Dec. 10, 1935. J. DUBROVIN 2,023,876

AIR COOLING APPARATUS

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Fig. 1.

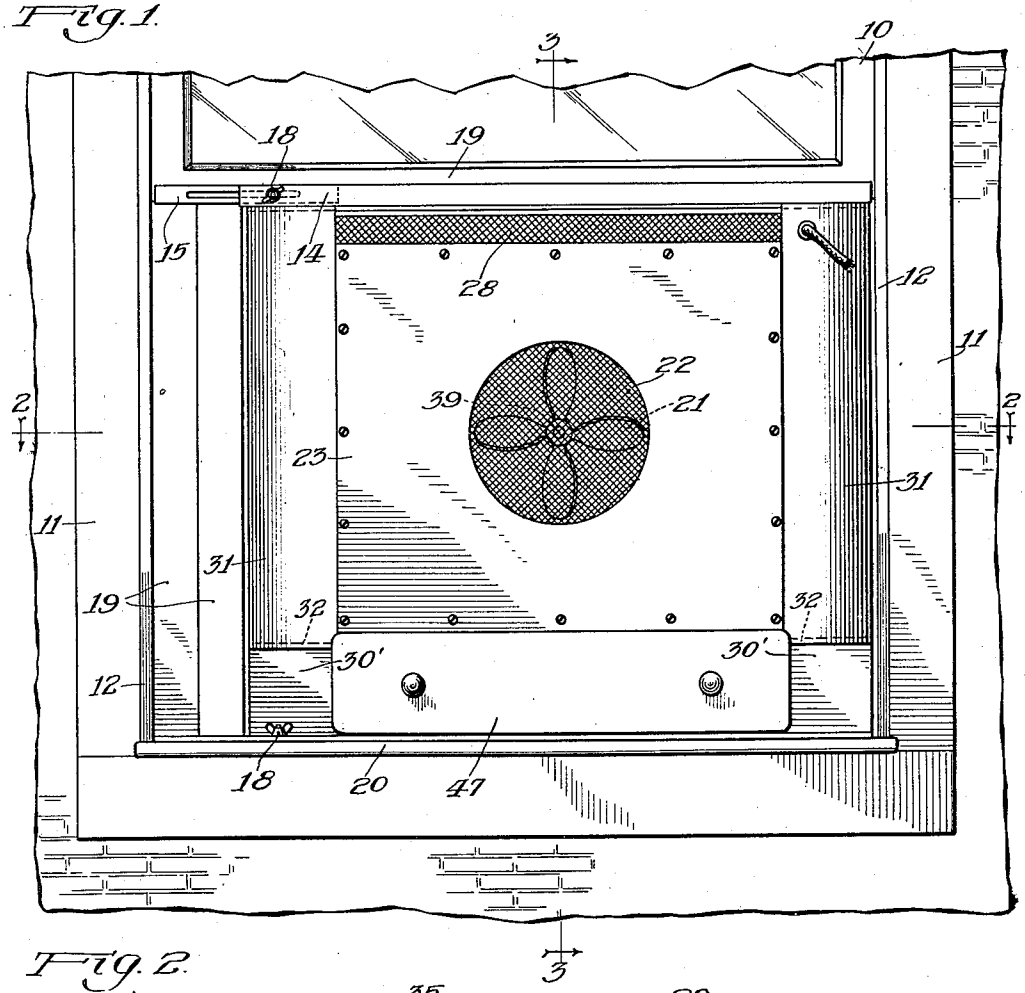
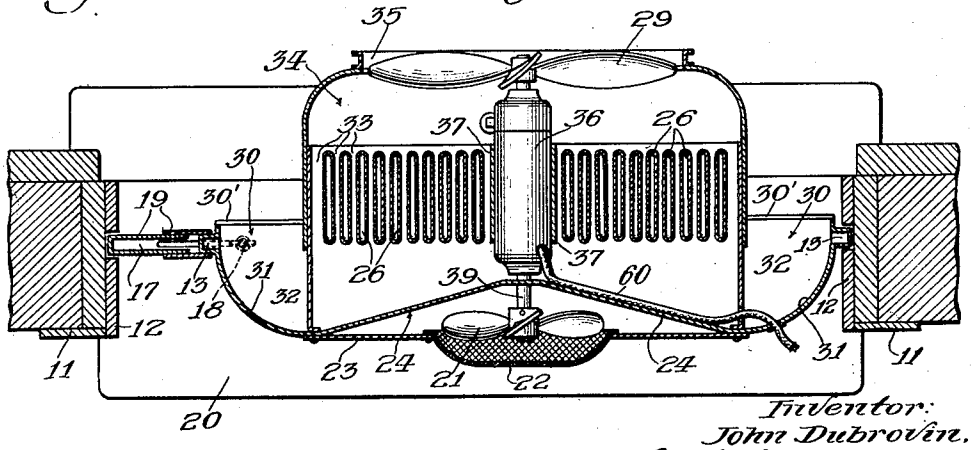


