May 26, 1942. L. G. HUGGINS 2,283,928

AIR CONDITIONING APPARATUS

Filed April 23, 1936 2 Sheets-Sheet 1

FIG. 1.

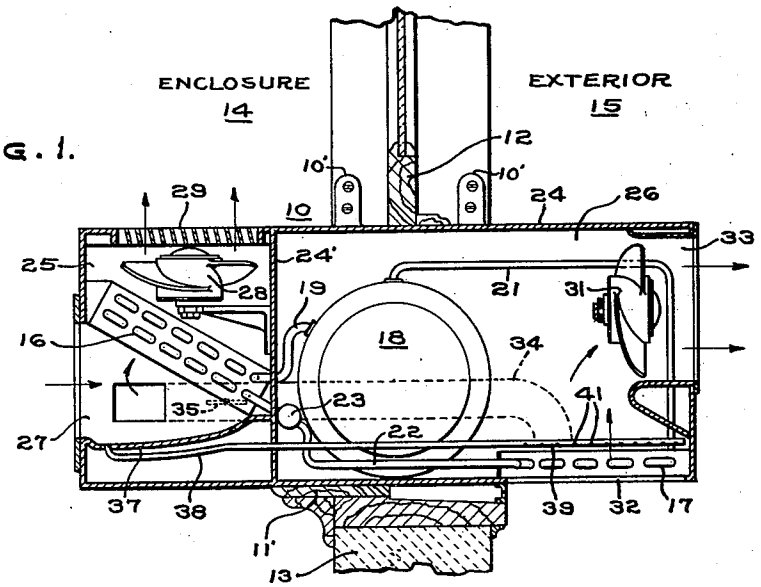
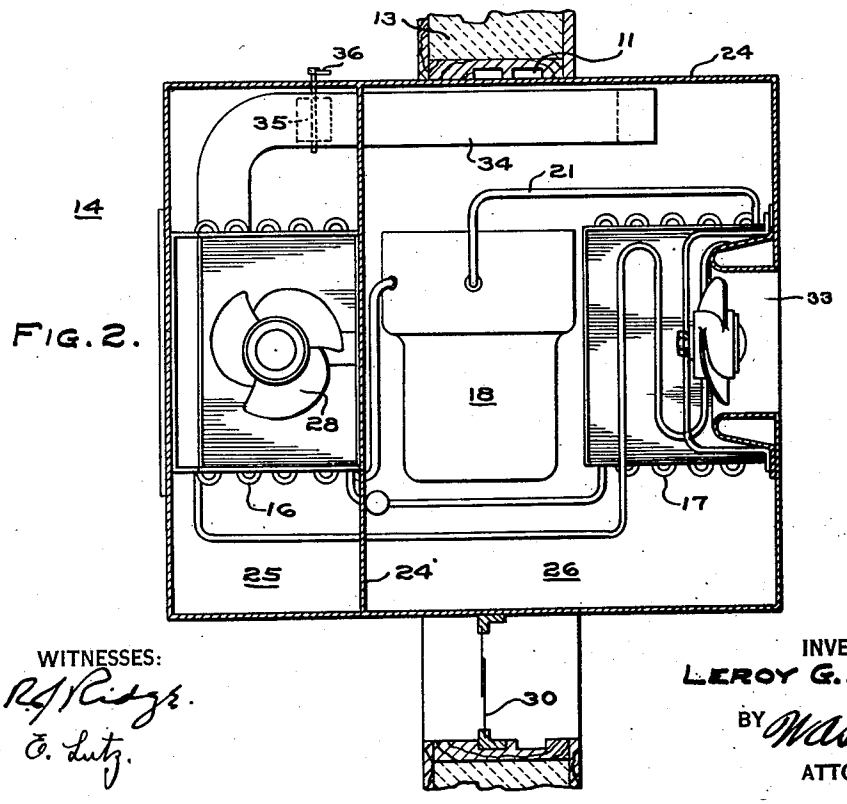


FIG. 2.



