May 23, 1939. H. HERSPERGER 2,159,024

AIR CONDITIONING APPARATUS

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Fig. 1.

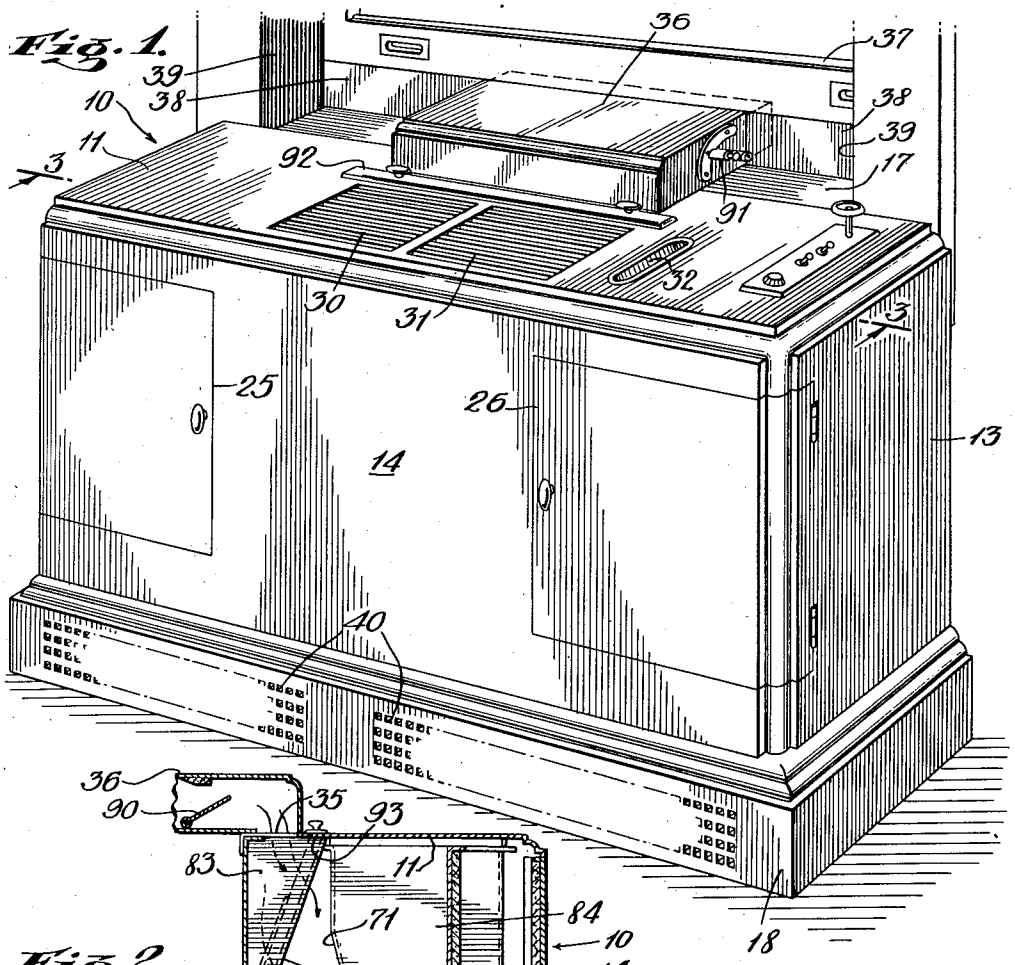
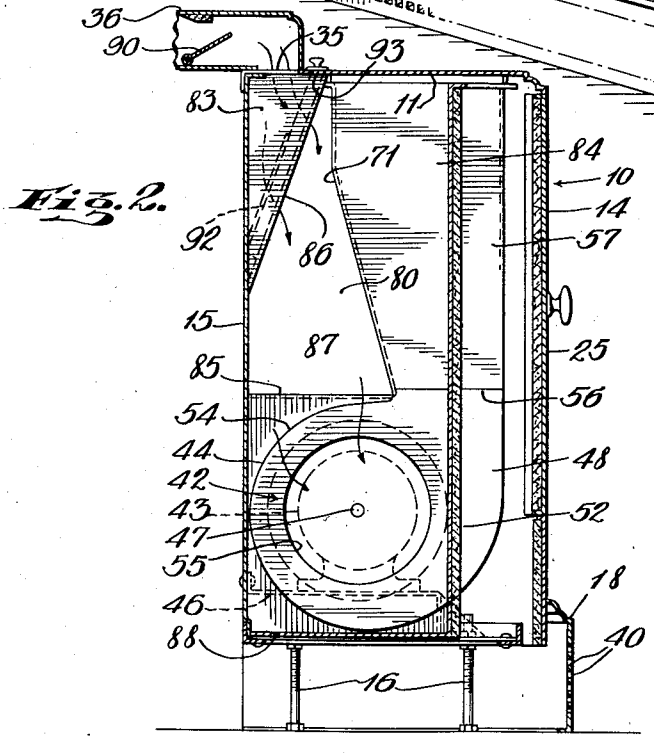