Fig. 2.



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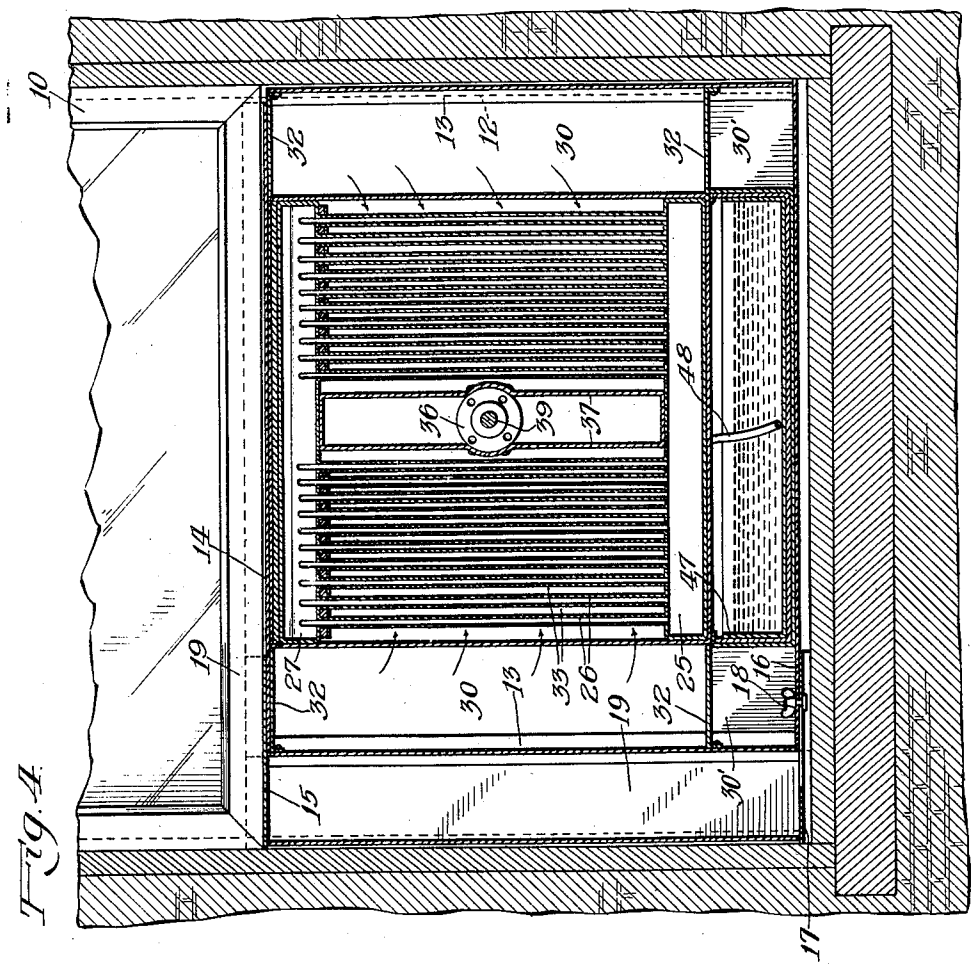


Fig. 4.