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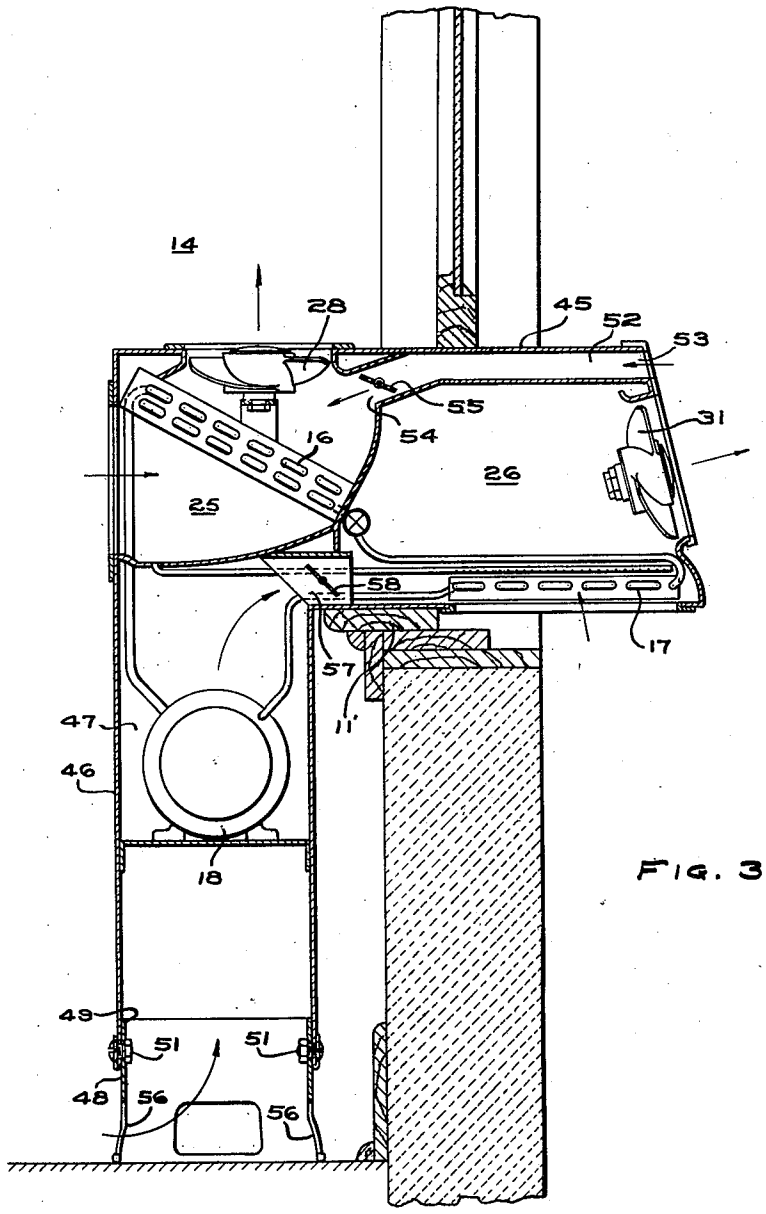


FIG. 3.

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UNITED STATES PATENT OFFICE

2,283,928

AIR CONDITIONING APPARATUS

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Application April 23, 1936, Serial No. 75,919

3 Claims. (Cl. 62—140)

My invention relates to air conditioning apparatus and has for an object to provide improved apparatus of this kind.

A particular object is to provide a simplified construction of air-cooled unit air conditioner that may be manufactured at reduced cost.

Still further objects of my invention are to facilitate the removal of moisture condensed from the air, and to conserve floor space in an air conditioning device for a room or enclosure.

These and other objects are effected by my invention as will be apparent from the following description and claims taken in connection with the accompanying drawings, in which:

Fig. 1 is a vertical sectional view of my improved air conditioner attached to a conventional window opening;

Fig. 2 is a plan view of the apparatus shown in Fig. 1 with parts removed for clearness; and

Fig. 3 is a vertical sectional view of a second embodiment of my improved air conditioner.

Reference will now be had to Figs. 1 and 2 of the drawings wherein I have shown my novel air conditioning apparatus, comprising an air cooled unit air conditioner indicated generally at 10, disposed in the lower portion of a window 11 and resting on the sill 11' thereof. The unit 10 forms a closure for the window opening upon the sash 12 being brought down to engage the top of the unit. The window frame and sash provide a window in a wall 13 of a room or enclosure to be air conditioned indicated at 14, the atmosphere exterior of the enclosure being indicated at 15. The unit 10 is preferably mounted so that its center of gravity lies centrally of the sill 11', and it is removably secured in the window frame in any suitable manner. Lugs or ears 10' fixed to the conditioner may be secured by suitable removable fastening devices to the window frame on the wall 13.