Fig. 2.



INVENTOR
HERMAN HERSPERGER
BY
his ATTORNEY

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Fig. 3.

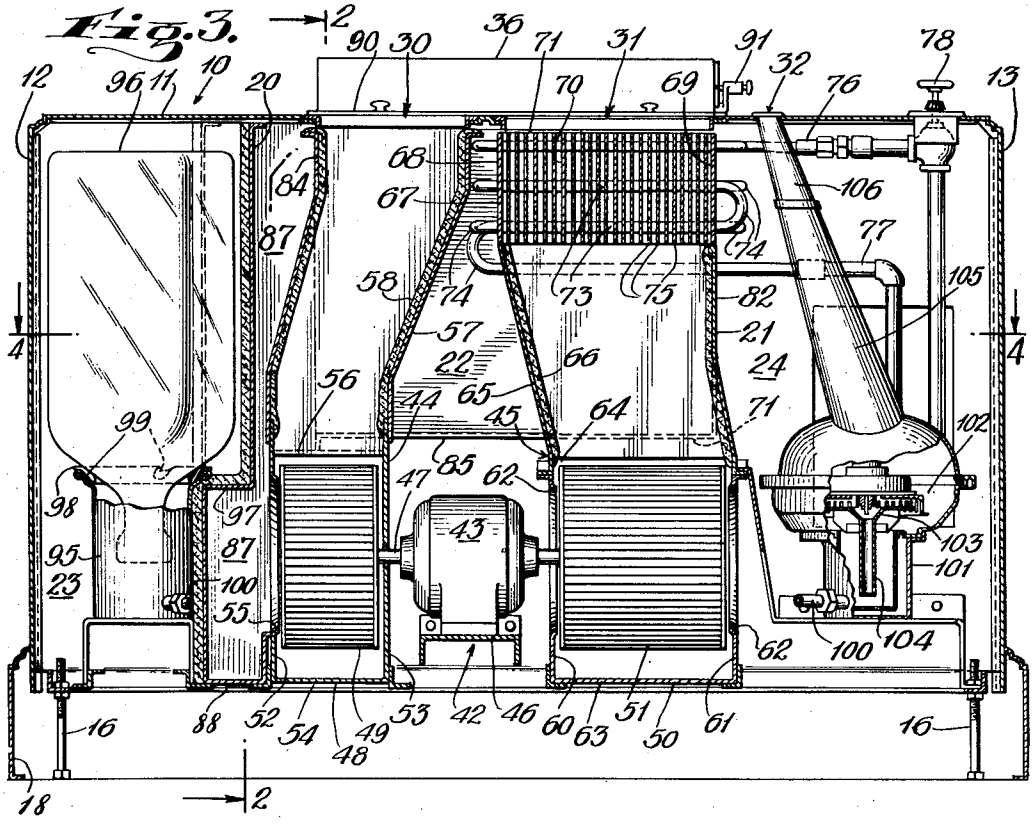
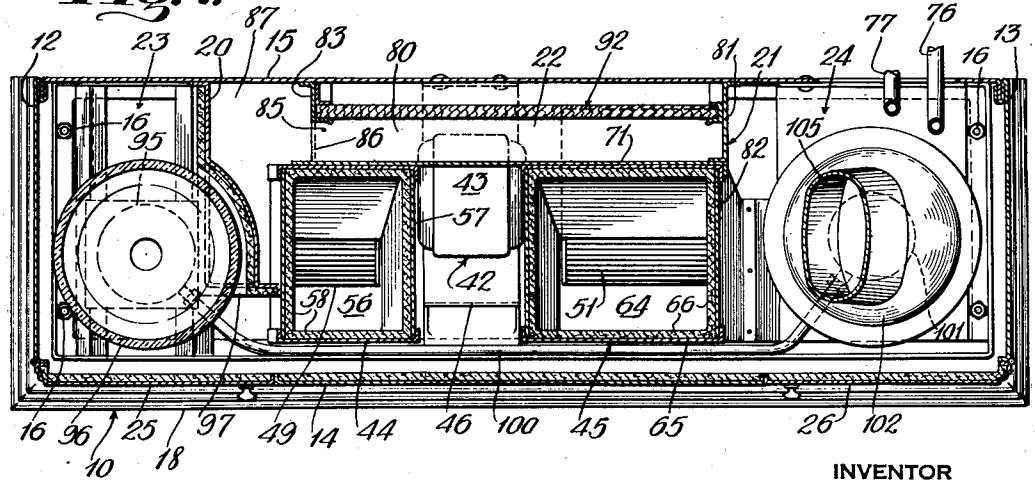