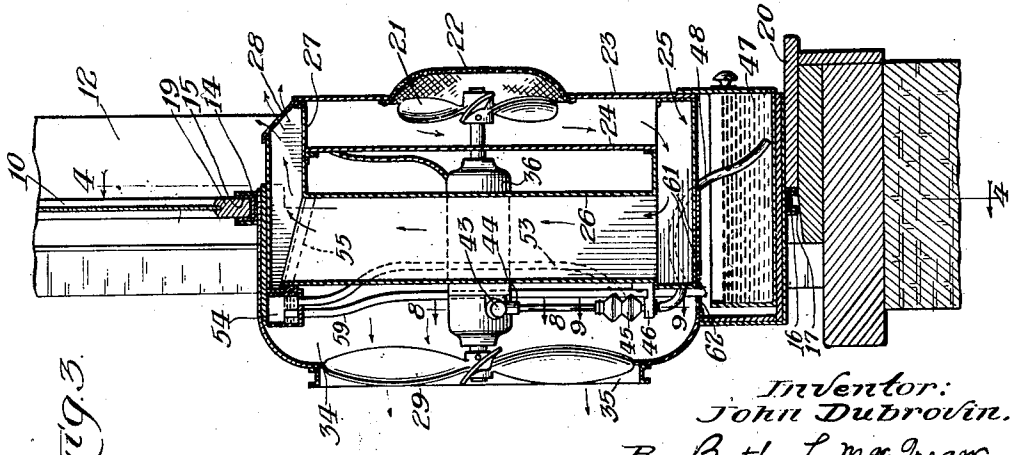


Fig. 3.

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AIR COOLING APPARATUS

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Fig. 5.

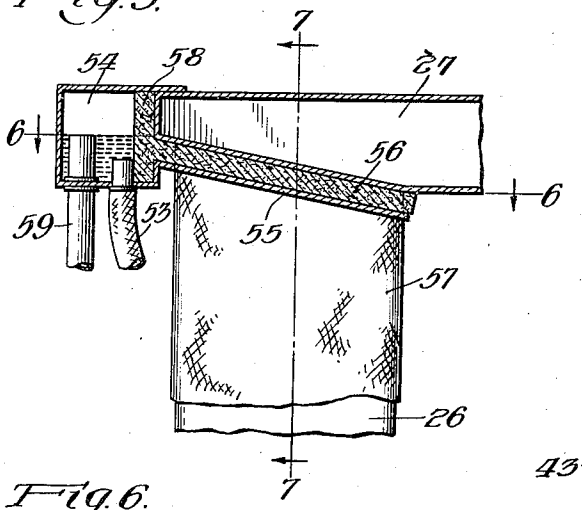


Fig. 6.

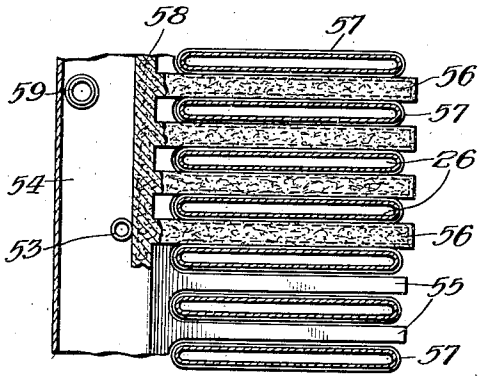


Fig. 7.

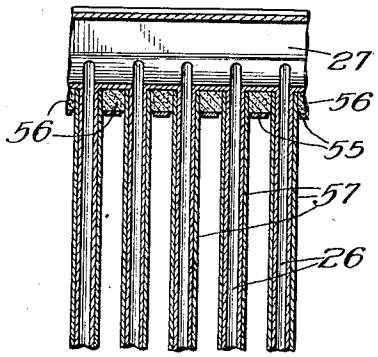


Fig. 8.