The unit air conditioner 10 includes a refrigerating system of any suitable type for cooling the air in the enclosure 14. I have shown a system of the compressor-condenser-expander type having a heat absorbing element or evaporator 16 and a heat dissipating element or condenser 17. A compressor mechanism, indicated at 18, withdraws refrigerant vapor from the evaporator 16 through a conduit 19 and compresses it to a relatively high pressure. The compressed vapor is delivered to the condenser 17 by means of a conduit 21, in which condenser the vapor is cooled and liquefied. The condensed refrigerant flows from the condenser through a conduit 22 to any suitable expansion device 23, such as a conventional thermostatic expansion valve, float valve, or other expansion device, wherein the pressure of the refrigerant is depressed. Vaporization of the refrigerant at relatively low pressure in the evaporator 16 is effected whereby heat is abstracted from the evaporator. This cycle of operation continues during periods of operation of the compressor 18.

The compressor 18 may be of any suitable type, but I have preferred to show one of the hermetically sealed type. In this type, the motor driven compressor (not shown) is enclosed and hermetically sealed within a shell, all of which is indicated by the numeral 18.

The refrigerating system is enclosed by a housing or casing 24 having a partition 24' for dividing the same into chambers 25 and 26, disposed adjacent the enclosure 14 and the exterior atmosphere 15, respectively. In the present embodiment, the casing projects beyond the wall into the enclosure and into the exterior atmosphere, the chamber 25 being disposed wholly within the enclosure. The evaporator 16 is disposed within the chamber 25. A fan 28 is also provided therein for withdrawing air from the enclosure 14 through an inlet opening 27, for conveying the same over the surfaces of the evaporator 16 and for discharging the cooled air through a discharge opening 29 into the enclosure 14. In order that the casing 24 may fit within windows of various widths, I provide an extensible closure member 30 between one side of the casing 24 and the window frame. The closure member may be constructed in any manner known in the art.

The chamber 26 contains the compressor 18 and the condenser 17, the latter being disposed across an inlet opening 32 in the bottom of the casing 24. A fan 31 is provided in the chamber 26 for effecting flow of outside air inwardly through the inlet opening 32 and over the condenser for cooling the same, through the chamber and outwardly through a discharge opening 33 in the side wall of the casing. The compressor mechanism 18 is cooled by the air passing through the chamber 26, particularly by the eddy currents produced therein.

In order that fresh air in controlled quantities may be furnished to the enclosure 14, I provide a fresh air duct 34 which communicates at its outer end with the atmosphere exterior of the enclosure and at its inner end with the chamber 25, preferably, on the upstream side

of the evaporator 16. A damper 35, actuated by a handle 36, controls the volume of fresh air conveyed by the duct 34 for mixture with the air withdrawn from the enclosure. As the inner end of the duct 34 communicates with the suction side of the fan 28, air flows from the exterior of the enclosure inwardly through the duct in quantities determined by the setting of the damper 35.

Water which may collect on the evaporator 16 due to the cooling of air below its dew point temperature, drops to a pan or collector 37. This water must be removed and is, preferably, discharged to the outside atmosphere for vaporization therein. Accordingly, I have provided a conduit 38 for draining the water collected by the pan 37 to the air stream conveyed by the blower 31. The end 39 of the conduit 38 may be provided with one or more openings 41 through which the water is discharged for vaporization. Preferably, the openings 41 are so arranged that the water issuing therefrom is deposited upon the condenser structure 17 for assisting in the cooling thereof; the latent heat of vaporization of the water being abstracted from the condenser and the air passed thereover.

Reference will now be had to Fig. 3 wherein a second embodiment of my improved air conditioner is shown. In this embodiment, a casing structure 45 for housing the elements of the refrigerating system is mounted upon and supported by the window sill 11'; said casing 45 including a downwardly extending portion 46 which is disposed within the enclosure 14. The portion 46 of the casing defines a chamber 47 in which the compressor mechanism 18 is disposed.

A base 48 is arranged at the bottom of the casing portion 46 which base 48 rests upon the floor and is adjustable with respect to the casing portion 46 for various elevations of the window sill. This adjustment is provided preferably, by telescopically arranging the base 48 within the casing 46 as shown at 49. After the proper adjustment is made these elements may be secured together in any suitable manner such as for example by screws 51.

