May 3, 1938. M. KALISCHER 2,115,715

AIR CONDITIONING APPARATUS

Filed March 9, 1935 2 Sheets-Sheet 1

FIG. 1.

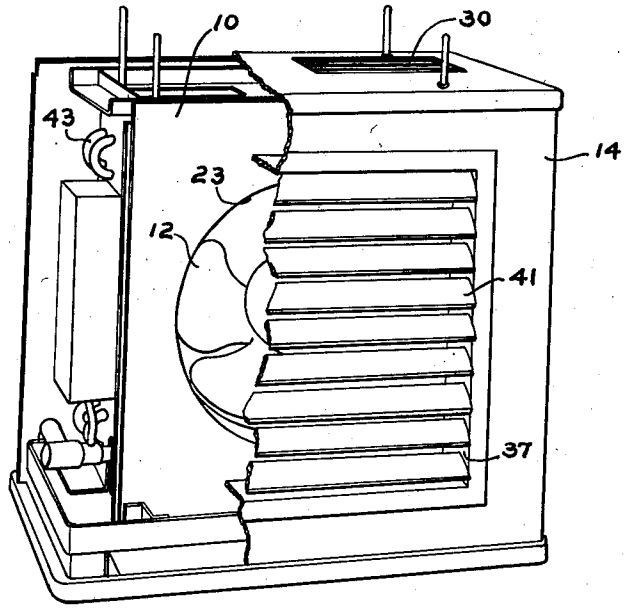
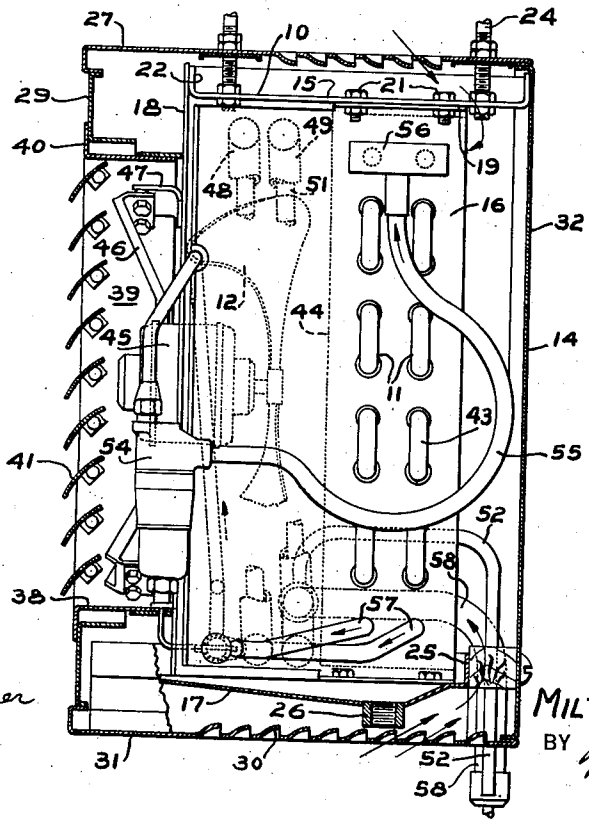


FIG. 2.



WITNESSES:
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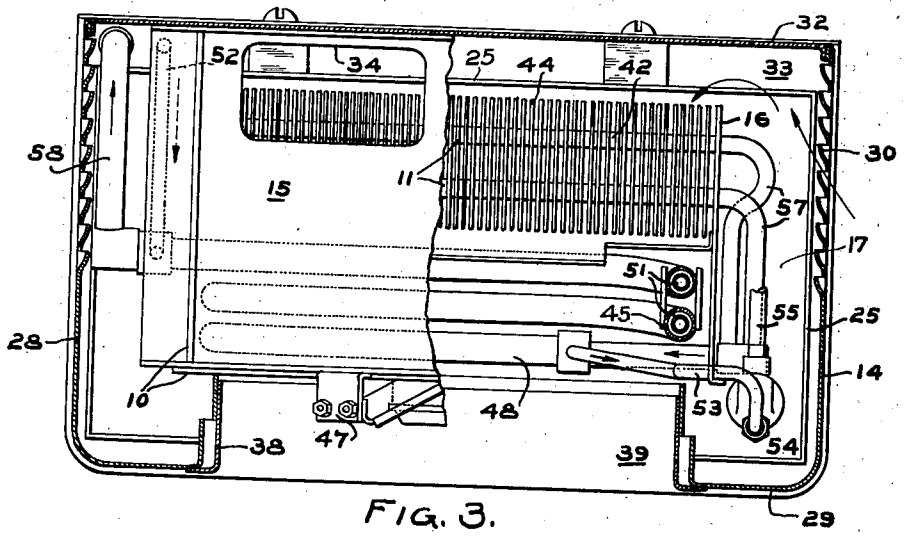


FIG. 3.

