APPARATUS FOR REMOTELY CONTROLLING VEHICLE HEATING AND COOLING SYSTEMS

A timed and remote controlled heating and cooling system (10) for a vehicle includes a control module (70) which is connected to the air conditioning compressor (24) of the vehicle and to an auxiliary heating strip (120) within the duct system (40) of the vehicle. For cooling purposes, a motor (90) actuates the compressor (24), and the blower (42) in the duct system (40) is actuated to provide cooling air for the interior of the vehicle. For heating purposes, the blower (42) is again actuated and the actuation of the auxiliary heating strip (120) allows warm air to circulate within the vehicle. The control module (70) is activated remotely by a transmitted radio signal (142) or by a transmitted telephonic signal (146). A clock timer (78) may be used to actuate the desired heating or cooling system (10) on the basis of a predetermined (preset) time rather than by the remote actuation.
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APPARATUS FOR REMOTELY CONTROLLING VEHICLE HEATING AND COOLING SYSTEMS

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to heating and cooling apparatus for vehicles and, more particularly, to remote controlled apparatus for providing cooling and heating for vehicles using auxiliary power units for the existing vehicle cooling and heating systems.

Description of the Prior Art

In the summertime, vehicles sitting outside, exposed to the sun, get very hot in the cab or passenger compartment of the vehicle. In the winter, the reverse is true. Vehicles sitting outside in cold temperatures get very, very cold inside the vehicle. The heat in the summer and cold in the winter render the vehicles rather uncomfortable for occupants during the first several minutes of driving. In the summer, it takes several minutes for the vehicle air conditioning system to cool the interior of the vehicle to a desired
comfort level. In winter, there is a period of again several minutes before the engine generates sufficient heat in the water circulation system before the heating unit provides sufficient heat for rendering the vehicle comfortable for an occupant or occupants and the engine is sufficiently warm for reasonably efficient operation.

The apparatus of the present invention provides heating and cooling by timed and remote control so that the vehicle may be cooled in the summer time and both the engine and vehicle may be warmed in the winter time prior to occupancy and use of the vehicle.

**SUMMARY OF THE INVENTION**

The invention described and claimed herein comprises a timed and remote control system for actuating the air conditioning compressor and blower system for cooling the interior of a vehicle prior to starting the engine and driving the vehicle in the summer time. The apparatus also provided auxiliary heating for warming the vehicle interior and engine in the winter time. Resistive heater elements are used in air circulation ducts to provide the heating of the interior of the vehicle prior to entering the vehicle and for warming the engine.
The remote operation of the heating and cooling systems may be accomplished in any of several ways, such as a direct transmission and receiving system and a pager unit for telephonic remote control.

Among the objects of the present invention are the following:

To provide new and useful apparatus for timing the heating and cooling of a vehicle prior to its operation;

To provide new and useful apparatus for remotely controlling the heating and cooling of a vehicle;

To provide remote control for operating the air conditioning compressor of a vehicle;

To provide new and useful apparatus for providing heat for a vehicle;

To provide remote control of heating and cooling elements of a vehicle; and

To provide for the telephonic remote control of a vehicle heating and cooling systems.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a schematic representation of the apparatus of the present invention in the use environment.
Figure 2 is a schematic representation of an alternate embodiment of a portion of the apparatus of the Fig. 1.

Figure 3 is a schematic representation of an alternate embodiment of the apparatus of Fig. 2.

Figure 4 is a schematic representation illustrating the actuation of the apparatus of the present invention.

Figure 5 is a schematic representation illustrating an alternate embodiment of the apparatus of Fig. 3.

Figure 6 is a schematic representation of another alternate embodiment of the apparatus of Fig. 2.

Figure 7 is a schematic representation of another portion of the apparatus of the present invention.

Figure 8 is a schematic representation of an alternate embodiment of the apparatus of Fig. 7.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Figure 1 is a schematic representation of a timed and remote controlled heating and cooling apparatus 10 for a vehicle. Within the vehicle, for purposes of the present invention, are a vehicle engine 11 and an air conditioning compressor 24. The air conditioning compressor 24 is connected to the vehicle engine 11 by means of a crank shaft pulley 15 and a belt 16 which extends to a pulley 18. The
pulley 18 is in turn connected to a clutch 20 which is in turn connected to a shaft 22 of the air conditioning compressor 24. In standard operation, when the vehicle engine 11 is operating, the crank shaft pulley 15 powers the air conditioning compressor 24 through the belt 16, the pulley 18, and the clutch 20.

