A spot cooling air conditioner system is for open boats having an open cockpit with seats. A refrigerant compressor is driven by the engine. A condenser includes a cooling water passage and a refrigerant passage in thermal communication. The condenser cooling water is supplied by the engine water pump.

An evaporator includes an air passage and a refrigerant passage in thermal communication. Pressure-regulating means is an orifice tube. Drying means includes an accumulator. The compressor, condenser, and evaporator refrigerants are connected. The orifice tube is connected between the condenser and the evaporator. The accumulator is connected between the evaporator and the compressor.

Air moving means includes a blower connected to the evaporator air passage. A plurality of ducts is connected to the evaporator. The ducts selectively direct cooled air toward the seats in the open cockpit, thereby spot cooling passengers in the open cockpit.
SPOT COOLING SYSTEM FOR OPEN BOATS

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable

BACKGROUND OF THE INVENTION

[0003] This invention relates to the field of air conditioners, and more particularly to an air conditioning system that cools individual occupants in an open boat, rather than an enclosed room.

[0004] Air conditioners for cooling the internal volume of an enclosed room or cabin are well known, and in common use in buildings, cars, and boats. However, cooling has not been available to occupants of open boats heretofore. Operating an open boat in hot weather presents discomfort, and in some cases, health problems as well. Drivers and crew have experienced heat stroke in extreme cases.

[0005] Conventional boat air conditioners will typically comprise a closed system having a refrigerant, such as R12 (freon®) or R134a. The system is divided into two sides, a high pressure or discharge side, and a low pressure or suction side. A compressor is used to compress and transfer the refrigerant gas to the condenser. The heat of compression is transferred to a coolant fluid. In this case, water is conveyed through a hull fitting, through the engine cooling pump, through the condenser, and then to the engine cooling system, and overboard. The cooled refrigerant condenses into a liquid and flows from the condenser to a pressure-regulating device. This device can be either a thermal expansion valve, or an orifice tube. The pressure-regulating device decreases and controls the refrigerant pressure and temperature. The refrigerant enters an evaporator and absorbs heat as it expands into a gas. Cabin air is blown through the evaporator, loses heat to the refrigerant, and returns to the cabin as cool air. A drying device is needed to separate moisture and contaminants from the refrigerant. A system using an expansion valve requires a receiver-drier downstream of the condenser to ensure that the refrigerant is dry. A system using an orifice requires an accumulator downstream of the evaporator to trap liquid, which would destroy the compressor.

[0006] Open boats used for competition skiing, such as slalom, tricks, jumping, and wakeboarding, have requirements peculiar to these sports. Specifically, the speed must be controlled within narrow limits. Conventional air conditioners typically will cycle on and off. This places changing loads on the engine, thereby causing the RPM to change with the load. The resulting speed fluctuations are unacceptable in water sports. The air conditioning system must have steady-state capability.

[0007] Some examples of marine air conditioners in the prior art are seen in the following:

[0008] Brunner, U.S. Pat. No. 6,701,733; discloses an engine-driven compressor and water-cooled condenser. The evaporator is clearly shown inside a cabin. No structure or method is disclosed for spot cooling passengers in an open boat. On a theoretical basis, the Brunner system is thermodynamically functional. On a practical basis however, the Brunner system neither shows nor suggests a drying device, and is therefore left vulnerable to compressor damage.

[0009] Dodge, U.S. Pat. No. 5,848,536; shows a system having the condenser and the evaporator in the same air-cooling shroud. No structure or method is disclosed for spot cooling passengers in an open boat.

[0010] Pressnill, U.S. Pat. No. 6,026,653; illustrates an icebox and heat exchanger providing chilled air to a cabin. The ice is heavy, bulky, and short-lived. No structure or method is disclosed for spot cooling passengers in an open boat.

[0011] Machen, U.S. Pat. No. 4,967,569; depicts a window type portable system mounted over a boat hatch to cool the cabin within. No structure or method is disclosed for spot cooling passengers in an open boat.

[0012] Accordingly, there is a need to provide a spot cooling system for open boats that can prevent discomfort and health problems due to hot weather.

[0013] There is a further need to provide a spot cooling system for open boats of the type described and that will deliver a cool air stream directly upon passengers, so as to directly cool the passengers, instead of cooling an entire cabin.

[0014] There is a yet further need to provide a spot cooling system for open boats of the type described and that has steady-state capability for constant boat speed.