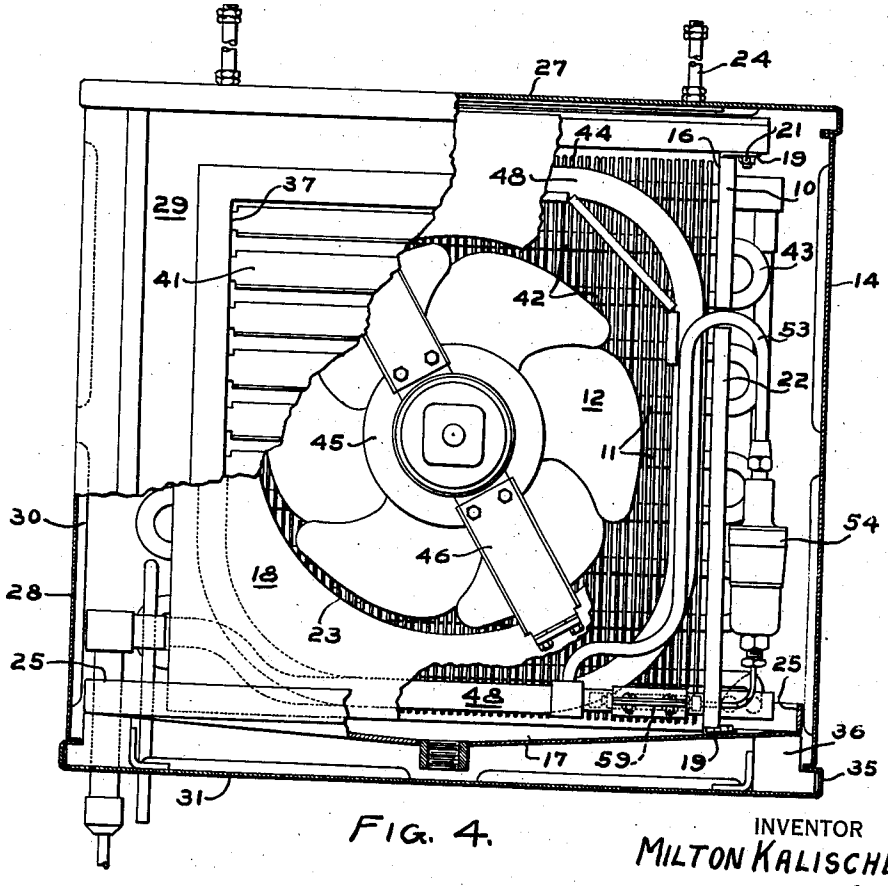


FIG. 4.

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Patented May 3, 1938 2,115,715

UNITED STATES PATENT OFFICE

2,115,715

AIR CONDITIONING APPARATUS

Milton Kalischer, Springfield, Mass., assignor to Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., a corporation of Pennsylvania

Application March 9, 1935, Serial No. 10,176

5 Claims. (Cl. 62—102)

My invention relates to air conditioning apparatus, more particularly to a unit air cooler of the suspended type, and it has for an object to provide improved apparatus.

A further object is to provide a unit air cooler having a compact arrangement of the parts thereof.

Another object is to provide a suspended unit air cooler having an inlet opening or openings so arranged that the cooler may be located against a ceiling or a wall, or placed upon a supporting surface.

In accordance with my invention, I provide a casing having a rear wall and top, bottom, and side walls extending forwardly from the rear wall. One, or preferably all, of the forwardly-extending walls are provided with an inlet opening adjacent the rear wall. A cooling element and a fan are disposed within the casing in spaced relation to the rear wall, the fan effecting circulation of air inwardly through one or more of said inlet openings and then forwardly over the cooling element.

The fan is located forwardly of the cooling element and driven by a motor disposed in front of the fan. The cooling element is preferably the evaporator of a refrigerating system, in which case I provide a double tube coil, disposed within the casing and about the fan, to serve as a heat exchanger to cool the liquid refrigerant supplied to the cooling element by the vaporized refrigerant discharged from the cooling element.

The above 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, forming a part of this application, in which:

Fig. 1 is a perspective view of the unit air cooler, with parts broken away;

Fig. 2 is an end view, in section, showing the inner casing in elevation;

Fig. 3 is a plan view in section and with parts broken away; and

Fig. 4 is a front elevational view, also with parts broken away and others in section.

Referring to the drawings in detail, I show a unit air cooler having an inner casing 10 through which the cooler is supported, cooling coils 11 mounted therein, a fan 12 disposed therein in front of the coils 11, and an outer casing 14 enclosing the inner casing and providing a suitable external appearance of the unit.