Two hoses or conduits 25 and 28 are schematically illustrated as connected to the compressor 24. The hose or conduit 25 may be considered as the high pressure hose which extends to a condenser coil 26 and then to an evaporator coil 27 which is disposed within a blower duct 40. The hose or conduit 28 may be considered as the low pressure or suction, return line for the vehicle air conditioning system.

For heating purposes, a pair of hoses 30 and 36 are shown connected to the engine 11. Hot water from the engine cooling system flows in the hose 30 to a heat exchanger or heater core 34 also located within the duct work 40 for heating the interior of the vehicle. The hose 36 is the hot water or heater return hose. A valve 32 controls the flow of water through the heater core 34.

A pair of hoses 12 and 14 are also shown connected to the engine 11. The hoses 12 and 14 represent the hoses which extend between the block of the engine 11 and a radiator 13 for cooling the engine during vehicle operation.
For purposes of the apparatus of the present invention, a vehicle battery 50 is illustrated with a conductor 52 comprising the ground conductor for the battery 50 and the vehicle, and a conductor 54 comprising a positive conductor for the vehicle battery for other, standard, electrical operations (not shown) of the vehicle.

The apparatus of the present invention is shown with an auxiliary battery 60 connected to the vehicle ground through a conductor 62.

The apparatus of the present invention includes a control module 70 which controls the operation of the various elements for the timed and remote auxiliary cooling and heating the vehicle. The control module includes a temperature sensor 72, which may be a simple thermistor, disposed within the vehicle passenger compartment. The temperature sensor 72 senses the temperature in the vehicle and the control module 70 controls the cooling system and the heating system in response to preset or predetermined temperature parameters which may be appropriately determined by the occupant or operator of the vehicle in which the apparatus is disposed.

A receiver antenna 74 is also included with the control module 70. The purpose of the receiver antenna 74 is to receive a remote control signal for appropriately actuating
the apparatus for either the cooling system or the heating system, depending on the temperature parameters.

Assuming a cooling situation, one in which the air conditioning compressor 24 is operated for purposes of cooling the vehicle, a conductor 76 extends from the control module 70 to the blower 42 within the duct system. The blower 42 operates in response to an appropriate current or signal on the conductor 76 to circulate air cooled by the evaporator 27.

A conductor 80 extends from the control module 70 to a relay 82. The relay 82 controls current flow from the battery 60 on a conductor 84 and a conductor 86 to a motor 90 which operates the air conditioning compressor 24. Connected to the motor 90 is a pulley 92, and the pulley 92 is connected by a belt 94 to a pulley 96. The pulley 96 is in turn connected to the shaft 22 of the air conditioning compressor 24.

When cooling is called for, the appropriate control signals originate within the control module 70 to actuate the motor 90 to power the compressor 24 and the blower 42. With the compressor 24 operating, the standard air conditioning system events occur, including air blown by the blower 42 through the duct work 40 to cool the interior of the vehicle.

The motor 90 may also be used as a generator to charge the auxiliary battery 60 when the air conditioning compressor is operating. That is, with the motor 90 connected to the
shaft 22 of the compressor 24, when the clutch 20 is engaged to connect the pulley 14 to the pulley 18 through the belt 16, the shaft 22 is rotated, and with it the pulley 96 is rotated. With the pulley 96 connected by the belt 94 to the pulley 92 on the motor shaft 90, the motor 90 is turned into a generator and provides a charging current to the battery 60 through a conductor 88. The conductor 88 extends from the conductor 86 to the positive terminal of the battery 60.

The control module 70 operates on a predetermined time cycle, which may be as desired, such as a fifteen minute "on" time of operation of either the cooling system or the heating system.

Included in the control module 70 is a clock timer 78 which may be preset to operate the cooling system or the heating system on the basis of time, rather than a remote signal. For example, a person who gets off work at 5:00 p.m. may desire to have the cooling system turned on at 4:45 p.m. in the summer and the heating system turned on at 4:35 p.m. in the winter. This predetermined time is an alternative to, or in addition to, the remote control actuation of the cooling and heating systems, which will be discussed below.

For heating purposes, the control module 70 is connected to a relay 112 by a conductor 110. The relay 112 is connected to the battery 60 through a conductor 114. A conductor 116
extends from the relay 112 to a resistive heater strip or element 120 disposed within the duct system 40. Again, the blower 42 is actuated through the conductor 76 by the control module 70 to circulate air heated by the heater strip 120. An appropriate signal on the conductor 110 allows current from the battery to flow through the relay 112 to the resistive heater strip 120.

