Sept. 17, 1957 M. B. CALKINS 2,806,362

AIR CONDITIONER

Filed July 25, 1955 2 Sheets-Sheet 1

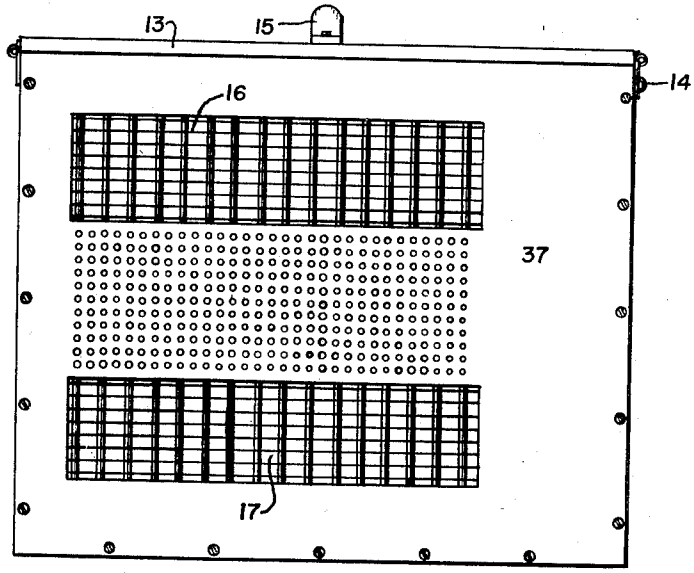


Fig. 1

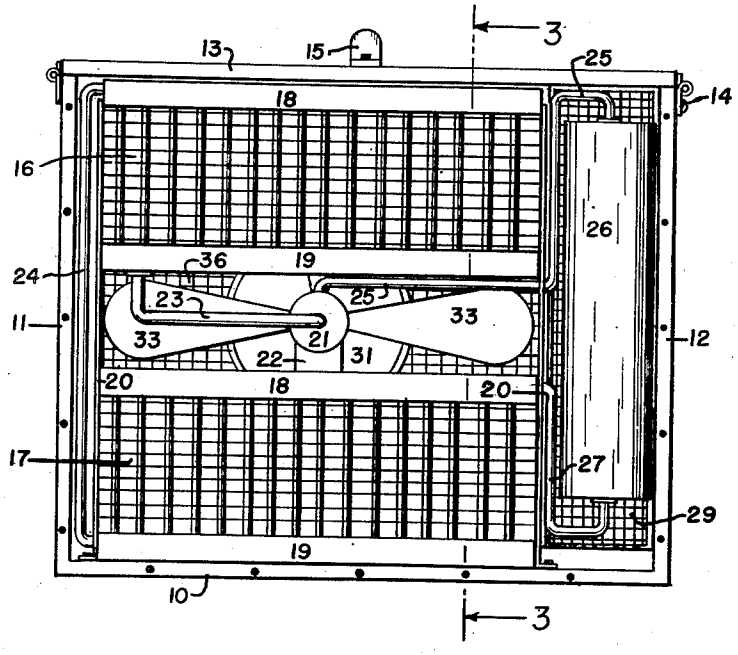


Fig. 2

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Filed July 25, 1955 2 Sheets-Sheet 2

