Auxiliary heating and cooling systems (10) for a vehicle are operable independent of the vehicle's engine, in response to control signals initiated remotely. The auxiliary systems are employed to precondition the passenger compartment of the vehicle prior to occupancy. A control system for the auxiliary systems includes a control module (70) associated with those systems and a communication module (142), generally hand-held, operable from a remote location.
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REMOTE CONTROL VEHICLE HEATING AND COOLING SYSTEM

Technical Field: This invention relates to heating and cooling apparatus for vehicles and, more particularly, to remote controlled apparatus for providing auxiliary cooling and heating for vehicles without running the vehicle's engine.

Background Art: In hot weather, the interior of the passenger compartment of a vehicle becomes uncomfortably hot. In cold weather, the reverse is true; that is, the interior becomes uncomfortably cold. Most vehicles include systems for heating air during cold weather. Air conditioning systems for cooling passenger compartment air are also common. Vehicular air heating and cooling systems conventionally rely upon operation of the vehicle's engine to function. Accordingly, a period of discomfort is normal at the start of a trip in either hot or cold weather conditions. Most heating systems require a hot engine, and in either case, a period of operation is required to alter the temperature of the air in the passenger compartment.

Various proposals have been made to alleviate the period of discomfort normally experienced under hot and cold weather driving conditions due to the air temperature within the passenger compartment of a vehicle. U.S. Patent 3,455,403, for example, discloses a radio transmitter system for remotely starting an automotive vehicle. One objective of the disclosed system is to provide a remote control means for climatically conditioning the interior of the vehicle. U.S. Patent 3,745,919 utilizes an electric motor powered by batteries to drive the compressor of an air conditioning system of a vehicle. The benefit of this arrangement is said to be that it enables separation of the compressor of the system from the vehicle engine. U.S. Patent No. 3,885,398 discloses an air conditioning system for recreational vehicles that can be operated by a battery powered electric motor, rather that the vehicles engine. U.S. Patent No. 4,274,265 discloses a car-mounted air conditioner which is computer controlled to cool or warm air to a preselected range. U.S. Patent No. 4,531,379 describes an auxiliary power system for a vehicle air conditioner and heater. This auxiliary system functions when the main engine of the vehicle is not operating. U.S. Patent Nos 4,947,657 and 5,177,978 disclose other auxiliary air conditioning systems operated by various power mechanisms other than the vehicle
engine. U. S. Patent No. 5,333,678 discloses an auxiliary power unit and system
structured to provide heat or cooled air to the cab of a vehicle when the engine is
running or not running. Other U.S. Patents which disclose technology generally
relevant to providing heated or cooled air to a passenger space include Nos.
3,072,176; 3,841,108; 4,575,003; 5,187,349 and 5,226,294.

In spite of the expediens available, no satisfactory system has yet been
devised whereby the interior of a passenger compartment may be reliably adjusted
prior to occupancy at the volition of a future occupant.

**DISCLOSURE OF INVENTION**

According to this invention, a motor vehicle is provided with self contained,
auxiliary heating and cooling systems. These systems are capable of operating
without running the main engine of the vehicle, and ideally rely upon a power supply
which is isolated from the battery required for starting the vehicle. Activation of
either of these systems is effected remotely, preferably by dialing a receiver
associated with the vehicle from any telephone. This invention thus enables a future
occupant of a passenger compartment of a vehicle to simply call the vehicle in
advance, and instruct the vehicle to establish comfortable temperature conditions
within the compartment prior to the occupant’s arrival.

Basically, the invention comprises a remote control system, which may also
be timed, for actuating an air conditioning compressor and blower system for cooling
the interior of a vehicle prior to starting the engine of the vehicle in hot weather.
Generally, the compressor will be an auxiliary unit of smaller capacity than the
compressor of the main air conditioning system of the vehicle. The system also
provides an auxiliary heating mechanism for warming the vehicle’s interior and
group in cold weather. The heating mechanism typically comprises resistive heater
elements mounted in air circulation ducts.

