 20 and one compartment contains a compressor 21, a motor 22 connected to the compressor by a belt 23, a fan 24 and a refrigerant condenser 25. In the other compartment there is an evaporator 26 and an air circulating fan 27. Indoor and outdoor air may be circulated through the casing as indicated by the arrows on the accompanying drawing, and as is explained more fully in the aforesaid patent and in my copending application Serial No. 221,226, filed July 25, 1938. Beneath the evaporator 26, there is a water collecting trough 26', having a pipe 28 communicating therewith and leading through or beneath the partition 20 to a trough 29 disposed below the condenser. Thus, as indoor air is circulated by the fan 27 past the cold evaporator 26, water of condensation will be deposited thereon and will be collected in the trough 26', from where it will flow through the pipe 28 to the trough 29, maintaining a volume of water in liquid state in both troughs.

As shown in Figures 4, 5 and 6, absorbent means are provided for conducting the water from the trough 29, by capillary attraction, upwardly across the outer face of the condenser 25 and in the path of the cooling air drawn past the condenser by the fan 24. Preferably, the absorbent means comprises a plurality of wicks 30 threaded through copper wire, spiral coils 31 secured to the face of the condenser by solder 32 or the like. The wicks 30 are fairly tightly embraced by the wire coils and have their lower ends dipping into the water in the trough 29.

The trough 29 has its outside wall disposed in the lower portion of the outside air inlet opening. The said wall is formed with a plurality of reversely bent portions, providing projections 33, extending outwardly beyond the casing wall. These extensions provide spaces for the reception of the lower ends of the wicks 30.

The fan 24 thus circulates outside air inwardly past the wicks 30 and through the casing, thereby serving to evaporate the water of condensa-

tion carried upwardly in the wicks by capillary attraction. This evaporation serves to cool the incoming air, so that its temperature is lowered immediately prior to its passage through the condenser 25, located adjacent the wicks. The evaporation tends to cool the wire coils, which have a high coefficient of heat conductivity. The coils, being in contact with the condenser extract heat therefrom by conduction. Also, the cooled air is drawn through the condenser to further extract heat from the refrigerant therein. It is then drawn past the compressor 21 and is blown outwardly by the fan 24 to the outside, through the adjacent opening. The evaporation of the water from the wicks 30 by the stream of air travelling therepast disposes of the water of condensation deposited on the evaporator. Moreover, that evaporation lowers the temperature of the incoming air, the wire coils and the condenser and increases the cooling effect of that air on the condenser, thereby increasing the efficiency of the refrigerating apparatus.

A standard procedure for determining the relative humidity of the air is to compare a wet bulb thermometer with a dry bulb thermometer. A drop in humidity is indicated by an increase in the difference between the temperatures registered by the wet and dry bulb thermometers, and vice versa. The present invention provides means for indicating to the occupant of a room, the outdoor temperature and humidity and the indoor temperature and humidity, whereby he can determine the improvement in air conditions, both as to temperature and humidity, effected by the air conditioning apparatus.

As shown in Figures 2 and 3, a bracket 40 is mounted on the top wall 13 of the casing, interiorly of the window sash 12. A similar bracket 41 is mounted on the casing exteriorly of the window, in position to be viewed through the window pane. The bracket 40 carries a dry bulb thermometer 42 and a wet bulb thermometer 43. Appropriate markings are disposed on the bracket to indicate the respective temperatures. A wick 44 is arranged around the bulb of the thermometer 43 to maintain the same in moistened condition. The wick extends downwardly through a conduit 45 to the trough 26' disposed below the evaporator 26. The wick is thus in contact with a constant source of liquid and it should be noted that the drainpipe 28 is disposed well above the bottom of the trough so that a reserve supply of water is always present in the trough.

The bracket 41 likewise carries wet and dry bulb thermometers and a wick 46 extends downwardly through a conduit 47 into absorptive relation to the water in the trough 26', so that the exteriorly disposed wet bulb is also supplied with moisture from the trough which collects the water of condensation deposited on the evaporator.

As a result of this arrangement, the wet bulbs associated with both the interior and exterior temperature and humidity indicating devices are constantly maintained in operative wet condition from a constant source of supply, continuously replenished by the inherent functioning of the apparatus. Thus, a never-failing temperature and humidity indicating system is provided.

