Nov. 17, 1970 P. H. BUNTEN 3,540,229

AIR COOLING APPARATUS

Filed Jan. 24, 1969 3 Sheets-Sheet 1

FIG. 1

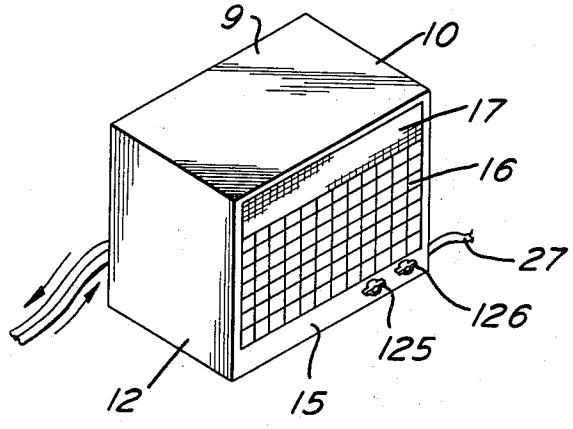
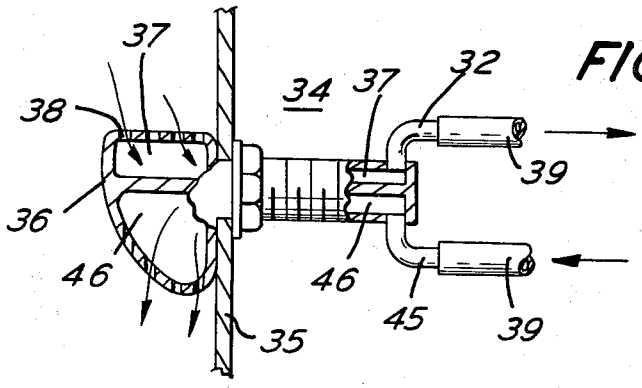