Remote operation of the heating and cooling systems may be accomplished by
means of any convenient transmission and receiving system, most notably a
telephonic system. Conventional telephones, cell phones and telephonic pager units
are examples of presently preferred remote control elements for use with this
invention.
Broadly, the invention may be considered to constitute an improvement to vehicles equipped with primary and auxiliary heating systems and primary and auxiliary cooling systems. The primary heating and cooling systems are conventionally structured and arranged for operation in association with operation of an internal combustion engine of the vehicle. The auxiliary heating and cooling systems of such vehicles are often structured and arranged for operation independent of operation of the internal combustion engine of the vehicle. This invention provides an improved control system for such auxiliary heating and cooling systems which permits a future occupant of the vehicle to precondition the traveling compartment of the vehicle prior to occupancy. The improvement basically includes first electronic circuitry, operably associated with the auxiliary heating and cooling systems to effect selective enablement and disablement of either of those auxiliary systems in response to electronic control signals applied to that first electronic circuitry. Second electronic circuitry, operable from locations remote from the vehicle, is constructed and arranged to generate selected control signals, and to apply those control signals to the first electronic circuitry. The second electronic circuitry may be partially mounted to the vehicle, but in any case is addressable from a remote location, either telephonically or by means of some other form of transmitter device.

It is within contemplation that the second electronic circuitry may comprise a signal generating component associated with the first electronic circuitry, but addressable telephonically from a remote location. The second electronic circuitry is nevertheless structured and arranged to generate the requisite control signals and to apply those control signals to the first electronic circuitry.

As currently envisioned, a preferred embodiment of the invention includes a control module with first electronic circuitry, including a receiver, operably associated with the auxiliary heating and cooling systems to effect selective enablement and disablement of either of those systems in response to electronic control signals applied to the receiver; and a remote communication module with second electronic circuitry, including a transmitter, operable from locations remote from the vehicle, constructed and arranged to generate selected control signals, and to transmit those control signals to the receiver. Of course, either of the first or second electronic circuitries may include additional signal generating components. It is also
within contemplation that a portion of the second circuitry may be housed with the first electronic circuitry, and that the first and second such circuitries may share certain components. The remote activation of this invention is achievable through a variety of configurations. The remote communication module may comprises a conventional telephone, for example. In any case, it may be structured to be hand carried; for example, in the nature of a cellular telephone.

Ideally, the control module comprises drive circuitry constructed and arranged to operate at least one of the auxiliary heating and cooling systems for an interval commencing at a predetermined time of day, or alternatively commencing upon the receipt of a control signal initiated by the remote communication module. It is also within contemplation to utilize a thermostat in circuit with the control module so that auxiliary heating and/or cooling will be supplied as needed to maintain the interior of the vehicle within a prescribed temperature range. In some instances, thermostatic control may be relied upon without regard to remote activation signals from the communication module.

**BRIEF DESCRIPTION OF DRAWINGS**

In the drawings, which illustrate what is currently regarded as the best mode for carrying out the invention:

FIG. 1 is a schematic representation of a system of the invention;
FIGS 2 and 3 are schematic representations of an alternative arrangement of the compressor component of FIG. 1;
FIGS. 4 and 5 are schematic representations of alternative arrangements of the control module component of FIG. 1;
FIG. 6 is a schematic representation similar to FIGS 2 and 3;
FIG. 7 is a schematic representations of the heater component of FIG. 1;
FIG. 8 is a schematic representation similar to FIGS.2, 3 and 6;
FIGS. 9 and 10 are schematic representations, similar to FIG. 6, of alternative arrangements.
FIG. 11 is a block diagram of a typical system of the invention.
FIG. 12 is a schematic diagram of practical circuitry for a relay center of the control module of FIG. 1; and
FIG. 13 is a schematic diagram of practical circuitry for a remote pager transmitter component.