Fig. 4.



INVENTOR
HERMAN HERSPERGER
BY
his ATTORNEY

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2,159,024

UNITED STATES PATENT OFFICE

2,159,024

AIR CONDITIONING APPARATUS

Herman Hersperger, Roselle, N. J., assignor to American Radiator Company, New York, N. Y., a corporation of New Jersey

Application December 31, 1936, Serial No. 118,483

5 Claims. (Cl. 261—12)

My invention relates to air conditioning apparatus, and more particularly to air conditioning apparatus of the room unit type; that is to say, one which is enclosed within a cabinet or casing structure and is adapted to be installed in a room space, and which operates to condition the air in such space.

An object of my invention is to provide apparatus of the above type which is of improved construction and arrangement of parts.

A further object is to provide apparatus of this type which is highly compact and which is pleasing in appearance and which operates to condition effectively the air within the room space in which it is installed.

Without imposing any limitation on the invention in its broader aspects, a still further object is to provide an air conditioning unit including as part thereof a means for circulating and heating the air during the winter, and a means for adding moisture to the heated air; both means being compactly arranged in an improved form of cabinet which is neat and pleasing in appearance, and being also arranged in a manner to perform efficiently the functions of heating and humidifying the air.

The invention consists in the novel construction and combination of parts, to be more fully described hereinafter, and the novelty of which will be particularly pointed out and distinctly claimed.

In the accompanying drawings, to be taken as a part of this specification, I have fully and clearly illustrated a preferred embodiment of my invention, in which drawings—

Fig. 1 is a perspective view illustrating one preferred embodiment of my invention as installed in a room space at points adjacent a window opening thereof;

Fig. 2 is a transverse vertical sectional view taken on the line 2—2 of Fig. 3;

Fig. 3 is a longitudinal vertical sectional view taken on the line 3—3 of Fig. 1; and

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

Referring now in detail to the construction illustrated, it will be observed that I have shown my invention as embodied in an air conditioning unit which is supported by the floor of a room space and is adapted to be installed adjacent a window thereof. The unit is entirely enclosed within a cabinet or casing structure 10 which comprises a top wall 11, an end wall 12, an end wall 13, a front wall 14, and a rear wall 15. The cabinet 10 is supported from the floor of the room by a plurality of jack screws 16 which serve to position the top wall 11 at the desired level with respect to a window sill 17. A skirt member 18 surrounds the lower part of the end walls 12 and 13 and front wall 14, and closes the space between the bottom of the cabinet and the floor, thereby providing a unit which presents a pleasing appearance to the eye of the observer, and at the same time one which may be adjusted as to height.