[0015] There is still further need to provide a spot cooling system for open boats of the type described and that will utilize standard automotive components for economy.

[0016] There is another need to provide a spot cooling system for open boats of the type described and that can be manufactured cost-effectively in large quantities of high quality.

BRIEF SUMMARY OF THE INVENTION

[0017] In accordance with the present invention, there is provided a spot cooling system for open boats 10 used in connection with a boat 12 having an open cockpit 14 with seats 16, a hull 18, and an engine. A cooling water pump 20 is driven by the engine. The cooling system has a cooling water inlet 22.

[0018] The spot cooling system is an air conditioner having a closed system and a refrigerant. A compressor 26 is driven by the engine. The compressor 26 has a compressor inlet 28 and a compressor outlet 30. A condenser 32 includes a cooling water passage 36 and a refrigerant passage 34. The refrigerant passage 34 and the cooling water passage 36 are in thermal communication. The refrigerant passage 34 has a condenser refrigerant inlet 38 and a condenser refrigerant outlet 40. The cooling water passage 36 has a condenser cooling inlet 42 and a condenser cooling outlet 44. The condenser refrigerant inlet 38 is connected to the compressor outlet 30. The condenser cooling inlet 42 is in fluid communication with the cooling water pump 20.

[0019] An evaporator 46 is provided. The evaporator 46 includes an air passage 50 and a refrigerant passage 48. The refrigerant passage 48 and the air passage 50 are in thermal communication. The refrigerant passage 48 has an evaporator refrigerant inlet 52 and an evaporator refrigerant outlet 54. The air passage 50 has an evaporator air inlet 56 and an evaporator air outlet 58.

[0020] Pressure-regulating means is an orifice tube 60. Drying means includes an accumulator 62. The compressor outlet 30 is connected to the condenser refrigerant inlet 38. The orifice tube 60 is connected between the condenser...
refrigerant outlet 40 and the evaporator refrigerant inlet 52. The accumulator 62 is connected between the evaporator refrigerant outlet 54 and the compressor inlet 28.

[0021] Air moving means includes a blower 64 in fluid communication with the evaporator air passage 50. The blower 64 includes blower blades and a motor. A plurality of ducts 66 is provided. Each of the ducts 66 has a proximal end 68 in fluid communication with the evaporator air outlet 58. The distal ends 70 of the ducts 66 are disposed adjacent the seats 16 in the open cockpit 14, for selectively directing air toward the seats 16 in the open cockpit 14.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING

[0022] A more complete understanding of the present invention may be obtained from consideration of the following description in conjunction with the drawing, in which:

[0023] FIG. 1 is a right side, partial sectional, elevational view of a spot cooling system for open boats constructed in accordance with the invention, and showing an orifice and accumulator.

[0024] FIG. 2 is a right side, partial sectional, elevational view of another spot cooling system for open boats constructed in accordance with the invention, and showing an expansion valve and receiver-dryer.

[0025] FIG. 3 is a top plan view of the spot cooling system for open boats of FIG. 1.

[0026] FIG. 4 is a top plan view of the spot cooling system for open boats of FIG. 2.

DETAILED DESCRIPTION OF THE INVENTION

[0027] Referring now to the drawing, and especially to FIGS. 1 and 3 thereof, a spot cooling system for open boats is shown at 10 and is for use in connection with a boat 12 having an open cockpit 14 with seats 16, a hull 18, and an engine (not shown). The engine has a cooling system and a cooling water pump 20 driven by the engine. The cooling system has a cooling water inlet 22 and a cooling water outlet (not shown). Cooling water flow is indicated by arrows 24.

[0028] The spot cooling system is an air conditioner having a closed system and a refrigerant, as described above. A compressor 26 is driven by the engine for compressing the refrigerant. The compressor 26 has a compressor inlet 28 and a compressor outlet 30. Refrigerant flow is indicated by arrows 74.

[0029] A condenser 32 is provided for condensing the refrigerant. The condenser 32 includes a fluid-tight housing defining a first passage, which is a cooling water passage 36. The condenser 32 includes at least one conduit within the housing, the conduit defining a second passage, which is a refrigerant passage 34. The first passage and the second passage are fluidly sealed from one another. The refrigerant passage 34 and the cooling water passage 36 are in thermal communication with one another. The refrigerant passage 34 has a condenser refrigerant inlet 38 and a condenser refrigerant outlet 40. The cooling water passage 36 has a condenser cooling inlet 42 and a condenser cooling outlet 44. The condenser refrigerant inlet 38 is connected to the compressor outlet 30. The condenser cooling inlet 42 is in fluid communication with the cooling water pump 20. Alternatively, a separate cooling water pump (not shown) can be driven with an auxiliary motor. This would supply cooling water to the condenser cooling inlet 42 independently of the engine cooling system and cooling water pump 20.