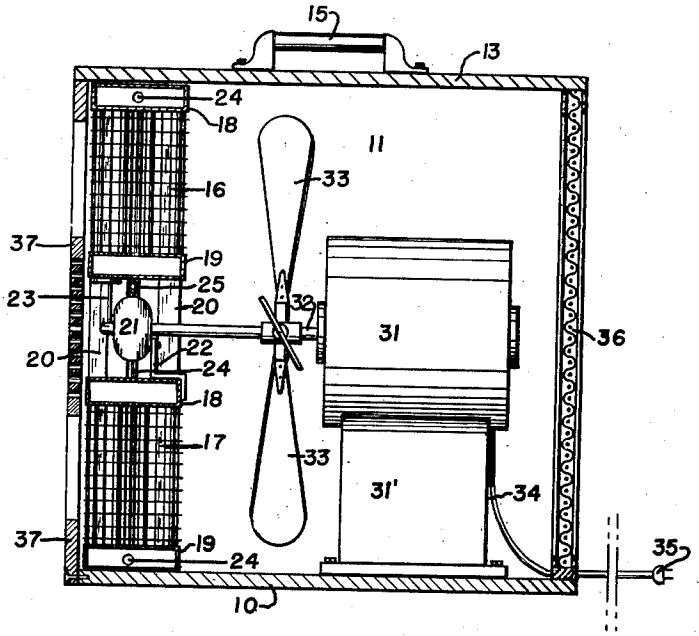


Fig. 3

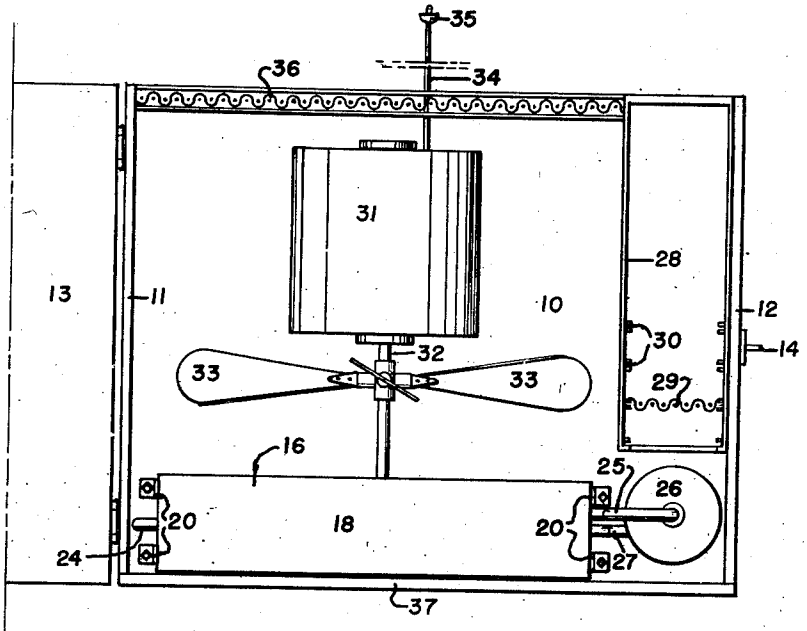


Fig. 4

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2,806,362

AIR CONDITIONER

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9 Claims. (Cl. 62—131)

This invention relates to air conditioning devices of a general type extensively in use to cool and to circulate air for the promotion of human comfort, and has as an object to provide a novel and improved such unit of wide utility and operative effectiveness.

A further object of the invention is to provide a novel and improved air conditioner in the form of a compact, portable unit adaptable for use in automobiles, rooms, and all types of inhabited enclosures where a supply of electric energy is available.

A further object of the invention is to provide a novel and improved air conditioner adapted to utilize any one of a number of conventional, readily-available refrigerants or cooling agents.

A further object of the invention is to provide a novel and improved air conditioner that is simple and inexpensive of production in a wide range of sizes from known and available facilities, elements, and materials.

A further object of the invention is to provide a novel and improved air conditioner adapted for operative association with conventional electric energy supplies of differing standard potentials.

A further object of the invention is to provide a novel and improved air conditioner characterized by a closed fluid circulating system requiring no replenishment to maintain the unit in operating condition, that is free from onerous servicing and maintenance requirements, and that is positive and efficient in attainment of the ends for which it is designed.

With the foregoing and other objects in view, my invention consists in the construction, arrangement, and operative combination of elements as hereinafter set forth, pointed out in my claims, and illustrated by the accompanying drawings, in which—

Figure 1 is a front elevation of a typical embodiment of the invention as assembled and arranged ready for practical use.