The interior of the cabinet 10 is divided longitudinally by a pair of spaced vertically arranged partition means 20 and 21 into a central air supply and circulating compartment 22, into a water supply compartment 23, and into a humidifying compartment 24. The compartments 23 and 24 may also be referred to as end compartments, as they are arranged respectively at the ends of the central compartment and provide with the latter a neat and well balanced unit. Doors 25 and 26 are provided in the front of the end compartments 23 and 24 respectively for the purpose of providing access to the interior thereof for inspection and replacement of elements housed therein. The doors 25 and 26 are of the same size and are similarly arranged with respect to their compartments so as to contribute further to the well balanced and neat design of the cabinet.

Air outlet openings 30 and 31 of similar size and shape are provided in the top wall 11 and at the center of the cabinet. The openings 30 and 31 are arranged symmetrically with respect to a vertical transverse median plane through the cabinet 10, as will appear from an examination of Fig. 1. A relatively small oblong outlet opening 32 is also provided in the top wall 11 at points adjacent the outlet opening 31 for the purpose of introducing moisture into the room, in a manner which will appear more fully hereinafter.

An air inlet opening 35 is provided in the center of the top wall 11 and at the rear thereof. The opening 35 communicates with the outside atmosphere by a horizontally and rearwardly extending duct 36 connected at its inner end to the top wall 11 and communicating with the opening 35, and having its open outer end arranged within an opening defined by a partially raised window sash 37 and the window sill 17, so as to provide communication with the outside atmosphere. Suitable filler pieces 38 are arranged respectively between the sides of the duct 36 and the adjacent window jambs 39. The skirt member 18 is provided with a pair of symmetrically arranged air inlet openings 40 which provide communication between the room space and the interior and bottom of the cabinet.

The unit 10 operates to bring in fresh outside air through the duct 36 and opening 35 and to discharge such fresh air into the room through the outlet opening 30. The unit also operates to recirculate room air by admitting such air through the openings 40 in the skirt 18 and discharging the air into the room through the

opening 31. The recirculation of room air and discharge of fresh air into the room serves to maintain the air in the room space in constant circulation.

The means providing for the introduction of fresh air and recirculation of room air is arranged within the central compartment 22. This means is in the form of a motor-blower unit 42 comprising a centrally arranged motor 43 and blowers 44 and 45 arranged respectively at the ends of the motor 43. The motor 43 may be suitably supported by a plate 46 extending from the rear wall 15 to the front wall 14, and the motor is provided with a horizontal shaft 47 extending from both ends thereof. The blower 44 comprises a scroll-shaped housing 48 suitably secured to the cabinet, and a blower wheel 49 fixed to one end of the motor shaft 47. The blower 45 comprises a scroll-shaped housing 50 and a blower wheel 51 fixed to the other end of the motor shaft.

The housing 48 comprises end walls 52 and 53 and a circumferentially extending wall 54 joining the periphery of the end walls 52 and 53. The end wall 53 is solid, as shown in Fig. 3, and the end wall 52 is provided with an axially arranged inlet opening 55. The blower housing 48 is provided with a radial discharge opening 56 arranged to discharge vertically upward, and is connected to the outlet opening 30 by a discharge duct section 57 suitably lined with sound deadening material, indicated at 58.

The housing 50 comprises end walls 60 and 61, both of which have axially arranged inlets 62, and a circumferentially extending wall 63 joining the end walls 60 and 61. The housing 50 is provided with a radial discharge opening 64 which is arranged to discharge air vertically upward into the lower end of a discharge duct section 65. The duct section 65 is provided with a sound deadening lining, as indicated at 66, and the upper end of the duct section is connected to a second duct 67 formed by end plates 68 and 69 of a heating coil 70 and by a part of an upright wall 71 at the rear of the unit and a part of the front wall 14. The upper end of the duct 67 discharges into the room space through the outlet opening 31.

The heating coil 70 comprises a plurality of parallel horizontal pipes 73 connected at their ends by return bends 74 for serial flows of a suitable heating fluid therethrough; such, for example, as steam or hot water. As stated, plates 68 and 69 extend across the ends of the effective heating surface of the coil 70. The coil is also provided with parallel heat radiating fins or plates 75. The coil is provided with an inlet pipe 76 and a discharge or return pipe 77 which may be connected respectively to the supply and return lines of a conventional heating system. The pipe 76 is provided with a hand-operated valve 78 for controlling the flow of the heating fluid to the coil 70.