[0030] An evaporator 46 is provided for evaporating the refrigerant. The evaporator 46 includes a fluid-tight housing defining a first passage, which is an air passage 50. The evaporator 46 includes at least one conduit within the housing, the conduit defining a second passage, which is a refrigerant passage 48. The first passage and the second passage are fluidly sealed from one another. The refrigerant passage 48 and the air passage 50 are in thermal communication with one another. The refrigerant passage 48 has an evaporator refrigerant inlet 52 and an evaporator refrigerant outlet 54. The air passage 50 has an evaporator air inlet 56 and an evaporator air outlet 58.

[0031] Pressure-regulating means is provided for regulating refrigerant pressure. Drying means is provided for drying the refrigerant. The compressor 26, the condenser refrigerant passage 34, the evaporator refrigerant passage 48, the pressure-regulating means, and the drying means are all in fluid communication with one another.

[0032] In the preferred embodiment, the pressure-regulating means includes an orifice tube 60. The drying means includes an accumulator 62. The compressor outlet 30 is connected to the condenser refrigerant inlet 38. The orifice tube 60 is connected between the condenser refrigerant outlet 40 and the evaporator refrigerant inlet 52. The accumulator 62 is connected between the evaporator refrigerant outlet 54 and the compressor inlet 28.

[0033] High-pressure tubing connects the various components together. The entire system filled with an appropriate refrigerant, such as R-12 or R-134a.

[0034] Air moving means is provided for moving air through the evaporator air passage 50. This includes a blower 64 in fluid communication with the evaporator air passage 50. The blower 64 includes blower blades and a motor. Airflow is indicated by arrows 72.

[0035] At least one, and preferably a plurality of ducts 66 are provided. Each of the ducts 66 has a proximal end 68 in fluid communication with the evaporator air outlet 58. The distal ends 70 of the ducts 66 are disposed adjacent the seats 16 in the open cockpit 14, for directing air toward the seats 16 in the open cockpit 14. Each of the ducts 66 is selectively directable, and can thus be aimed to direct cooling air for maximum passenger comfort.

[0036] Turning now to FIGS. 2 and 4, another embodiment of the spot cooling system for open boats is shown at 110. The spot cooling system 110 is similar to the spot cooling system 10, in that it is for use in connection with a boat 112 having an open cockpit 114 with seats 116, a hull 118, and an engine (not shown). The engine has a cooling system and a cooling water pump 120 driven by the engine. The cooling system has a cooling water inlet 122 and a cooling water outlet (not shown). Arrows 124 indicate cooling water flow.

[0037] The spot cooling system is an air conditioner having a closed system and a refrigerant, as described above. A compressor 126 is driven by the engine for compressing the refrigerant. The compressor 126 has a compressor inlet 128 and a compressor outlet 130. Refrigerant flow is indicated by arrows 174.

[0038] A condenser 132 is provided for condensing the refrigerant. The condenser 132 includes a fluid-tight housing defining a first passage, which is a cooling water passage 136. The condenser 132 includes at least one conduit within the housing, the conduit defining a second passage, which is a
refrigerant passage 134. The first passage and the second passage are fluidly sealed from one another. The refrigerant passage 134 and the cooling water passage 136 are in thermal communication with one another. The refrigerant passage 134 has a condenser refrigerant inlet 138 and a condenser refrigerant outlet 140. The cooling water passage 136 has a condenser cooling inlet 142 and a condenser cooling outlet 144. The condenser refrigerant inlet 138 is connected to the compressor outlet 130. The condenser cooling inlet 142 is in fluid communication with the cooling water pump 120. Alternatively, a separate cooling water pump (not shown) can be driven with an auxiliary motor.

**0039** An evaporator 146 is provided for evaporating the refrigerant. The evaporator 146 includes a fluid-tight housing defining a first passage, which is an air passage 150. The evaporator 146 includes at least one conduit within the housing, the conduit defining a second passage, which is a refrigerant passage 148. The first passage and the second passage are fluidly sealed from one another. The refrigerant passage 148 and the air passage 150 are in thermal communication with one another. The refrigerant passage 148 has an evaporator refrigerant inlet 152 and an evaporator refrigerant outlet 154. The air passage 150 has an evaporator air inlet 156 and an evaporator air outlet 158.