Figure 2 is a front elevation of the organization according to Figure 1 with the front cover plate of the first view removed to disclose interior constructions and arrangements.

Figure 3 is a vertical section through the organization according to the preceding views taken substantially on the indicated line 3—3 of Figure 2.

Figure 4 is a top plan view of the organization according to the preceding views with the cover member of the unit open to disclose interior constructions and arrangements.

In accordance with the principles and to realize the purposes of the invention, the cooperating elements of the improved air conditioner are supported by and enclosed within a preferably rectangular, rigid housing having a bottom member **10**, spaced, parallel side walls **11** and **12** fixedly upstanding from opposite margins of said member **10**, and a cover **13** hinged to the upper margin of the side wall **11** in position to close against the upper margin of the side wall **12** in spaced, parallel relation with the member **10** and to be releasably secured to said latter side

wall, as by means of a latch **14**. The members **10**, **11**, **12**, and **13** thus define a hollow, rectangular housing open at its opposite ends, interiorly accessible through its top area when the cover **13** is unlatched from the side wall **12** and swung to open position as represented in Figure 4, and arranged for convenient portage and positioning through the agency of a handle **15** secured to and centrally and exteriorly of the cover **13**.

A closed fluid circulation system expediently constituted as a removable and replaceable unit is detachably mounted within the housing just described adjacent and to substantially fill one open end thereof. The fluid circulating system includes two conveniently identical radiator members **16** and **17**, of any suitable particular construction characterized by the usual upper header **18** and lower header **19** for each member, spacedly superposed in coplanar relation by means of struts **20** secured to the ends thereof and sized, as so superposed and correlated, to substantially span the vertical extent of the housing interior and to extend transversely of the housing less than the full width thereof in a disposition such as to space said members a slight distance inwardly from the side wall **11** and a considerably greater distance inwardly from the side wall **12**, substantially as illustrated. The adjacent headers of the members **16** and **17** are spaced apart sufficiently to accommodate therebetween a fluid pump **21** supported by a bracket **22** with the pump axis perpendicular to the plane of said members at about the mid-length thereof, and the input to said pump is connected by means of a flow line **23** with the lower header **19** of the upper radiator member **16**. In the space between the side wall **11** and adjacent ends of the members **16** and **17**, a flow line **24** connects the upper header **18** of the unit **16** and the lower header **19** of the unit **17**. The outlet from the pump **21** delivers through a flow line **25** to the upper end of a cooling chamber **26** disposed vertically within and to substantially fill the space between the housing side wall **12** and the adjacent ends of the members **16** and **17**, and a flow line **27** connects the lower end of the said chamber **26** with the upper header **18** of the radiator member **17**. Thus, with the members **16** and **17**, the headers **18** and **19**, the flow lines **23**, **24**, **25**, and **27**, and the chamber **26** all filled with fluid, the pump **21** is effective to circulate the fluid from the lower header **19** of the member **16** through the chamber **26** and then through the member **17** to return from the lower header **19** of said latter member and to the upper header of the member **16**. Along the side wall rearwardly adjacent the chamber **26** a compartment **28** is provided interiorly of the housing and extending the full depth of the latter for the accommodation of suitable, conventional refrigerants or cooling agents, such as Dry Ice, so-called "canned ice," and the like. The compartment **28** is closed at its otherwise open upper end by means of the cover **13** and is hence interiorly accessible for charging with refrigerant when said cover is open. The compartment is closed at its end remote from the chamber **26** by a wall preferably coplanar with the end of the housing remote from the fluid circulating system, and is open at its end adjacent the chamber **26**, thus to expose said chamber to the cooling effect of refrigerant charged within the compartment **28**. Retentive of the charge within the compartment **28** and to provide means for some regulation of cooling effect imposed by the refrigerant charge upon said chamber, a reticulate or foraminous baffle **29** is vertically disposed in transversely-obstructing relation across the compartment **28** adjacent the open end thereof and for adjustment toward and away from the chamber **26**, as by means of sliding engagement within grooved guides **30** spaced apart on and upstanding along the inner walls of the compartment. As should be obvious, the baffle **29** may be positioned to hold the refrigerant charge within the compartment **28** at

various distances away from the chamber **26**, thereby regulating the effect of the refrigerant on the fluid within said chamber and consequently adjusting the temperature of the fluid circulated by the pump **21** through the radiator members **16** and **17**.