With the resistive heater strip or element 120 providing heat, the heated air is circulated within the vehicle. Again, the "on" time of the heating system may be about fifteen minutes, more or less, depending on desired parameters as determined by the operator of the vehicle.

Figure 2 illustrates an alternative method of operating the air conditioning compressor 24. Rather than using the motor 90, the conductor 86 extends directly to an auxiliary electric motor 130. The motor 130 is connected to the shaft 22 of the air conditioning compressor 24. Thus, the use of the motor 130 obviates the necessity for the motor 90, with its pulley and belt system, and the pulley 96 connected to the shaft 22 of the compressor 24.

The motor 130 may also be used as a generator to provide a charging current for the battery 60.

Figure 3 comprises a schematic representation of an alternate power apparatus for the air conditioning compressor.
24. In Fig. 3, the motor 130 is shown connected directly to the shaft 22 of the air conditioning compressor 24. The motor 130 is connected directly to the air conditioning compressor 24 in lieu of the pulley 18 and belt 16 and the clutch 20, as shown in Fig. 2. That is, the motor 130 comprises the prime power source for the air conditioning compressor 24 regardless of whether the motor 130 is controlled by the regular air conditioning controls in the vehicle, as when the vehicle is operating, or whether the motor 130 is under the control of the control module 70. Using the electric motor 130 as the prime power source for the air conditioning compressor 24 obviates the use of the pulley 18 with its engine drive belt 16 and the clutch 20.

Figure 4 illustrates, schematically, the use of a remote transmitter 142 controlled by the operator of the vehicle in which the apparatus is installed. A radio signal from the transmitter 142 is received by the antenna 74 and is transmitted to a receiver module 140 which is part of the control system 70. From the receiver 140, an appropriate signal actuates either the cooling system or the heating system, depending on the temperature parameters as discussed above.

Figure 5 illustrates another actuation system which may be used in addition to the transmitter 142. A pager 144 is
specifically connected to the receiver 140. The pager 144 is actuated by a call from a telephone 146. When the pager 144 receives the "call" from the telephone 146, it provides an output signal to the receiver 140 to actuate either the cooling system or the heating system, depending on the temperature parameters.

Since a typical transmitter 142 may have a limited range from the receiver 140, the use of a telephonic radio signal using the pager 144 may be advantageous. The pager, which is, of course, simply a receiver, may receive a telephonic signal from a distance substantially greater than the effective range of a conventional transmitter 142.

Figure 6 comprises a schematic representation of another alternate embodiment for operating the compressor 24. An auxiliary internal combustion engine 160 is connected to a hydraulic pump 170 for operating a hydraulic motor 180 which is connected to the shaft 22 of the air conditioning compressor 24. The auxiliary internal combustion engine 160 may be located remotely from the engine, if desired, with a pair of hoses or conduits 172 and 174 extending between the pump 170 and the motor 180.

An alternator 190 may also be connected to the auxiliary internal combustion engine 160 to provide electric power for
the system. A pair of conductors 192 and 194 are shown extending from the alternator 190. The conductor 192 is a positive conductor and the conductor 194 is illustrated as a ground conductor by which the alternator is connected to the vehicle ground.

The auxiliary internal combustion engine 160 may also be used to supply heat for heating the vehicle engine 12 under winter conditions. The auxiliary internal combustion engine 160 is thus defined as a water cooled engine, in which the cooling jacket includes a pair of hoses or conduits which may be connected by tee connections to the hoses 12 and 14 of the vehicle engine 11, shown in Fig. 1. Thus, the cooling jacket for the engine 160 is connected to the cooling jacket in the block of the engine 12 whereby the engine 12 is warmed by circulating the water through the hoses 162 and 164.

In the winter time this use of the heat generated by the engine 160 is put to good advantage, and in the summer time, the reverse occurs. That is, the cooling system for the engine 11 is also used to cool the engine 160 by the circulation of the water through the radiator 13 for the engine 11.

Figure 7 is a schematic representation of an alternate system for providing heat for the engine 11 under winter conditions. A tank 210 is shown with a resistive heating
element 222 disposed therein. The tank 210, filled with water, is connected by a conduit or hose 230 to a pump 232, and the pump 232 is in turn connected to a conduit 234 which extends to a tee 236. The tee 236 is connected in the heater hose line 36 between the vehicle engine and the heater core 32. The pump 232 is, of course, an electrical pump. Both the heater element 222, with its conductor 220, and the pump 232 are controlled by the control module 70. A conductor 220 is shown extending to the element 222 and a conductor 233 is shown extending to the pump 232. The conductors 220 and 233 are similar to the conductors 116 and 86 for the heater element 120 and the motor 90, respectively, of Fig. 1. Appropriate relays controlled by the control module 90 and related conductors, etc., are not shown.