**0040** Pressure-regulating means is provided for regulating refrigerant pressure. Drying means is provided for drying the refrigerant. The compressor 126, the condenser refrigerant passage 134, the evaporator refrigerant passage 148, the pressure-regulating means, and the drying means are all in fluid communication with one another.

**0041** The spot cooling system 110 differs from the spot cooling system 10, in that the pressure-regulating means includes a thermal expansion valve 160. The drying means includes a receiver-drier 162. The compressor outlet 130 is connected to the condenser refrigerant inlet 138. The thermal expansion valve 160 is connected between the receiver-drier 162 and the evaporator refrigerant inlet 152. The receiver-drier 162 is connected between the condenser refrigerant outlet 140 and the thermal expansion valve 160. The evaporator refrigerant outlet 154 is connected to the compressor inlet 128.

**0042** Air moving means is provided for moving air through the evaporator air passage 150. This includes a blower 164 in fluid communication with the evaporator air passage 150. The blower 164 includes blower blades and a motor. Airflow is indicated by arrows 172.

**0043** At least one, and preferably a plurality of ducts 166 are provided. Each of the ducts 166 has a proximal end 168 in fluid communication with the evaporator air outlet 158. The distal ends 170 of the ducts 166 are disposed adjacent the seats 116 in the open cockpit 114, for directing air toward the seats 116 in the open cockpit 114. Each of the ducts 166 is selectively directable, and can thus be aimed to direct cooling air for maximum passenger comfort.

**0044** A method is also disclosed for spot cooling for open boats. The method comprises the steps of providing a boat with an open cockpit, providing the open cockpit with seats. Then providing a refrigerant, providing a compressor, driving the compressor by the engine, and compressing the refrigerant. Next, providing a condenser, connecting the compressor to a refrigerant passage of the condenser, and condensing the refrigerant.

**0045** Next, providing an evaporator in fluid communication with the compressor and the condenser, and evaporating the refrigerant. Then, providing a pressure-regulating means in fluid communication with the condenser and the evaporator, and regulating refrigerant pressure. Next, providing a drying means in fluid communication with the evaporator and the condenser, and drying the refrigerant.

**0046** Next, moving air through an air passage of the evaporator, cooling the air with the evaporator, thereby creating cooled air, providing at least one duct, and connecting a proximal end of the duct to an evaporator air outlet. Then, positioning a distal end of the duct adjacent the seats in the open cockpit, directing the cooled air toward the seats in the open cockpit, and cooling passengers in the open cockpit with the cooled air.

**0047** Further steps comprise juxtaposing an evaporator refrigerant passage and an evaporator air passage in thermal communication with one another, connecting a blower, including blower blades and a motor, in fluid communication with an air inlet of the evaporator air passage, and moving air through the evaporator air passage with the blower.

**0048** Yet further steps comprise providing a plurality of ducts, and connecting a proximal end of each of the ducts in fluid communication with an air outlet of the evaporator air passage, positioning a distal end of each of the ducts adjacent the seats in the open cockpit, and directing each of the ducts selectively toward the seats in the open cockpit, thereby directing the cooled air for maximum passenger comfort.

**0049** Still further steps comprise juxtaposing a condenser refrigerant passage and a condenser cooling water passage in thermal communication with one another, providing the cooling water passage with a condenser cooling inlet and a condenser cooling outlet, providing a boat engine cooling system in fluid communication with a cooling water pump and a cooling water inlet, connecting the cooling water pump in fluid communication with the condenser cooling water passage and condensing the refrigerant with cooling water, and driving the cooling water pump with the engine. An alternative step is driving the cooling water pump with an auxiliary motor.

**0050** More steps comprise connecting the cooling water pump to the cooling water inlet and the condenser cooling inlet, and connecting the condenser cooling outlet to the boat engine cooling system. Alternatives to these steps comprise connecting the cooling water inlet to the condenser cooling inlet, and connecting the cooling water pump to the condenser cooling outlet and to the boat engine cooling system.

**0051** Yet more steps comprise using an orifice tube as the pressure-regulating means, and using an accumulator as the drying means.

**0052** Still more steps comprise connecting a compressor outlet to a condenser refrigerant inlet, connecting an orifice tube between a condenser refrigerant outlet and an evaporator refrigerant inlet, and connecting an accumulator between an evaporator refrigerant outlet and a compressor inlet.