Interiorly of the housing, an electric motor **31** is fixed to the bottom member **10**, as by means of an elevating base **31'**, with the power shaft **32** of said motor in alignment with the axis of the pump **21**. The shaft **32** of the motor **31** mounts a fan **33**, of any suitable particular construction, whereof the blades are pitched to circulate air through the housing and outwardly through the fluid circulating system represented by the radiators **16** and **17** when the motor is operated, and said shaft is extended to driving relation with the pump **21**, whereby to establish circulation of fluid in the system including said pump when and as the fan **33** is operating. The motor **31** may be of any type and construction appropriate for reaction to particular electric supply circuits and is provided with leads in the form of a conventional cord **34** terminating in a plug connection **35** detachably engageable with a conventional electric outlet to power the motor in a customary manner. Enhancive of the utility of the conditioner, the motor **31** may be an available type operable on circuits of widely different potentials, such as the battery circuit of an automobile and the usual wiring circuit of a civic community, in which event the plug **35** is adapted for connection with the outlets usual to such circuits.

The otherwise open end of the housing remote from the fluid circulating system is expediently obstructed by a reticulate or foraminous panel **36** closed across the full vertical height of the housing between the bottom member **10** and cover **13** and extending in substantially coplanar relation with the closed end of the compartment **28** to engagement with the side wall **11**, thus providing a screen through which air may freely pass under the action of the fan **33** without entrainment of undesirable foreign matter. The opposite end of the housing is preferably closed by a detachable panel **37** suitably apertured to expose major areas of the radiator members **16** and **17** and preferably perforated or otherwise worked in the area overlying the space between said members occupied by the pump **21** to facilitate air passage therethrough.

Constructed as shown and described, the improvement is a compact portable unit available to function as an air conditioner whenever the compartment **28** is charged with a suitable cooling agent and the plug **35** is connected with a supply of electrical energy appropriate to power the motor **31**. The fluid circulating system is preferably filled with a fluid, such as a commercial anti-freeze, brine, alcohol, or the like, which has a low freezing point and circulates freely at temperatures lower than the freezing point of water, thus accommodating the use of Dry Ice or any other cooling agent productive of quite low temperatures without impairment of unit operation. The large area of the chamber **26** subject to the action of the cooling medium operates to effectively lower the temperature of the fluid circulated therethrough, and the circulation of the fluid through the radiator members **16** and **17** accomplished by the pump **21** maintains the said members at a temperature effective to cool the air circulated therethrough by the fan **33**, all in an obvious manner. Since the air circulated by the fan **33** is at no time brought into contact with water, or any other fluid, the output from the unit is not humidified or in any way different, except for lowered temperature, from the air present where the unit is operating. The fluid circulating system being entirely closed during operation of the unit, the air subjected to action of the conditioner is free from odors deriving from the unit and also free from any contamination which might prove disagreeable.

Since changes, variations, and modifications in the form, construction, and arrangement of the elements shown and described may be had without departing from the spirit of my invention, I wish to be understood as being limited solely by the scope of the appended claims, rather than by any details of the illustrative showing and foregoing description.