FIG. 7



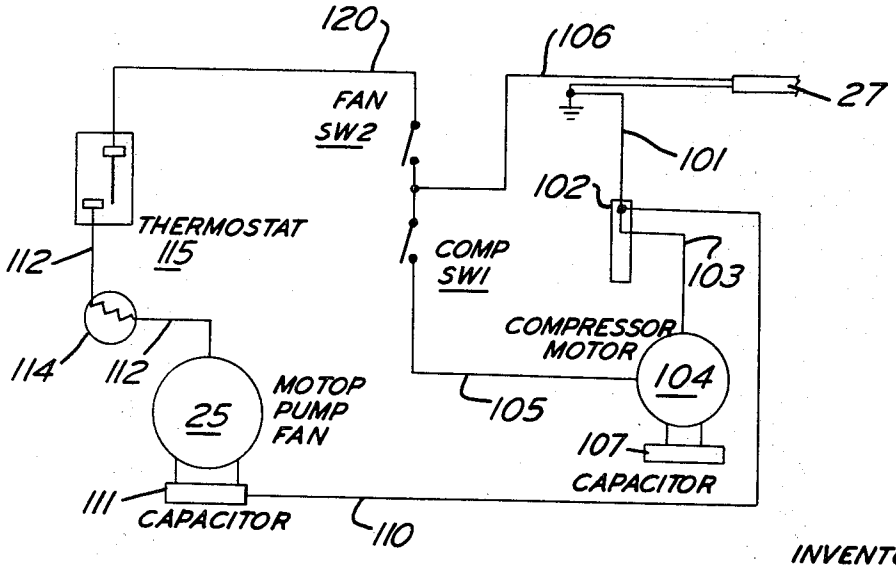


FIG. 8

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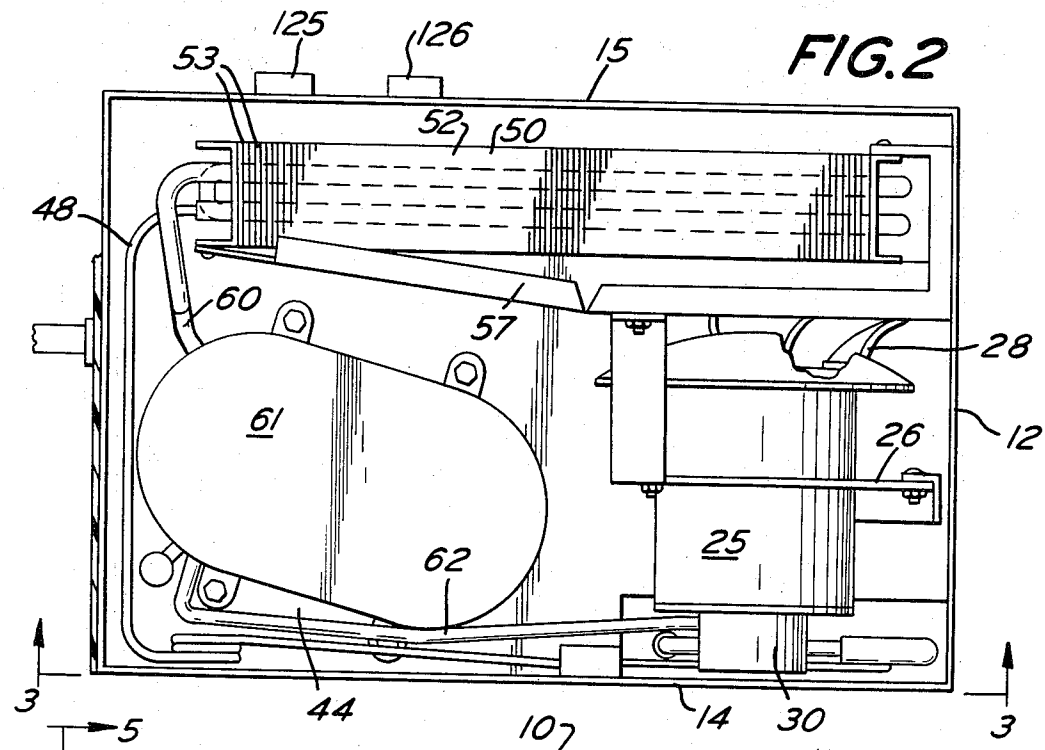
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AIR COOLING APPARATUS