A return conduit or line 238 is connected by a tee 240 to the conduit or hose 30 between the engine 11 and the heater valve 34. A valve 34 controls the flow of water from the conduit 30 to the heater core 34. The valve 32 is the conventional heater valve which controls the heater of the vehicle by controlling the flow of water through the core 34.

With the tees 236 and 240, and the conduits 234 and 238, respectively, the water from the tank 210 is pumped by the pump 232 through the vehicle block to warm the vehicle engine 11. Obviously, if desired, the tees 236 and 240 could be
placed in the lines 12 and 14, which extend from the block of the engine 11 to the radiator 13, as discussed above. The particular connection of the tank 210 with its conduits will be appropriate for the location of the tank 210 and the amount of space found in a vehicle, whether under the hood, in the trunk, etc. For trucks, motor homes, and the like, all the elements discussed herein may be located as appropriate, depending on the space limitations, etc.

It will be obvious that the internal combustion engine 160 of Fig. 6 may be an electric motor, if desired. Moreover, the motor 90 illustrated in Fig. 1 may also be an internal combustion engine, if desired. The selection of a particular power plant will depend on the space limitations, distance limitations, etc.

Figure 8 schematically represents another alternate embodiment of the apparatus of the present invention in which an electric motor 250 is connected to an auxiliary air conditioning compressor 260. From the auxiliary air conditioning compressor 260, a conduit 262 extends to a tee 264 connected to the line or conduit 25. A second line or conduit 266 extends from the compressor 260 to a tee 268 in the line or conduit 28.

The conduit 262 is the high pressure line, and the conduit or line 266 is the suction or return line for the
compressor 260. In the embodiment of Fig. 8, the compressor 260 may be located remotely from the vehicle engine 12 and the primary air conditioning compressor 24. The air conditioning compressor 260 is simply connected directly to the lines or conduits of the compressor 24 in lieu of powering the compressor 24 by either the motor and pulley arrangement illustrated in Fig. 1, or the motor arrangement of Fig. 2, Fig. 3, and Fig. 6.

In the embodiments of Figs. 1, 2, 3, and 6, the vehicle air conditioning compressor 24 is run by an auxiliary motor of some type connected to the air conditioning compressor 24. In the embodiment of Fig. 8, the auxiliary air conditioning compressor 260 is tied in to the lines 25 and 28 of the compressor 24, but may be located at a remote location, such as in the trunk of a vehicle, or at any appropriate or desirable location in a motor home, truck, bus, or the like.

The control of the compressor 260 and its motor 250 is, of course, controlled by the control module 70 as described above. That is, the operation of the motor 250, which in turn causes the operation of the compressor 260, may either be on a preset timed basis, as discussed above, or in response to a remotely generated signal. In any event, the timed function of a predetermined operating time is still applicable, as also discussed above.
Details of the control module 70 have not been shown. Microprocessor technology is well known and understood in the art.

While the principles of the invention have been made clear in illustrative embodiments, there will be immediately obvious to those skilled in the art many modifications of structure, arrangement, proportions, the elements, materials, and components used in the practice of the invention, and otherwise, which are particularly adapted to specific environments and operative requirements without departing from those principles. The appended claims are intended to cover and embrace any and all such modifications, within the limits only of the true spirit and scope of the invention.
WHAT I CLAIM IS:

1. In a vehicle having an engine, a radiator connected to the engine by a first pair of hoses, a heater system including a second pair of hoses connected to the engine and a heater core disposed in the duct and connected to the second pair of hoses, an air conditioning system including a compressor connected to and powered by the engine and connected by a third pair of hoses to an evaporator also disposed in the duct, and a blower in the duct for blowing air through the duct and through the heater core and evaporator into the vehicle; a cooling and heating system comprising in combination:

   means for actuating the compressor and the blower to provide cooling air in the vehicle when the engine is not running; and

   means for providing heat in the duct and for actuating the blower to provide heated air in the vehicle when the engine is not running.

2. The apparatus of claim 1 in which the means for providing heat includes a heater element disposed in the duct.
3. The apparatus of claim 2 in which the means for actuating the compressor and the means for providing heat include a temperature sensor for sensing the temperature in the vehicle and a control module for selectively actuating the compressor or the heater element in response to the sensed temperature.