I claim as my invention:

1. An air conditioner comprising a portable housing formed with opposite open ends and a hinged top closure, a closed, unitary fluid circulating system characterized by spacedly superposed radiator members detachably within and substantially obstructing one open end of said housing, a cooling chamber included in said system disposed within the housing at one end of said radiator members, a pump supported by and between said radiator members, flow lines connecting said pump, chamber, and radiator members for circulation of fluid therethrough in reaction to pump operation, a motor within said housing in direct driving relation with said pump, a fan in driven relation with said motor between the latter and said pump, and a compartment adapted to contain refrigerants interiorly of said housing separate from, rearwardly adjacent and opening toward said chamber.

2. An air conditioner comprising a portable housing formed with opposite open ends and a hinged top closure, a closed, unitary fluid circulating system characterized by spacedly superposed radiator members detachably engaged within said housing in substantially obstructing relation with one open end thereof, a cooling chamber included in said system at one end of said radiator members, a pump for the circulation of fluid through said system mounted on and between the radiator members, a motor within said housing in direct driving relation with said pump, a fan in driven relation with said motor between the latter and said pump, and a compartment adapted to contain refrigerants interiorly of said housing separate from, rearwardly adjacent and opening toward said chamber.

3. The organization according to claim 2, wherein the open end of the housing remote from the fluid circulating system is traversed by a sheet of reticulate or foraminous material.

4. The organization according to claim 2, wherein the end of the housing accommodating the fluid circulating system is closed by a detachable panel apertured to expose major areas of the radiator members and perforated for the passage of air throughout the area thereof overlying the space between said members.

5. The organization according to claim 2, wherein said radiator members are similarly formed with upper and lower headers, a flow line connects the lower header of the lower member with the upper header of the upper member at one end of the assembly, a flow line connects the lower header of the upper member with the intake of said pump, a flow line connects the outlet of said pump with the upper end of said chamber, and the lower end of said chamber is connected through a flow line with the upper header of said lower member.

6. The organization according to claim 2, wherein the power output shaft of said motor is aligned and directly connected in driving relation with the rotor axis of said pump, and said fan is fixed to and for rotation with said power output shaft adjacent and inwardly of the housing from said pump.

7. The organization according to claim 2, wherein said compartment is formed with an open top closable by means of the housing hinged top closure, whereby to facilitate the charging of the said compartment with refrigerants when the top closure is swung to opening relation with the housing, said compartment is formed with an open end rearwardly adjacent said chamber, and a panel of reticulate or foraminous material slidably traverses the open end of said compartment for selective adjustment toward and away from said chamber.

8. In an air conditioner, a portable rectangular housing formed with opposite open ends and a hinged top closure, a closed, unitary fluid circulating system detachably asso-

ciated with and substantially obstructing one open end of said housing, said system including spacedly superposed radiator members, a fluid circulating pump supported by and between the said members, a cooling chamber at one end of said members, and flow lines operatively connecting between said members, pump, and chamber for circulation of fluid therethrough in reaction to pump operation, a motor within said housing in simultaneously driving relation with said pump and a fan rearwardly adjacent to the latter, and a compartment adapted to contain refrigerants associated with said housing separately from and rearwardly adjacent said chamber.

9. In an air conditioner having an open end, portable housing formed with a hinged top closure, a motor within said housing, and a fan in driven relation with said motor for the circulation of air through the open ends of the housing, a fluid circulating system adapted to cool the air circulated by said fan, said system comprising in a unitary assembly like radiator members spacedly superposed and detachably mounted in substantially obstructing relation with the open end of the housing through which air is delivered by said fan, upper and lower headers in each of the said radiator members, a flow line connecting between the upper header of the upper member and the lower header of the lower member, a fluid circulating pump supported by and between said members, a flow line connecting the lower header of the upper member with the intake of said pump, a cooling chamber at the end of the radiator member assembly remote from said first flow line, a flow connection between the pump outlet and the upper end of said chamber, a flow connection between the upper header of the lower member and the lower end of said chamber, a direct driving connection between said motor and pump, and a compartment within said housing separate from and opening toward said chamber adapted to contain refrigerants.

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