At the rear and upper part of the interior of the cabinet is provided a chamber 80 defined by the upright wall 71 extending longitudinally of the cabinet behind the ducts 57, 65 and 67, a vertical end wall 81 flush with the end plate 69 and the upper part of an end wall 82 of the duct 65, a vertical end wall 83, lying in the same plane as the upper part of an end wall 84 of duct 57, and a horizontal bottom wall 85. The chamber 80 is provided with an open top which communicates with the fresh air inlet opening 35 and with an opening 86 in the end wall 83 which communicates with a second and vertically extending chamber 87.

The chamber 87 is defined by a part of the rear wall 15, by a part of the partition means 20, by the end wall 84 of the duct 57, and by a bottom wall 88. The chamber 87 is entirely closed, except for its communication with the chamber 80 and with the inlet 55 of the blower casing 48.

From the above description, it will be apparent that the blower 44 draws into the unit only fresh outside air from the duct 36 and through the chamber 80 and chamber 87, and the blower 44 forces such air upwardly through the duct 57 and outlet 30 into the room. The amount of fresh air flowing through the duct 36 may be varied by hand adjustment of a damper 90 in the duct. A hand lever 91 for operating the damper 90 is conveniently located at one side of the duct 36. All fresh air entering the unit passes through a replaceable filter 92 arranged across the chamber 80 and replaceable through an opening 93 in the top wall 11.

The blower 45 draws only room air into the unit through the inlet openings 40 in the skirt 18, and forces such air upwardly into the room through the duct 65, duct 67, and outlet opening 31. As the air flows through the duct 67, its dry bulb temperature is raised, due to contact with the surfaces of the coil 70.

Arranged within the compartment 23 is a water supply receptacle or cup 95 secured to the cabinet structure and supporting in inverted position a water supply bottle 96 which may be conveniently removed from the compartment 23 through the door 25, refilled and replaced in position in the compartment 23. From an examination of Figs. 3 and 4, it will be observed that, in the interest of compactness, the partition means 20 is shelved out, as indicated at 97, for receiving the enlarged part of the bottle 96. The bottle is supported by a rim member 98 secured to the upper periphery of the cup 95, and the member 98 is provided with an air inlet groove 99 which provides for the maintenance of atmospheric pressure above the water in the cup, as is well known in this type of water supply means for humidifiers.

The cup 95 is connected by a horizontal pipe 100 with a water receptacle 101 suitably supported in the compartment 24 and at approximately the same level as the cup 95 so that an adequate amount of water is maintained in the receptacle 101.

The receptacle 101 forms a part of a humidifying mechanism 102 which also includes a motor-driven atomizer unit 103 which operates to draw water from the receptacle upward through a tube 104, to atomize such water and to provide a stream of air in which the atomized water or mist is entrained and carried away. The mechanism 102 discharges the stream of air with water mist upward into the lower end of a duct 105 which connects at its upper end with a nozzle member 106, the latter extending upwardly through the opening 32 in the top wall. The nozzle 106 is arranged adjacent the outlet opening 31 and is preferably inclined toward the outlet opening 31 so that the stream of air with water mist flowing from the nozzle will contact the heated air stream flowing upwardly through the outlet 31 and thereby provide for the quick and complete evaporation of the moisture in the heated air stream and for efficiently increasing the humidity content of the atmosphere in the room space.