**0053** Additional steps comprise using a thermal expansion valve as the pressure-regulating means, and using a receiver-drier as the drying means.

**0054** Yet additional steps comprise connecting a compressor outlet to a condenser refrigerant inlet, connecting the thermal expansion valve between the receiver-drier and an evaporator refrigerant inlet, connecting the receiver-drier between a condenser refrigerant outlet and the thermal expansion valve, and connecting an evaporator refrigerant outlet to a compressor inlet.
Numerous modifications and alternative embodiments of the invention will be apparent to those skilled in the art in view of the foregoing description. Accordingly, this description is to be construed as illustrative only and is for the purpose of teaching those skilled in the art the best mode of carrying out the invention. Details of the structure may be varied substantially without departing from the spirit of the invention and the exclusive use of all modifications that will come within the scope of the appended claims is reserved.

PARTS LIST

<table>
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<tr>
<th>Part</th>
<th>Spot Cooling System for Open Boats</th>
</tr>
</thead>
<tbody>
<tr>
<td>0056</td>
<td>No. Description</td>
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<td>10 spot cooling system</td>
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<td>12 boat</td>
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<tr>
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<td>32 condenser</td>
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<td>172 air flow</td>
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<td>0122</td>
<td>174 refrigerant flow</td>
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The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A spot cooling system for open boats, comprising:
   - a boat, the boat having an open cockpit, a hull, an engine, a cooling water inlet, and a cooling water outlet; the open cockpit having seats, the engine having a cooling system, a cooling water pump in fluid communication with the cooling water inlet and cooling water outlet;
   - a condenser;
   - a compressor for compressing the refrigerant, the compressor having a compressor inlet and a compressor outlet;
   - a condenser for condensing the refrigerant, the condenser having a refrigerant passage and a cooling water passage in thermal communication with one another, the refrigerant passage having a condenser refrigerant inlet and a condenser refrigerant outlet, the cooling water passage having a condenser cooling inlet and a condenser cooling outlet, the condenser refrigerant inlet being connected to the compressor outlet, the condenser cooling inlet being in fluid communication with the cooling water pump;
   - an evaporator for evaporating the refrigerant, the evaporator having a refrigerant passage and an air passage in thermal communication with one another, the refrigerant passage having an evaporator refrigerant inlet and an evaporator refrigerant outlet, the air passage having an evaporator air inlet and an evaporator air outlet;
   - pressure-regulating means for regulating refrigerant pressure;
   - drying means for drying the refrigerant, the compressor, the condenser refrigerant passage, the evaporator refrigerant passage, the pressure-regulating means, and the drying means being in fluid communication with one another,
   - at least one duct, the duct having a proximal end in fluid communication with the evaporator air outlet, and a distal end adjacent the seats in the open cockpit, for directing air toward the seats in the open cockpit; and
   - air moving means for moving air through the evaporator air passage.

2. The spot cooling system for open boats of claim 1, wherein:
   - the pressure-regulating means further comprises an orifice tube; and
   - the drying means further comprises an accumulator.

3. The spot cooling system for open boats of claim 2, wherein:
the compressor outlet is connected to the condenser refrigerant inlet;  
the orifice tube is connected between the condenser refrigerant outlet and the evaporator refrigerant inlet; and  
the accumulator is connected between the evaporator refrigerant outlet and the compressor inlet.

4. The spot cooling system for open boats of claim 1, wherein:
   the pressure-regulating means further comprises a thermal expansion valve; and
   the drying means further comprises a receiver-drier.

5. The spot cooling system for open boats of claim 4, wherein:
   the compressor outlet is connected to the condenser refrigerant inlet;  
the thermal expansion valve is connected between the receiver-drier and the evaporator refrigerant inlet;  
the receiver-drier is connected between the condenser refrigerant outlet and the thermal expansion valve; and  
the evaporator refrigerant outlet is connected to the compressor inlet.

6. The spot cooling system for open boats of claim 1, wherein the air moving means further comprises a blower including blower blades and a motor, the blower being in fluid communication with the evaporator air passage.

7. The spot cooling system for open boats of claim 1, wherein the condenser further comprises:
   a housing, the housing being fluid-tight, the housing defining a first passage; and
   at least one conduit within the housing, the conduit defining a second passage, the first passage and the second passage being fluidly sealed from one another; and
   wherein
   one of the passages serves as the refrigerant passage and
   the other passage serves as the cooling water passage.