It must be understood that the invention is not limited to the details of construction shown in the accompanying drawings and described below, but covers all arrangements of parts coming within the scope of the appended claims and their equivalents.

I claim:

1. A condenser assembly for use in air conditioning apparatus, comprising a trough, a condenser extending upwardly therefrom, a plurality of elongated cylindrical casings carried by the condenser and terminating adjacent the trough and disposed across one face of the condenser in heat exchange contact therewith, and a wick in each casing having an end disposed in said trough.

2. A condenser assembly for use in air conditioning apparatus, comprising a condenser unit, a trough below the lower end thereof having a vertical wall formed to provide trough extensions, a plurality of tubular metallic casings secured to one face of the condenser and terminating adjacent said trough extensions, and a wick in each casing having an end disposed in the trough extensions.

3. A condenser assembly for use in air conditioning apparatus, comprising a condenser, a trough enclosing the lower end thereof, said trough having a wall provided with reversely bent portions forming trough extensions, a plurality of spiral wire coils secured across one face of the condenser and a wick threaded through each coil having its lower end disposed in one of said trough extensions.

4. Apparatus for cooling and conditioning the air in a room or the like and means for indicating the indoor and outdoor temperatures and the relative indoor and outdoor humidities, said apparatus comprising a refrigerant evaporator, means for circulating air past said evaporator, means for collecting water of condensation deposited on the evaporator, wet and dry bulb thermometers disposed interiorly of said room, wet and dry bulb thermometers disposed exteriorly thereof, and wicks extending from each wet bulb thermometer to said means for collecting water of condensation, whereby the wet bulb thermometers are constantly maintained in the wet condition by said water of condensation.

5. Apparatus for cooling and conditioning the air in a room or the like and means for indicating the indoor and outdoor temperatures and relative humidities, said apparatus comprising a casing adapted to be bodily positioned in a window opening and to have the window sash closed downwardly upon the top wall thereof, a refrigerant evaporator in the casing, means for collecting water of condensation deposited on the evaporator, wet and dry bulb thermometers mounted on the casing interiorly of said window sash, wet and dry bulb thermometers mounted on the casing exteriorly of said sash and visible from the interior of the room for inspection through the window, and wicks extending from the wet bulb thermometers to the water in said collecting means, whereby said thermometers are constantly maintained in the wet condition by the water of condensation resulting from the operation of said apparatus.

6. Apparatus for cooling and conditioning the air in a room or the like and means for visually indicating the indoor temperature and relative humidity, said apparatus comprising a casing, a refrigerant evaporator therein, means for circulating air past the evaporator, means for collecting water of condensation deposited thereon, wet and dry bulb thermometers exposed exteriorly of the casing in position for visual inspection in the room, and a wick extending from the wet bulb thermometer to the water in the water collecting means, whereby the wet bulb thermometer

is constantly maintained in the wet condition by the water of condensation resulting from the operation of said apparatus.

7. The combination in an air conditioning apparatus, of an evaporator adapted to cool inside room air circulated therepast and to de-humidify the same by the condensation of moisture thereon, a condenser including refrigerant conduits adapted to be cooled by the circulation of outside cooling air, means for conducting a portion of the water of condensation collected on the evaporator to a position in proximity to the condenser conduits solely by gravity flow, and absorbent means in contact with the collected water and extending in heat exchange contact across the face of the condenser conduits first encountered by the condenser cooling air.

8. The combination in an air conditioning apparatus of an evaporator adapted to cool inside room air circulated therepast and to de-humidify the same by the condensation of moisture thereon, a condenser adapted to be cooled by the circulation of outside cooling air therepast, a plurality of spiral wire coils disposed across the face of the condenser in the path of the incoming cooling air, an absorbent wick threaded through each coil, and means for maintaining a portion of the water of condensation collected on the evaporator in contact with said wicks.

9. The combination in an air conditioning apparatus of an evaporator adapted to cool inside room air circulated therepast and to de-humidify the same by the condensation of moisture thereon, a condenser adapted to be cooled by the circulation of outside cooling air therepast, a plurality of tubular metallic casings disposed across one face of said condenser in heat conducting relation thereto and in the path of the incoming cooling air, a wick threaded through each casing and means for conducting water of condensation from the evaporator to said wicks.

RICHARD F. ROPER.