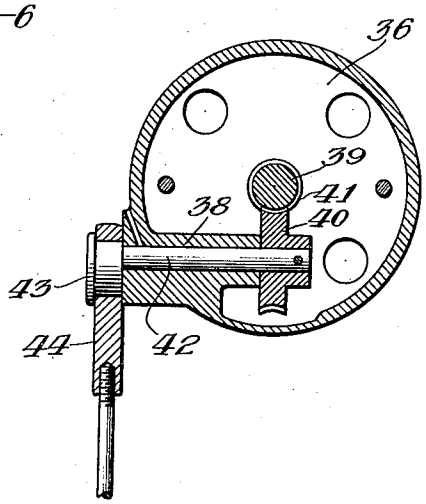
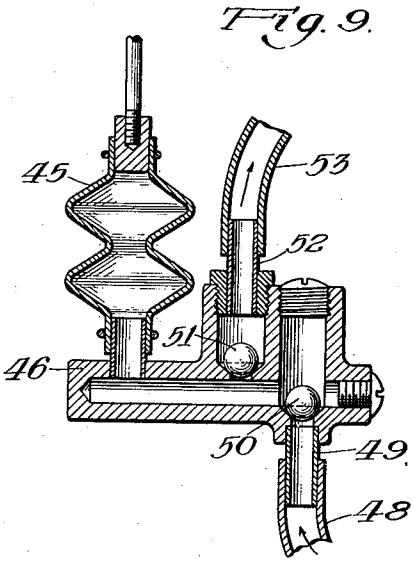


Fig. 9.



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Patented Dec. 10, 1935 2,023,876

UNITED STATES PATENT OFFICE

2,023,876

AIR COOLING APPARATUS

John Dubrovin, Chicago, Ill., assignor of one-half to Charles H. Canode, Chicago, Ill.

Application June 10, 1933, Serial No. 675,202

3 Claims. (Cl. 62—139)

My invention relates to air cooling apparatus, particularly adapted for cooling air of rooms to provide comfort for the occupants during uncomfortably warm weather.

The object of my invention is to provide air cooling apparatus of low initial cost, inexpensive to maintain, simple in operation, compact and portable, and efficient for its intended purposes.

My air cooling apparatus has important advantages over prior art constructions which are built on the principle of refrigerators for food preservation and are objectionably expensive as to initial cost and maintenance. My apparatus is designed for the employment of water as the refrigerant, which renders its operation and maintenance very economical.

Other objects and advantages will appear from the following description.

In the drawings:

Fig. 1 is a front elevation of air cooling apparatus embodying my invention, as viewed from the room side of the apparatus.

Fig. 2 is a horizontal sectional view taken on the line 2—2 of Fig. 1, looking downwardly as indicated by the arrows.

Fig. 3 is a transverse vertical sectional view taken on the line 3—3 of Fig. 1.

Fig. 4 is a longitudinal vertical sectional view taken on the line 4—4 of Fig. 3.

Fig. 5 is an enlarged vertical section of a detail of construction showing the upper part of the room air duct and means for feeding water to the fabric covering of the duct.

Fig. 6 is a horizontal sectional view, on the same scale as Fig. 5, taken on the line 6—6 of Fig. 5.

Fig. 7 is a longitudinal vertical section, on the same scale as Fig. 5, taken on the line 7—7 of Fig. 5 and looking in the direction indicated by the arrows.

Fig. 8 is an enlarged view of a detail of construction, taken on the line 8—8 of Fig. 3, looking in the direction indicated by the arrows.

Fig. 9 is an enlarged view of another detail of construction, namely, the water pumping means, taken on the line 9—9 of Fig. 3, looking in the direction indicated by the arrows.