BEST MODES FOR CARRYING OUT THE INVENTION

Fig. 1 illustrates a typical timed and remote controlled heating and cooling system, generally 10, for a vehicle (not shown). The vehicle includes a main engine, generally 11, and an air conditioning compressor, generally 24. The air conditioning compressor 24 is connected to the vehicle engine 11 by means of a crankshaft pulley 15 and a belt 16, which extends to a pulley 18. The pulley 18 is 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 crankshaft pulley 15 powers the air conditioning compressor 24 through the belt 16, the pulley 18, and the clutch 20.

Two fluid flow lines (hoses or conduits) 25 and 28 are connected to the compressor 24. The line 25 may is assumed for purposes of illustration to function as a high pressure supply line; it extends to a condenser coil 26 and then to an evaporator coil 27 disposed within a blower duct, generally 40. The line 28 is thus considered as a low pressure (or suction) return line for the vehicle air conditioning system.

As illustrated, a pair of heater hoses 30 and 36 are connected to the engine 11. Hot water from the engine cooling system flows in the supply 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 return hose 36 completes the circulation loop of the heating system. A valve 32 controls the flow of water through the heater core 34. A second pair of hoses 12 and 14 are also shown connected to the engine 11. The hoses 12 and 14 circulate coolant between the block of the engine 11 and a radiator 13 for cooling the engine during vehicle operation.

A conventional vehicle battery 50 is illustrated with a ground conductor 52 and a supply conductor 54, usually extending from the positive pole of the battery 50. According to the invention, this battery is connected to power the standard electrical operations typical of automotive vehicles. An auxiliary battery 60 is shown 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 of the vehicle. The control module includes a temperature sensor 72, which may be a simple thermometer 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. These parameters may be set by any interested person; generally a regular 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 transmitted control signal for appropriately actuating the apparatus from a remote location. Either the cooling system or the heating system may be activated, depending upon the ambient temperature conditions. 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 typically operates on a predetermined time cycle, such as a fifteen minute "on" time of operation of either the cooling system or the heating system, commencing with a transmitted "start" signal. The control module 70 may further include a clock timer 78 which may be preset to operate the cooling system or the heating system, commencing at a particular time, rather than in response to 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 PM in the winter.

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. A typical "on" interval for the auxiliary heating system is about ten minutes to about thirty minutes, depending on operator preferences and ambient conditions.

FIG. 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.

FIG. 3 comprises a schematic representation of an alternate power apparatus for the air conditioning compressor 24. As shown by Fig.3, the motor 130 is connected directly to the shaft 22 of the air conditioning compressor 24. The motor
130 is also 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.

FIG. 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, as appropriate.

FIG. 5 illustrates another actuation system which may be used in addition to the transmitter 142. A pager 144 is included within, or connected to, the control system 70 and specifically connected to the receiver 140. The pager 144 is actuated by a call from a telephone 146. When the pager 144 receives the incoming call from the telephone 146, it provides an output signal to the receiver 140 to actuate either the cooling system or the heating system, as appropriate.

Because 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 generally functions as a receiver, may receive a telephonic signal from a distance substantially greater than the effective range of a conventional transmitter 142.

FIG. 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.

FIG. 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 should be understood that an internal combustion engine 160 is illustrated by Fig. 6 and an electric motor 90 is illustrated in Fig. 1 by way of example, only. The selection of a particular power plant in any particular instance will depend upon design constraints and preferences imposed by space limitations or other factors inherent in the particular application at hand.

FIG. 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 a conduit 25. A second conduit 266 extends from the compressor 260 to a tee 268 in the line 28. The conduit 262 constitutes a high pressure line, and the conduit 266 constitutes a 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 auxiliary compressor 260 is simply connected directly to the fluid-carrying lines 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. The compressor 24 is the primary compressor, coupled to the engine 11.

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. Operation
of the compressor 260 and its motor 250 are controlled by the control module 70. 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 or in response to a remotely generated signal. In any event, a predetermined operating time is generally incorporated in the control program of the system.