The arrangement of the evaporator 16 and the condenser 17 within the chambers 25 and 26 of the upper portion of the casing 45 is similar to that shown in Fig. 1. The principal difference between the two embodiments resides in the location of the compressor mechanism 18. By disposing the compressor mechanism 18 as shown in Fig. 3, the length or distance that the casing 45 of the conditioner extends through the window 11, may be reduced. In the second embodiment, a portion of the weight of the unit conditioner is carried by the base 48 so that the sill 11' is relieved of this portion of the total weight.

Fresh air may be supplied to the enclosure through a duct 52 having an inlet opening 53 communicating with the outside atmosphere and air outlet opening 54 communicating with the chamber 25. A damper 55 may be employed for controlling the amount of fresh air drawn through the duct 52. In the present embodiment the air drawn from the outside atmosphere is mixed with the air translated by the fan 28 subsequent to the cooling thereof. The cooled air is thereby tempered by warm air drawn in through the duct 52 and the mixture discharged into the room may be adjusted to the desired temperature or relative humidity by adjusting the damper 55.

A positive discharge of air from the enclosure 14 may be effected by the fan or blower 31. An opening 56 may be provided in the base 48 for the passage of air from the enclosure 14 into the chamber 47 and a duct 57 is employed for conducting the air from the chamber 47 to the chamber 26, from which it is discharged to the outside atmosphere by the fan 31. A damper 58 is preferably disposed in the duct 57 for controlling the amount of air discharged from the room. The passage of air through the chamber 47 may be utilized for cooling the compressor 18, but it will be understood that the latter may be cooled by any other suitable means.

Except as recited heretofore, the operation of the unit conditioners of both embodiments is similar.

From the foregoing, it will be apparent that I have provided a novel air cooled device which may be disposed in a conventional wall opening for cooling the air in an enclosure or room, wherein the heat abstracting and the heat dissipating elements may be compactly arranged as a unit structure, so that a considerable saving in the space occupied by apparatus of this kind within the room is effected. Furthermore, the various elements are assembled as a unit at the factory and are so arranged that, when the unit is installed in a window opening, it is unnecessary to provide the usual long tortuous ducts for conveying outside air for cooling the condenser. The water precipitated from the air being cooled may be readily removed by gravity by my improved device and, furthermore may be employed for assisting in cooling the condenser.

While I have shown my invention in several forms, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various other changes and modifications without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. An air conditioner unit suitable for conditioning the air of a room comprising two compartments, a refrigeration apparatus having a heat absorbing portion, a heat dissipating portion, and a motor-compressor, the heat absorbing portion being in one compartment, and the heat dissipating portion and the motor-compressor being in the other compartment, said unit being adapted to be held in such position with respect to an opening in the wall of an enclosure that the heat absorbing portion is on the inside of the wall, the heat dissipating portion is on the outside of the wall, and the motor-compressor is disposed substantially in the plane of said wall intermediate said heat-absorbing and heat-dissipating portions, and means for forcibly circulating air from the enclosure over said heat absorbing portion to condition the air, said unit being provided with means for engaging an edge of said opening for holding said unit in said position.

2. The combination with a room having a window casing and a window, of a unitary air conditioning unit of the air cooled type detachably mounted on said window casing and substantially balanced therein with a portion extending into said room and a refrigeration apparatus compartment extending outside said room, said unit having a partition extending across said unit and dividing the same into a room air cooling chamber and said refrigeration apparatus com-

partment, an evaporator in said room air chamber and a condenser and a hermetically sealed motor-compressor in said apparatus compartment, said motor-compressor being disposed along and substantially directly over the sill of said window casing, power driven blower means in said room air chamber operable to withdraw air from the room, pass the same over the evaporator and then discharge the air into the room, blower means in said apparatus compartment for circulating atmospheric cooling air over the refrigeration apparatus therein to cool the same, and means for collecting condensate in said room air chamber, conducting it to the apparatus compartment and discharging the same into the atmosphere.

3. An air conditioning unit suitable for conditioning the air of a room comprising two compartments, refrigerating apparatus including an evaporator, a condenser, and a motor compressor unit enclosed in a fluidtight casing, the evaporator being in one compartment and the condenser and the motor-compressor unit being in the other compartment, said unit being adapted to be held in such position with respect to a window casing in the wall of an enclosure that the evaporator is on the inside of the wall, the condenser is on the outside of the wall, and the motor-compressor unit is disposed along and substantially directly over the sill of said window casing and between said evaporator and said condenser, and means for forcibly circulating air from the enclosure over said evaporator to condition the air, the unit being provided with means for engaging said window casing for holding said unit in said position.

LEROY G. HUGGINS.