4. The apparatus of claim 3 in which the control module includes a clock for selectively actuating the compressor or the heater element in response to the sensed temperature at a predetermined time.

5. The apparatus of claim 3 in which the control module includes a radio receiver, and the compressor or the heater element are selectively actuated in response to a signal received by the radio receiver in response to the sensed temperature.

6. The apparatus of claim 3 which further includes means for providing heated water for heating the engine when the engine is not running.
7. The apparatus of claim 6 in which the means for providing heated water for heating the engine includes an auxiliary water cooled internal combustion engine, and the auxiliary water cooled internal combustion engine further provides power for actuating the compressor.

8. The apparatus of claim 1 in which the means for providing heat in the duct includes means for providing heated water to the heater core.

9. The apparatus of claim 8 in which the means for providing heated water includes

a tank for holding a quantity of water,

a heater element in the tank for heating the water,

a fourth pair of hoses connected to the second pair of hoses through which the heated water flows, and

a pump for pumping the heated water.

10. The apparatus of claim 9 in which the means for providing heat in the duct further includes means for providing an electric current to the heater element and for controlling the pump for pumping the heated water.
11. The apparatus of claim 1 in which the means for actuating the compressor includes a motor connected to the compressor.

12. The apparatus of claim 11 in which the motor is an electric motor.

13. The apparatus of claim 9 in which the motor is a hydraulic motor.

14. The apparatus of claim 13 which further includes a hydraulic pump connected to the hydraulic motor and an auxiliary internal combustion engine connected to the hydraulic motor.
15. In a vehicle having an engine, an air conditioning system including a compressor, a condenser, an evaporator disposed in a duct, hoses connecting the compressor, condenser, and evaporator, and a blower in the duct for circulating air cooled by the evaporator, control apparatus for controlling the compressor when the engine is not running comprising in combination:

   motor means for running the compressor;
   means for controlling the running of the motor means; and
   means for controlling the blower for circulating air cooled by the evaporator.

16. The apparatus of claim 15 in which the motor means includes an electric motor.

17. The apparatus of claim 16 in which the motor means further includes a belt connecting the electric motor to the compressor.

18. The apparatus of claim 16 in which the electric motor is coupled directly to the compressor.

19. The apparatus of claim 15 in which the motor means includes a hydraulic motor coupled to the compressor.
20. The apparatus of claim 15 in which the means for controlling the running of the motor means includes a clock for running the compressor at a predetermined time.

21. The apparatus of claim 15 in which the means for controlling the running of the motor means includes a radio receiver and a radio transmission for remotely controlling the running of the motor means.

22. In a vehicle having a water cooled engine, a radiator connected to the engine through which water from the engine circulates for cooling, a heater core disposed in a duct, hoses connecting the engine to the heater core through which water form the engine flows for heating the vehicle, and a blower in the duct for circulating air warmed by the heater core, apparatus for warming the vehicle when the engine is not running comprising in combination:

   a heater strip disposed in the duct for producing heat;

   means for providing an electric current to the heater strip to produce heat;

   means for controlling the blower to circulate air heated by the heater strip; and

   means for controlling the blower and the means for providing an electric current to the heater strip.
23. The apparatus of claim 22 in which the means for controlling the blower and the means for providing an electric current to the heater strip includes a clock to provide an electric current to the heater strip and to operate the blower at a predetermined time.

24. The apparatus of claim 22 in which the means for controlling the blower and the means for providing an electric current to the heater strip includes a radio receiver and a radio transmission for remotely controlling the providing of an electric current and the operation of the blower.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6): F25B 29/00
US CL: 165/202
According to International Patent Classification (IPC) or to both national classification and IPC.

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S.: 165/202, 42, 43, 237/12.3A, 12.3B, 12.3R; 219/202; 62/236, 244; 236/51

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

NONE

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NONE

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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Further documents are listed in the continuation of Box C.

Date of the actual completion of the international search
05 MARCH 1997

Date of mailing of the international search report
29 APR 1997

Name and mailing address of the ISA/US
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Form PCT/ISA/210 (second sheet)(July 1992)*
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<td>US,A, 3,841,108 (PIERRAT) 15 OCTOBER 1974 SEE ENTIRE DOCUMENT.</td>
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<td>US,A, 4,575,003 (LINKER ET AL.) 11 MARCH 1986 SEE ENTIRE DOCUMENT.</td>
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<td>US,A, 3,072,176 (SUNDAY) 08 JANUARY 1963 SEE ENTIRE DOCUMENT.</td>
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