Filed Jan. 24, 1969 3 Sheets-Sheet 2

FIG. 2



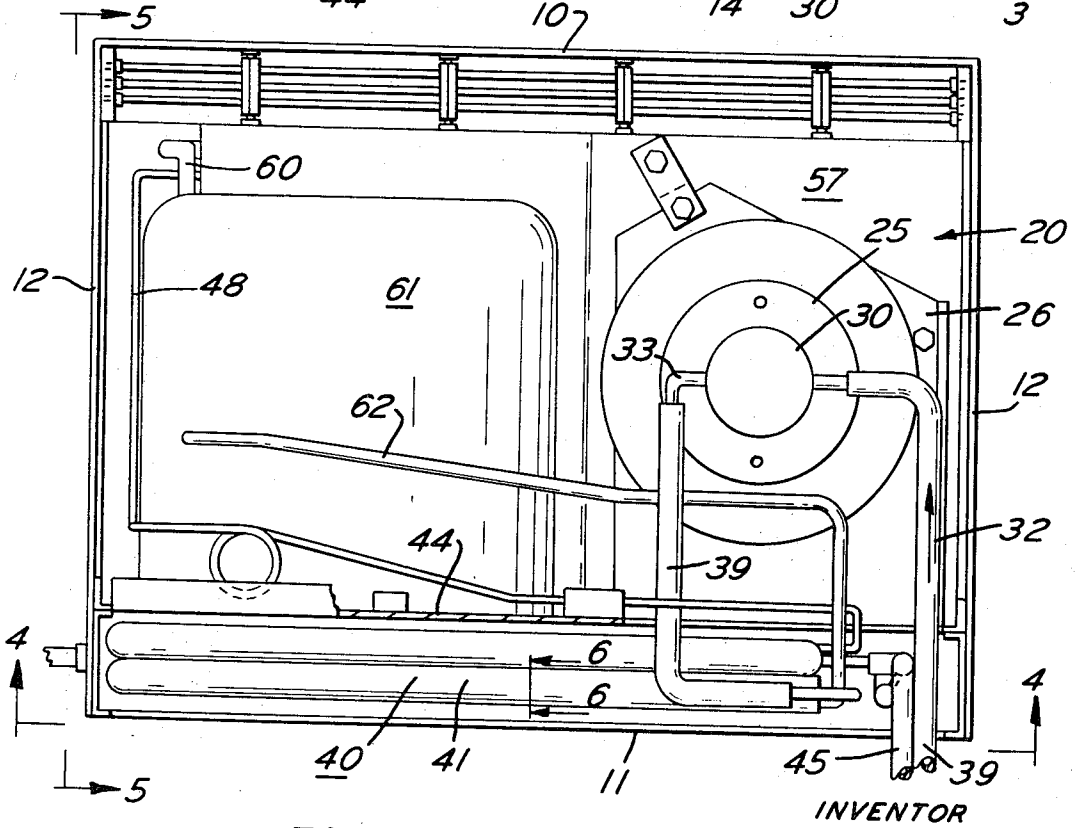


FIG. 3

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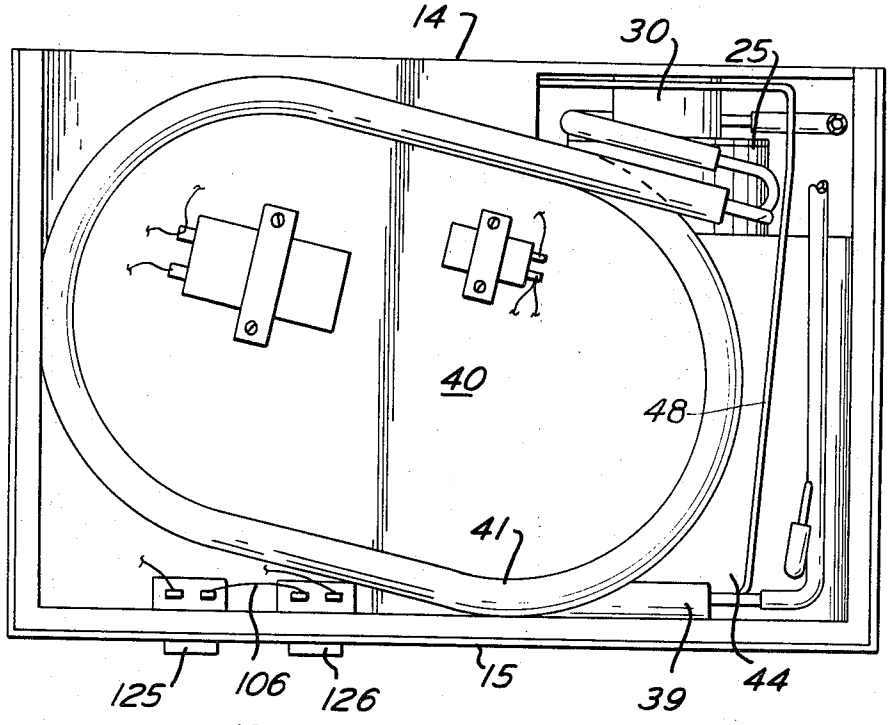
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AIR COOLING APPARATUS