The inner casing includes a top wall 15, side walls 16, a bottom wall 17 and a front wall 18, and is open at the back. Adjacent walls are secured to each other in any suitable manner, as by bolting a flange on one wall to the adjacent wall. In the illustrated embodiment, outwardly extending flanges 19 are formed along the rear half of the top and bottom edges of the side walls 16 and are secured to the top and bottom walls 15 and 17, by bolts 21. Similarly, the front edges of the top and side walls, 15 and 16, are formed with outwardly-extending flanges 22 which are secured to the front wall 18.

The front wall 18 is formed with a circular outlet opening 23. Four bolts 24 are secured to the top wall 15 and extend upwardly for attachment to a ceiling or other structure from which the unit is suspended and supported. The bottom wall 17 is extended beyond the front and side walls and formed with an upwardly extending flange 25 at each edge, thereby forming a drip pan to collect moisture condensed from the air. It is provided with a drain connection 26 through which the condensate may be removed.

The outer casing 14, which may be made of thinner sheet metal than the inner casing, includes a top wall 27, side walls 28, a front wall 29, and a bottom wall 31, all disposed in spaced relation to the respective walls of the inner casing, and it further includes a rear wall 32. The rear edges of the side walls 16 and the bottom wall 17 of the inner casing are spaced from the rear wall 32, providing passages 33 for the flow of air. The inner top wall 15 extends to the rear wall 32, but is provided with openings 34 for the flow of air. The top, side and bottom walls of the outer casing are formed with louvers 30 adjacent the rear wall 32, providing inlet openings through which air enters and flows to the passages 33.

The outer bottom wall 31 is supported from the inner bottom wall 17, being formed with upwardly and inwardly-extending flange portions 35 engaging wood blocks 36 secured to the wall 17. The outer side and front walls, 28 and 29, are formed by a U-shaped member resting on the flange portions 35 and supporting the outer top wall 27. The outer casing is preferably constructed as described and claimed in the patent of R. E. Holmes, 2,115,720, granted May 3, 1938. The outer front wall 29 is provided with a rectangular outlet opening 37 opposite the outlet opening 23 in the inner front wall 18. A rectangular collar 38 extends inwardly from the edges of the opening 37 to the inner front wall 18, providing a discharge passage 39 between the outlet openings 23 and 37 and separating said passage from the remainder of the space between the inner and outer casings. Adjustable louvers 41 are

pivotally mounted in the collar **38** for directing the discharged air in the desired direction, and also serve to conceal the fan to an extent dependent upon their position. The opening **37** and the collar **38** are square, so that said collar may be installed with the louvers extending either vertically or horizontally as desired. The collar **38** has a flange **40** engaging the front wall **29**.

The cooling coils **11** comprise horizontal turns or tubes **42** mounted in the side walls **16**, and connected by U-shaped connecting conduits **43** to form serpentine coils. Plates or fins **44**, extending transversely of said turns **42**, are applied thereto to increase the air cooling surface. As shown in Figs. 2 and 3, the coils **11** are disposed adjacent the rear end of the inner casing, but in spaced relation to the rear wall **32**.

The fan **12** is preferably driven by and overhung on the shaft of an electric motor **45**, and the fan-motor unit is mounted in the inner casing in any suitable manner. For example, and as shown, brackets **46** may be secured at one end to the motor **45** and at the other end to angle pieces **47** secured to the inner front wall **18**. The motor **45** projects through the opening **23** into the passage **39**, and the adjacent side of the fan **12** is disposed substantially in the opening **23** to effect flow of air therethrough.

The fan **12** is spaced a short distance from the coils **11** in order to avoid excessive noise. The fan effects circulation of air in forward direction so that said space is also utilized to collect the moisture condensed from the air, which moisture is collected in the drip pan formed by the bottom wall **17**. This arrangement, in which the coils are on the suction side of the fan instead of the discharge side, also provides a more even distribution of air through the coils, while the velocity imparted to the cooled air in passing through the fan is utilized in obtaining a greater movement of air in the space into which said cooled air is discharged.

As is known in the art of refrigeration, greater efficiency can frequently be obtained by the use of a heat exchanger in which the liquid refrigerant supplied to the evaporator is cooled by the vaporized refrigerant discharged from the evaporator. I provide such a heat exchanger **48** in the form of a double tube coil disposed within the inner casing **15** and wound in two turns about the fan **12**, thereby utilizing an otherwise wasted space and accommodating said heat exchanger without increasing the size of the unit.