8. The spot cooling system for open boats of claim 1, wherein the evaporator further comprises:
   a housing, the housing being fluid-tight, the housing defining a first passage; and
   at least one conduit within the housing, the conduit defining a second passage, the first passage and the second passage being fluidly sealed from one another; and
   wherein
   one of the passages serves as the refrigerant passage and
   the other passage serves as the air passage.

9. The spot cooling system for open boats of claim 1, further comprising a plurality of ducts, each of the ducts having a proximal end in fluid communication with the evaporator air outlet, and a distal end adjacent the seats in the open cockpit, for directing air toward the seats in the open cockpit, each of the ducts being selectively directable, so as to direct cooling air for maximum passenger comfort.

10. A method for spot cooling for open boats, the method comprising the steps of:
   providing a boat with an open cockpit and an engine;  
   providing the open cockpit with seats;  
   providing a refrigerant;  
   providing a compressor, and compressing the refrigerant;  
   providing a condenser, connecting the compressor to a refrigerant passage of the condenser, and condensing the refrigerant;  
   providing an evaporator in fluid communication with the compressor and the condenser, and evaporating the refrigerant;  
   providing a pressure-regulating means in fluid communication with the condenser and the evaporator, and regulating refrigerant pressure;  
   providing a drying means in fluid communication with the evaporator and the condenser, and drying the refrigerant;  
   moving air through an air passage of the evaporator;  
   cooling the air with the evaporator, thereby creating cooled air;  
   providing at least one duct, and connecting a proximal end of the duct to an evaporator air outlet;  
   positioning a distal end of the duct adjacent the seats in the open cockpit;  
   directing the cooled air toward the seats in the open cockpit; and
   cooling passengers in the open cockpit with the cooled air.

11. The method of claim 10, further comprising the steps of:
   juxtaposing an evaporator refrigerant passage and an evaporator air passage in thermal communication with one another;  
   connecting a blower, including blower blades and a motor, in fluid communication with an air inlet of the evaporator air passage; and
   moving air through the evaporator air passage with the blower.

12. The method of claim 11, further comprising the steps of:
   providing a plurality of ducts, and connecting a proximal end of each of the ducts in fluid communication with an air outlet of the evaporator air passage;  
   positioning a distal end of each of the ducts adjacent the seats in the open cockpit; and
   directing each of the ducts selectively toward the seats in the open cockpit, thereby directing the cooled air for maximum passenger comfort.

13. The method of claim 12, further comprising the steps of:
   juxtaposing a condenser refrigerant passage and a condenser cooling water passage in thermal communication with one another;  
   providing the cooling water passage with a condenser cooling inlet and a condenser cooling outlet;  
   providing a cooling water pump and a cooling water inlet;  
   connecting the cooling water pump in fluid communication with the condenser cooling water passage and condensing the refrigerant with cooling water.

14. The method of claim 13, further comprising the steps of:
   connecting the cooling water pump to the cooling water inlet and the condenser cooling inlet;  
   connecting the condenser cooling outlet to the boat engine cooling system;  
   driving the cooling water pump with the engine; and
   driving the compressor with the engine.

15. The method of claim 13, further comprising the steps of:
   connecting the cooling water inlet to the condenser cooling inlet;  
   connecting the cooling water pump to the condenser cooling outlet and to the boat engine cooling system;  
   driving the cooling water pump with the engine; and
   driving the compressor with the engine.

16. The method of claim 13, further comprising the step of:
   driving the cooling water pump with a motor.
17. The method of claim 13, further comprising the steps of:
   using an orifice tube as the pressure-regulating means; and
   using an accumulator as the drying means.

18. The method of claim 17, further comprising the steps of:
   connecting a compressor outlet to a condenser refrigerant inlet;
   connecting the orifice tube between a condenser refrigerant outlet and an evaporator refrigerant inlet; and
   connecting the accumulator between an evaporator refrigerant outlet and a compressor inlet.

19. The method of claim 13, further comprising the steps of:
   using a thermal expansion valve as the pressure-regulating means; and
   using a receiver-drier as the drying means.

20. The method of claim 19, further comprising the steps of:
   connecting a compressor outlet to a condenser refrigerant inlet;
   connecting the thermal expansion valve between the receiver-drier and an evaporator refrigerant inlet;
   connecting the receiver-drier between a condenser refrigerant outlet and the thermal expansion valve; and
   connecting an evaporator refrigerant outlet to a compressor inlet.

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