FIG. 9 comprises a schematic representation of another alternate embodiment 280 of the present invention. The apparatus of Fig. 9 may be incorporated in a system generally similar to that illustrated in Fig. 1, but many of the elements shown in Fig. 1 are omitted from Fig. 9 for purposes of clarity. As shown in Fig. 9, the vehicle engine 11 is connected to the primary air conditioning compressor 24 through a belt 16. Pulleys 15 and 18 are shown, along with the clutch 20 and shaft 22. From the primary compressor 24, the conduit 25 extends to an auxiliary air conditioning compressor 282. The compressor 282 is driven by a motor 284. The motor 284 may be an electric motor, such as the motor 250 of Fig. 8, or it may be a hydraulic motor, such as the hydraulic motor 180 of Fig. 6. The hydraulic motor of Fig. 6 is powered by a pump 170 which is in turn powered by an auxiliary internal combustion engine 160. Thus, the elements of Fig. 6 may be applied to the auxiliary compressor 282 of Fig. 9, if desired.

From the auxiliary compressor 282, a conduit 286 extends to the condenser 26. From the condenser 26, a conduit 288 extends to the evaporator 27. From the evaporator 27, the conduit 28 extends to the low pressure side of the primary compressor 24. As in the embodiment of Fig. 1, the evaporator 27 is shown in a duct 40, and a blower 42 provides for a flow of air through the duct 40 for cooling the vehicle in which the apparatus 280 is disposed.

The auxiliary compressor 282 is in series with the primary compressor 24. The series arrangement of the apparatus 280 has advantages over a parallel arrangement of compressors when the same condenser and same evaporator are used. In a parallel arrangement, because different compressors are active during respective modes of operation, the length of the active Freon lines and the amount of active Freon is different during those respective modes of operation. Accordingly, the system is not optimally efficient in each mode of operation. During operation, lubricating oil and Freon may accumulate in the inactive lines and compressor, at the
expense of the active system. During at least one mode of operation, the active system cannot be assured of the proper amount of Freon and lubricating oil required for efficient operation and to prevent failure of the active compressor due to inadequate lubrication.

By connecting the auxiliary compressor in series with the vehicle compressor, the Freon and lubricating oil flows through both compressors and all of the Freon lines. Accordingly, the same length of Freon lines is active in each mode of operation, thus maintaining efficiency by minimizing the puddling of Freon and lubricating oil.

FIG. 10 discloses an alternate embodiment 300 of the apparatus 280 of Fig. 9. The apparatus 300 includes the same general elements illustrated in Fig. 9, except that a pair of check valves 302 and 3 12 are disposed about the auxiliary compressor 282 and primary compressor 284, respectively. The check valves are in parallel with the compressors to decrease pressure losses through the inactive compressor. At the same time, the check valves do not appreciably affect the system operation in either mode.

A tee 306 is disposed in the conduit 25 and tee 308 is disposed in the conduit 208. A conduit 304 extends between the conduit 25 and the conduit 286 in parallel with the auxiliary compressor 282. A check valve 302 is disposed in the conduit 304. Another tee 318 is disposed in the conduit 25 and a tee 316 is disposed in the conduit 28. A conduit 314 extends between the tees 316 and 318 and a check valve 312 is disposed in the conduit 314. Thus, the check valve 302 is in parallel with the auxiliary compressor 282, and the check valve 312 is in parallel with the primary compressor 24. In all other respects, the apparatus 300 is substantially identical to the apparatus 280, with the compressors 24 and 282 in series with each other. Again, the motor 284 may be an electric motor, as shown in Fig. 8 with the electric motor 250 driving the auxiliary compressor 260, or the motor 284 may be a hydraulic motor, such as the motor 180 illustrated in Fig. 6 for powering the compressor 24.

The two embodiments 280 and 300 include the control module 70, the auxiliary heating element 120 in the duct 40, and their respective elements, as discussed in conjunction with Fig.1 and Fig. 5. Moreover, the tank 210 of Fig. 7 may also be incorporated into the system, all as discussed previously in this
disclosure. Essentially, the embodiments 280 and 300 simply illustrate the two compressors, the primary compressor 24 and the auxiliary compressor 282, disposed in a series relationship rather than in a parallel relationship.