Filed Jan. 24, 1969 3 Sheets-Sheet 3

FIG.4



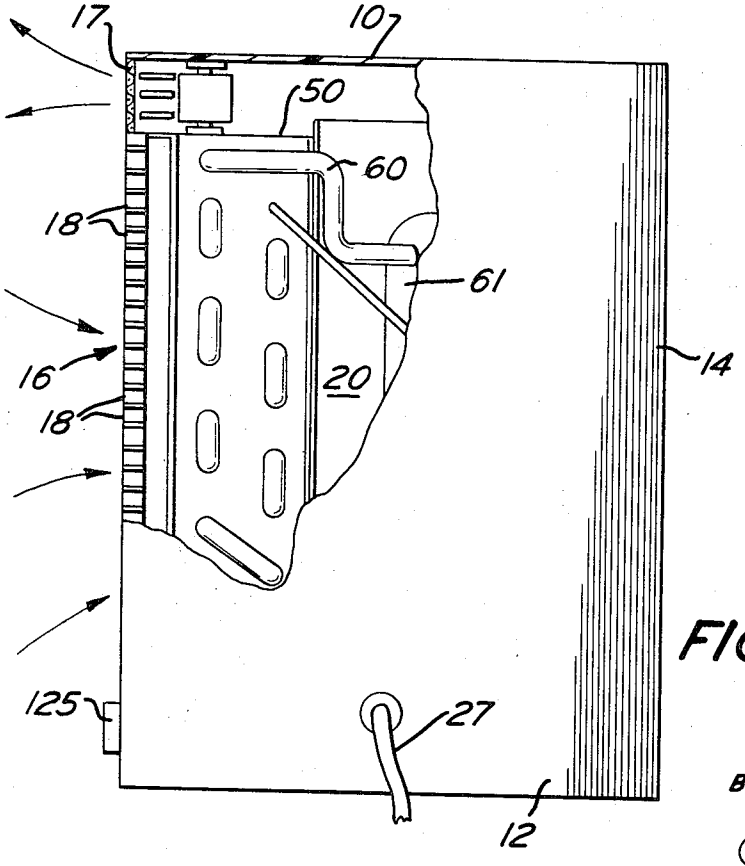


FIG.6

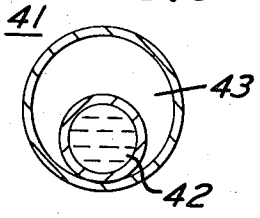


FIG.5

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United States Patent Office

3,540,229

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AIR COOLING APPARATUS

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Int. Cl. B63b 25/26

U.S. Cl. 62—240 7 Claims

ABSTRACT OF THE DISCLOSURE

Air cooling apparatus for use in boats which is resistant to corrosion, and comprises a unit having a compressor, condenser and evaporator and a cool air circulating fan and cooling water pump driven by the same motor. The unit is mounted entirely within the boat, and uses the external water for cooling the condenser.

BACKGROUND OF THE INVENTION

Field of the invention

This invention relates to air cooling apparatus particularly for boats which is constructed of corrosion resistant material, is internally mounted within the boat and uses water from that surrounding the boat for cooling.

Description of the prior art

The use of air coolers or conditioners for cooling of air in homes and cars has grown considerably in recent years and demand for a good air cooler has now spread to the boating industry.

Air coolers or conditioners as used in homes are not satisfactory for use in boats, for several reasons one of which is that the materials of which they are constructed are subject to corrosion and the resultant service life in boats is usually but a few weeks.

In addition the units available use excessive amounts of electricity which is often not present on the boats or dockside, do not operate satisfactorily for cooling without ventilation and under the conditions present on boats must be externally mounted thereby interfering with safe operation and appearance of the boat.

The present air cooling apparatus is corrosion resistant, is mounted entirely within the boat, uses less electricity than previously available boat coolers and is water cooled.

SUMMARY OF THE INVENTION

In accordance with the invention air cooling apparatus for boats is provided which is water cooled, internally mounted within the boat, totallly self-contained, operates economically and is constructed of corrosion resistant materials.

The principal object of the present invention is to provide air cooling apparatus particularly suitable for use on boats.

A further object of the present invention is to provide air cooling apparatus that is water cooled, with its own self contained water pumping system.

A further object of the present invention is to provide air cooling apparatus of low electricity consumption and suitable for operation from the power supply of a boat.

A further object of the present invention is to provide air cooling apparatus totally self contained with its own water pumping system, and that is mounted anywhere entirely within the boat.