In that embodiment of the invention shown in the drawings, the air cooling apparatus is located in a window, the window sash 10 being raised to admit the apparatus into the window casing 11. At each side of the casing 11 is a grooved guide member 12. The cooling apparatus comprises a frame having vertical side strips 13, 13, top channel strips 14, 15, and bottom channel strips 16, 17. The strips 14 and 15 are telescopic for purposes of adjustment to window openings of different widths, and the same is true of the bottom strips 16, 17, said telescopic strips being held in adjusted position by wing nuts and bolts 18, 18. The side strip 13 at one side of the apparatus fits into the guide member 12, and as shown at the left side of Fig. 2, the other side strip 13 fits into a filler panel 19, adjustable as to width, to fill the space between the side strip 13 and the guide member 12. The bottom edge 19 of the raised window fits into the telescopic strips 14, 15, and the bottom frame strips 16, 17 fit against the sill 20 of the window. Of course, the panel 19 may be removed to admit outside air into the room.

Two separate air ducts are provided in the apparatus. Room air is circulated through a plurality of conduits, and outside air is circulated through the passageways provided externally of said conduits. A fan 21 draws room air through the screen 22 into a space defined by the front panel 23, rear panels 24, the bottom of the air duct or header 25, and the bottom of the upper header 27. The opening, triangular in cross section, thus formed, leads into the intake header 25, and room air travels as shown by the arrows in Fig. 3, first downwardly, and then upwardly through a plurality of flattened pipes 26, the upper ends of which communicate with the header 27, from which cooled air is discharged into a room through the screened opening 28 of the header 27.

A fan 29 draws outside air through the openings 30 (Fig. 2), above the vertical walls 30', and as the air is guided by curved vertical walls 31, 31, between the top and bottom walls 32, it enters the space 33 enclosed by headers 27 and 25 on top and bottom, and by the outside of panels 24, and moves toward the fan 29, passing externally of the flattened pipes 26 into the chamber 34, and is discharged by the fan 29 through the circular opening 35.

The fans 21 and 29 are driven by an electric motor 36 horizontally disposed, centrally of the apparatus, and supported on walls 37, 37, which extend parallel with the pipes 26. The walls 37 provide a narrow air passage for the full length and width of the pipes 26 nearest to the motor, but with the exception of some air that may pass through the motor for cooling it. Passage of air above and below the motor is prevented.

The end of the motor 36, nearest to the fan 29, carries a sleeve bearing 38, at right angle to the motor shaft 39, Fig. 8, the bearing 38 being located somewhat below the motor shaft 39 and carrying a worm gear 40 meshing with a worm 41 on the motor shaft 39. The gear 40 is pinned to a small shaft 42 which is provided with an eccentric 43 for actuating the connecting rod 44 linked to bellows 45 of the water pump block 46, attached to wall 37 below the motor 36. Running of the motor 36 will set the bellows 45 in reciprocating motion, causing increase and decrease of pressure

in the bellows and the hollow of the pump block 46.

A water supply tank 47, Figs. 1 and 3, is located under the air circulation ducts. As pressure in the pump is reduced, the atmospheric pressure will force some of the water from the supply tank 47 through a rubber hose 48, pump intake nipple 49, and check valve 50 into the bellows 45; and the downstroke of the bellows 45 will force the water present in the bellows through the check valve 51, pump discharge nipple 52, and rubber hose 53, into the water feeding reservoir 54. See Figs. 3, 7 and 9. A water feeding reservoir 54 is located at the top of the chamber 34 and is in contact with and extends the full length of the header 27. On that side facing the header 27, the reservoir 54 is provided with channel shaped prongs 55 extending between and the full width of the pipes 26, as shown in Figs. 5, 6 and 7. The prongs 55 support wicks 56 which fill the spaces between the prongs 55 and header 27, and come in contact with cloth covers 57 of pipes 26, as shown in Figs. 5, 6 and 7. Cloth covers 57 are drawn tightly over the full length of the pipes 26 by any desired means. The wicks 56 are joined by a strip wick 58 which rests in the water the entire length of the reservoir 54. The overflow tube 59 extends from the reservoir 54 down to the water supply tank 47 and keeps the water in the reservoir 54 at proper level. An electrical supply cord to the motor is shown at 60.