What I claim and desire to secure by Letters Patent of the United States is:

1. In an air conditioning unit, the combination of an elongated casing structure adapted to be arranged in a room space and operable to circulate and condition the air therein; a pair of spaced upright partition means extending across the interior of said enclosing casing structure and dividing the latter into a main or central compartment and into first and second end compartments arranged respectively at the ends of said central compartment; said central compartment having spaced air inlet and outlet openings; means in said central compartment defining an air passage connecting said inlet and outlet openings; heating means arranged across said passage; water supply means arranged in said first end compartment; water atomizing mechanism in said second end compartment, and having a discharge outlet and operable to deliver through its outlet a stream of air with water mist entrained therein; conduit means connecting the water supply means and the water atomizing mechanism; nozzle means connected to the discharge of said mechanism and having its outlet and extending through a defining wall part of said second end compartment at points adjacent the outlet in said central compartment, and being inclined toward such outlet so as to provide for the flow of air with water mist entrained therein outwardly over the outlet in said central compartment so that the water mist becomes quickly evaprated upon contacting with the heated air from said outlet in the central compartment.

2. In an air conditioning unit adapted to be arranged within a room space, the combination of an elongated casing structure adapted to be arranged in a room space and operable to circulate and condition the air therein; a pair of spaced upright partition means extending across the interior of said enclosing casing structure and dividing the latter into a central compartment and into first and second end compartments arranged respectively at the ends of said central compartment; said central compartment having spaced air inlet and outlet openings; means in said central compartment defining an air passage connecting said inlet and outlet openings; blower means providing for the flow of air through said passage and said outlet into said room space; heat exchange means arranged in said passage and operable to increase the temperature of the air flowing therethrough; water supply means arranged in said first end compartment; water atomizing mechanism arranged in said second end compartment and connected to said water supply means and operable to discharge a stream of air with water mist entrained therein into said room space at points adjacent said outlet in the central section.

3. In an air conditioning unit adapted to be arranged within a room space, the combination of an elongated casing structure adapted to be arranged in a room space and operable to circulate and condition the air therein; a pair of spaced upright partition means extending across the interior of said enclosing casing structure and dividing the latter into a central compartment and into first and second end compartments arranged respectively at the ends of said central compartment; said central compartment having spaced air inlet and outlet openings; means in said central compartment defining an air passage connecting said inlet and outlet openings; blower means providing for the flow of air through said passage and said outlet into said room space; heat exchange means arranged in said passage and operable to increase the temperature of the air flowing therethrough; water supply means arranged within said first end compartment and including a cup-shaped receptacle and a water bottle supported in inverted position by said receptacle; water atomizing mechanism in said second end compartment and connected to said receptacle and operable to discharge a stream of air with water mist entrained therein into said room space at points adjacent said outlet in the central section; said first and second end compartments being each provided with doors similarly positioned with respect to their respective compartments and capable of being opened to permit access to the water supply means and the water atomizing mechanism.

4. In an air conditioning unit adapted to be arranged within a room space, the combination of an elongated casing structure adapted to be arranged in a room space and operable to circulate and condition the air therein; a pair of spaced upright partition means extending across the interior of said enclosing casing structure and dividing the latter into a central compartment and into first and second end compartments arranged respectively at the ends of said central compartment; said central compartment having spaced air inlet and outlet openings; means in said central compartment defining an air passage connecting said inlet and outlet openings; blower means providing for the flow of air through said passage and said outlet into said room space; heat exchange means arranged in said passage and operable to increase the temperature of the air flowing therethrough; water supply means arranged in said first end compartment; water atomizing mechanism arranged in said second end compartment and connected to said water supply means and operable to discharge a stream of air with water mist entrained therein into said room space at points adjacent said outlet in the central section; said first and second end compartments being each provided with doors similarly positioned with respect to their respective compartments and capable of being opened to permit access to said water supply means and said water atomizing means.

5. An air conditioning unit for room spaces, comprising an enclosing casing divided interiorly into a main warm air compartment and an auxiliary humidifying compartment; said casing including a substantially horizontal top wall portion having first and second outlet openings therein; means in the main compartment defining a flow path for air terminating in said first outlet opening; air heating means arranged in said flow path; water-atomizing means in said auxiliary compartment providing a stream of air with water mist entrained therein; and conduit means for directing said stream of air and water mist through said sceond outlet opening and into the room, and said conduit means including a terminal nozzle part directed to project said stream upward and over said first outlet opening, whereby said stream of air and water mist is projected into the heated air flowing upwardly from said first outlet opening and the mist entrained in said stream is evaporated.

HERMAN HERSPERGER.