A further object of the present invention is to provide air cooling apparatus that is resistant to corrosion.

A further object of the present invention is to provide air cooling apparatus for boats that uses a single electric motor, to pump the coolant water, and to move the air through the apparatus.

Other objects and advantageous features of the invention will be apparent from the description and claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The nature and characteristic features of the invention will be more readily understood from the following description taken in connection with the accompanying drawings forming part thereof, in which:

FIG. 1 is a view in perspective of the air cooling apparatus of the present invention removed from the boat;

FIG. 2 is a top view of the air cooling apparatus as shown in FIG. 1, with the top cover removed;

FIG. 3 is a horizontal sectional view, taken approximately on the line 3—3 of FIG. 2;

FIG. 4 is a horizontal sectional view, taken approximately on the line 4—4 of FIG. 3;

FIG. 5 is a vertical sectional view, taken approximately on the line 5—5 of FIG. 3;

FIG. 6 is a vertical sectional view, enlarged, taken approximately on the line 6—6 of FIG. 3;

FIG. 7 is an enlarged cutaway view of the water exchange portion of the air cooling aparatus, and

FIG. 8 is a schematic view of the electrical circuit used with the apparatus of the present invention.

It should, of course, be understood that the description and drawings herein are illustrative merely, and that various modifications and changes can be made in the structure disclosed without departing from the spirit of the invention.

Like numerals refer to like parts throughout the several views.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now more particularly to the drawings, the air cooler apparatus is of rectangular box like shape having an outer cabinet **9** comprised of top and bottom walls **10** and **11**, side walls **12**, rear wall **14** and front wall **15**.

The front wall **15** is provided with two grill portions **16** and **17**. The grill portion **16** is the inlet grill and has a plurality of large openings **18** to permit warm air to be cooled to flow into the interior **20** of the cabinet **9**. The grill portion **17** is the outlet grill through which the cooled air flows from interior **20** and is preferably composed of any desired material.

The bottom wall **11** has a motor **25** mounted thereto by vertical flanges **26**. The motor **25** is connected to an electrical source (not shown) by power cord **27** through the circuit shown in FIG. 8 to be described below.

The motor **25** for this embodiment is a one twelfth horsepower 110 volt motor of very high starting torque design which at the forward end of the shaft as shown in FIG. 2 carries a fan **28** of a type to provide positive pressure within the cabinet **9** and thereby cool the compressor **61** and for drawing warm air through grill **16** into and through the interior of the cabinet **9** and over the evaporator **50** and out through the grill **17** as cooled air. The fan **28** combines the desirable characteristics of both the squirrel cage and the propeller types with reduced noise and compactness.

At the rear end of the shaft of the motor **25** a water pump **30** is provided attached to the motor **25**, the pump **30** is of conventional positive displacement self priming type, and constructed of corrosion resistant material so that it can be used with both salt and fresh water.

The pump **30** has an inlet pipe **32** and an outlet pipe **33** attached to it. The inlet pipe **32** extends to a water scoop and exchange member **34** which is mounted through the hull **35** of a boat (not shown) below the water line. The member **34** as shown in FIG. 7 is of cylindrical shape retained to the hull **35** by nut **31** and with a head portion **36** which is external to the hull **35** and has an inlet pas-

sage **37** therein at the top with a screen **38**. The passage **37** extends through the member **34** to and connects to the pipe **32** to supply filtered cool water thereto. The outlet pipe **33** extends from the pump **30** to a condenser **40**.

The condenser **40** is comprised of a plurality of coils of pipe **41** and as shown in FIG. 6 is of double wall construction with an interior passageway **42** carrying the water from the pipe **33** and an outer passageway **43** carrying the refrigerant material. A horizontal partition **44** may be provided in the cabinet **9** to isolate the condenser **40** from the air moving thereabove.

An outlet pipe **45** connects to the condenser **40** to carry hot water to the head **36** of member **34** wherein it is discharged through passageway **46** to the body of water surrounding the boat (not shown).