The amount of water fed by the wicks 56 to the cloth covers 57 is the same or slightly greater than the amount which is evaporated from the entire heat dissipating surface of the apparatus.

The bottom of the header 25 has a few perforations 61 (Fig. 3), for draining into the supply tank 47 any condensation water deposited by the room air in the tubes 26. An opening 62 through which the overflow tube 59 is led into the supply tank 47 is used for draining small amounts of water that may drip from the lower ends of the pipes 26.

The exterior walls or casing of the apparatus may be heat insulated by waterproofed pressed wood board, or other means, and the panels 24, curved walls 31, and water feeding reservoir 54, on these surfaces exposed towards the chamber 34, and the surfaces of headers 25 and 27 exposed to the circulating outside air, are preferably lined with heavy canvas.

After the apparatus has been positioned within the window casing as heretofore described, and the water holder 47 has been supplied with water, the motor is started and very shortly the pump, actuated by the motor, fills the feeding reservoir 54 for supplying water to the wicks 58—56, and from the wicks 56 to the cloth covers 57 on the tubes 26. Capillary attraction and gravity cause the cloth covers to become saturated with water.

The fan 29 circulates outside air about the outside of the cloth covered tubes 26, which air absorbs the water vapor given off from the surface of the cloth, thereby absorbing heat from the tubes. The fan 21 circulates room air through the interior of the tubes 26, the heat of the air being absorbed by the tubes and transmitted to the water in the cloth covers, from where it is carried off by vapor, as heretofore explained.

The extent to which room temperature may be reduced depends on the amount of heat the apparatus is capable of discharging. To obtain discharge of heat of great amount, the heat absorbing and dissipating surface is made large by using a number of comparatively long flat pipes. To increase heat conductance, thin walled pipes of copper are used. The shape of the pipes used is especially favorable for the cooling of room air, for the air readily loses its heat when passed in thin layers.

The room air passing through my cooling apparatus, besides being cooled, also loses some of its humidity, which in the form of dew is deposited on the cold surfaces, and finally drips into the water supply tank. The air so conditioned becomes more comfortable to the occupants of the room.

Changes may be made in details of construction without departing from the scope of my invention and I do not intend to be limited to the exact form shown and described, except as set forth in the appended claims.

I claim:—

1. In combination with the sash and casing of a window, air cooling apparatus comprising a housing adapted to be mounted in the window casing and separating the room air from outside air, a plurality of conduits mounted in the housing, said conduits communicating interiorly with the room air, means for circulating room air through the conduits, said conduits providing relatively long air passages small in cross section, means for wetting the conduits exteriorly, means for admitting outside air into the housing in large volume and means for causing said outside air to pass out of the housing after brief contact with the exteriors of the conduits.

2. In combination with the sash and casing of a window, air cooling apparatus comprising a housing adapted to be mounted in the window casing and separating room air from outside air, a plurality of vertically disposed, relatively long and narrow conduits communicating interiorly with the room air, means for circulating room air through the conduits, means for wetting the conduits exteriorly, said housing being provided with large openings for the admission and exit of outside air in large volume for carrying off water vapors from the conduits, and means for causing said outside air to travel through the housing in a short path transversely of the conduits, whereby said conduits are traversed by outside air substantially unsaturated by said water vapors.

3. In combination with the sash and casing of a window, air cooling apparatus comprising a housing adapted to be mounted in the window casing and separating room air from outside air, a motor horizontally disposed within the housing, the motor shaft extending through the inner wall of the housing, a fan mounted on each end of the motor shaft, a plurality of conduits mounted in the housing, upper and lower air ducts communicating with the interiors of said conduits and with room air, means for wetting the outside of the conduits, one of said fans being arranged to circulate room air through said air ducts and conduits, and the other fan being located in an opening in the outer wall of the housing, said housing being provided with relatively large openings whereby outside air is admitted in large volume into the housing and withdrawn by the fan after traversing the exteriors of the conduits in a relatively short path.

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