The heat exchanger **48** comprises an outer tube **49** and a smaller tube **51** within the outer tube. Liquid refrigerant from a supply conduit **52** is conveyed through the space between the tubes, then through a conduit **53**, a thermostatic expansion valve **54**, a conduit **55**, and header or connection **56** to the coils **11** in parallel. The vaporized refrigerant is discharged from the coils **11** through tubes **57** to the inner tube **51** of the heat exchanger wherein it cools the liquid refrigerant in the space between the tubes, and then flows to a suction conduit **58**. The conduits **52** and **58** are connected to a refrigerating or compressor-condenser unit of suitable design located at any convenient place. The thermostatic expansion valve **54** has a thermostatic tube **59** retained in contact with the inner tube **51**, so that it may respond to the temperature of the vaporized refrigerant, as is well known in the art.

The air cooler described above may be disposed with its rear wall **32** disposed against a wall of the room. Also one of the top, bottom and side walls may be disposed, at the same time, against the ceiling or another wall of the room, the inlets formed by the louvers **30** and the passages **33** being of sufficient capacity so that the inlets and passage of any three of said walls provide sufficient air flow. If desirable in a particular case, the rear wall **32** may be omitted or removed to permit flow of air in forward direction to the coils **11**, in which case the unit may be disposed against a ceiling and a wall of the room. It will thus be seen that the novel construction described enables the unit to be arranged in practically any desired location.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various 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. In a unit air conditioner, the combination of an inner casing comprising a first wall having an outlet opening therein and adjacent walls disposed at an angle thereto, means extending upwardly from said inner casing for supporting the same in suspended manner, a temperature-changing element mounted in said inner casing in spaced relation to said first wall, a fan-motor unit comprising a fan and a motor for driving the same mounted on said first wall partly in said outlet opening, and an outer casing structure supported by the inner casing and comprising walls corresponding to the first wall and at least three of the adjacent walls of the inner casing and disposed in spaced relation thereto, the first wall of the outer casing structure having an outlet opening registering with the first-mentioned outlet opening.

2. In a unit air cooler, the combination of an inner casing comprising front, top, bottom and side walls, said front wall having an outlet opening therein, an evaporator mounted in said casing adjacent the rear thereof, said evaporator being supplied with liquid refrigerant and discharging vaporized refrigerant therefrom, a fan-motor unit comprising a fan for circulating air forwardly over said evaporator and through said outlet opening and a motor for driving the fan, said fan-motor unit being mounted on said front wall and disposed partly in said outlet opening, an outer casing having walls corresponding to the walls of the inner casing and disposed in spaced relation thereto, the front wall of the outer casing having an outlet opening, and a heat exchanger utilizing the vaporous refrigerant discharged from the evaporator for cooling the liquid refrigerant supplied thereto, said heat exchanger comprising a double tube coil disposed about said fan motor unit.

3. In a unit air cooler, the combination of a casing comprising front, top, bottom and side walls, said front wall having an outlet opening therein, an evaporator mounted in said casing adjacent the rear thereof, said evaporator being supplied with liquid refrigerant and discharging vaporized refrigerant therefrom, a fan disposed between the evaporator and the front wall for circulating air forwardly over said evaporator and through said outlet opening, and a heat exchanger utilizing vaporized refrigerant discharged from the evaporator for cooling the liquid refrigerant supplied thereto, said heat exchanger

comprising a double tube coil disposed within said casing and about said fan.

4. In a unit air conditioner. the combination of a chassis, means extending upwardly from said chassis for supporting the same in suspended manner, a temperature-changing element carried by said chassis, a propeller fan arranged forwardly of said element and carried by said chassis, and an outer casing carried by said chassis and comprising a front wall having an outlet opening registering with said fan, a rear wall disposed adjacent to but spaced from said temperature-changing element, and a plurality of walls connecting said front and rear walls, one or more of said connecting walls having an inlet opening therein communicating with the space between said element and said rear wall, said fan operating to translate air forwardly, whereby air is caused to flow inwardly through said inlet opening, through the space between said element and said rear wall and forwardly through said element and said outlet opening.

5. In a unit air conditioner, the combination of a chassis, means extending upwardly from said chassis for supporting the same in suspended manner, a cooling element carried by said chassis, a propeller fan arranged forwardly of said element and carried by said chassis, a drip pan carried by said chassis and extending under said cooling element and said propeller fan for collecting the moisture condensed out of the air by said cooling element, and an outer casing carried by said chassis and comprising a front wall having an outlet opening registering with said fan, a rear wall disposed adjacent to but spaced from said cooling element, and a plurality of walls connecting said front and rear walls, one or more of said connecting walls having an inlet opening therein communicating with the space between said element and said rear wall, said fan operating to translate air forwardly, whereby air is caused to flow inwardly through said inlet opening, through the space between said element and said rear wall and forwardly through said element and said outlet opening.

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