The refrigerant utilized in the condenser **40** and elsewhere may be of any suitable type such as refrigerant **22** or other desired refrigerant.

The condenser **40** which contains the heated refrigerant in the outer passageway **43** is reduced to a low temperature by the cool water passing therethrough and combined with the high pressure of the refrigerant condenses the material so that it is in a liquid state. The condenser **40** has a capillary tube expansion device **48** connecting it to one side of an evaporator **50**.

The evaporator **50** is composed of several coils of pipe **52** which extend across the front wall **15** in back of the grill **17** and are mounted within a plurality of fins **53** which permits a greater surface area for cooling. The evaporator **50** is mounted to brackets **55** and has a baffle plate **57** attached below and downwardly inclined within interior **20** to guide the air flowing in grill **16** over and out past evaporator **50** in contact therewith for cooling and through grill **17**.

The liquid refrigerant under pressure when introduced into the evaporator expands into a gaseous state, the process thereby absorbing large quantities of heat and cooling the coils of pipe **52** and the fins **53**.

The other end of evaporator **50** is connected by pipe **60** to compressor **61**. The compressor **61** is of conventional sealed type and is designed to compress the gaseous refrigerant from the evaporator and force it into the condenser **46** by pipe **62** connected to the compressor **61** and to the condenser **40**. The capillary tube **48** provides for control of expansion of the refrigerant for cooling.

The water circulating in the condenser **40** cools the refrigerant so that it is liquified and then flows into the evaporator **50** as previously described.

The electrical circuit is shown in FIG. 8 and includes an electrical power source (not shown) with a two wire cord **27** connected thereto and by lead **101** to a common junction **102**.

A lead **103** connects from the common junction **102** to one side of a compressor motor **104** which is connected on the other side by lead **105** to a normally open switch SW1 and by lead **106** to cord **27**. The compressor motor **104** has a capacitor **107** attached thereto to aid in starting.

A lead **110** connects from the junction **102** to one side of the fan and pump motor **25** which has a capacitor **111** attached thereto and is connected by lead **112** through fuse **114** to a thermostat **115**. The thermostat **115** is of well known type and connected by lead **120** to normally open switch SW2 which is connected to lead **105** and therefrom to a source of electrical energy. The thermostat **115** as shown in FIG. 1 is provided with a knob **125** below grill **16** on wall **15**. The switches SW1 and SW2 are combined in a 3 position switch (not shown) with knob **126** and which provides an off position, a fan only position and combined fan and water pump position.

It is thus apparent that structure has been provided with which the objects of the invention are attained.

I claim:

1. Air conditioning apparatus for use in boats comprising, as a self contained unit,
- an outer cabinet with air inlet and outlet openings,
- a motor driven compressor within the cabinet,
- an evaporator and a condenser in said cabinet in series with the compressor,
- water cooling means for said condenser,
- a self priming liquid pump in said cabinet for circulating water in said water cooling means,
- a fan in said cabinet for delivering air from said air inlet and through said air outlet opening in contact therebetween with said evaporator, and
- driving means in said cabinet for said pump and said fan.

2. Air conditioning apparatus as defined in claim **1** in which said driving means is an electric motor.

3. Air conditioning apparatus as defined in claim **2** in which said motor is interposed between said fan and said pump.

4. Air conditioning apparatus as defined in claim **3** in which said fan and said pump are directly connected to a common motor shaft.

5. Air conditioning apparatus as defined in claim **1** in which
- a partition is provided at the lower part of said cabinet, and
- said compressor is disposed above said partition, and
- said condenser is disposed below said partition and below said compressor.

6. Air conditioning apparatus as defined in claim **1** in which
- said condenser includes a refrigerant carrying tube outside a cooling water carrying tube.

7. Air conditioning apparatus as defined in claim **6** having
- fluid connections extending from said cooling water carrying tube to the exterior of the boat.

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WILLIAM I. WYE, Primary Examiner

U.S. Cl. X.R.

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