Fig. 11 illustrates in block diagram format a typical practical embodiment of the invention. Elements designated by capital letters are conventionally included in most vehicles as they arrive from the factory; specifically: a factory engine cooling fan, A; a factory heater blowing fan, B; a factory air conditioning condenser, C; a factory air conditioning compressor, D and a factory air conditioning evaporation coil, E. Components provided in accordance with this invention are designated by Roman numerals, and include: a one-way valve, I; an auxiliary heating coil, II; an auxiliary air conditioning compressor, III; an electric motor, IV; an auxiliary battery pack, V; a relay center, VI; a pager board, VII and a control switch, VIII. The factory fans A, B and the auxiliary heater II are interconnected with the relay center VII by electrical conductors 320, 321, 321, respectively. Power is supplied by the auxiliary battery pack V to the relay center VI via conductor(s) 325. The conductors illustrated by Figure 11, as is the case with the drawings generally, may comprise cable sets, individual wires or conductive busses or strips, as best serves the structural circumstances of the overall assembly. The relay center VI is further conductively connected, as shown through conductors 327, 329, 330, to the auxiliary air conditioning compressor III and its drive motor IV. Other conductors 335, 337 interconnect the relay center VI to the pager board VII and control switch VIII. The factory air conditioning lines 341, 343, 345 are supplemented by auxiliary air conditioning lines 351, 353

In operation, the control switch VIII functions merely to enable or disable the auxiliary heating and cooling system of the invention. The pager board VII, while it often includes an internal clock to activate the system, is structured and arranged to function in response to a transmitted control signal. Upon receipt of such a signal, it generates control signals to activate the auxiliary heating or cooling components of the system through the relay center VI.

FIGS. 12 and 13 illustrate practical electronic circuits for the relay center VI and pager board VII of FIG. 11. The diagrams identify commercially available components and specify practical values for generic components. The Reference in
this disclosure to details of the preferred or illustrated embodiments is not intended to
limit the scope of the appended claims, which themselves recite those details regarded
as important to the invention.

INDUSTRIAL APPLICABILITY

The apparatus of this invention is useful in connection with all types of
industrial, public and private conveyances, including, without limitation, trucks,
heavy equipment, passenger cars, busses and any other vehicular equipment which
includes a passenger (including operator) compartment.
CLAIMS

What Is Claimed Is:

1. An automotive vehicle equipped with primary and auxiliary heating systems and primary and auxiliary cooling systems, the primary heating and cooling systems being structured and arranged for operation in association with operation of an internal combustion engine of the vehicle and the auxiliary heating and cooling systems being structured and arranged for operation independent of operation of said internal combustion engine, an improved control system for said auxiliary heating and cooling systems comprising:

   a control module with electronic circuitry, including a receiver, operably associated with said auxiliary heating and cooling systems to effect selective enablement and disablement of either of said auxiliary heating and cooling systems in response to electronic control signals applied to said receiver; and

   a remote communication module with electronic circuitry, including a transmitter, operable from locations remote from said vehicle, constructed and arranged to generate selected control signals, and to transmit said control signals to said receiver.

2. An improved control system according to Claim 1, wherein said remote communication module comprises a telephone.

3. An improved control system according to Claim 1, wherein said remote communication module is structured to be hand carried.

4. An improved control system according to Claim 3, wherein said remote communication module comprises a cellular telephone.

5. An improved control system according to Claim 1, wherein said control module comprises drive circuitry constructed and arranged to operate at least one of said auxiliary heating and cooling systems for an interval commencing at a predetermined time of day.
6. An improved control system according to Claim 1, wherein said control module comprises drive circuitry constructed and arranged to operate at least one of said auxiliary heating and cooling systems for an interval commencing upon the receipt of a control signal initiated by said remote communication module.

7. An improved control system according to Claim 6, wherein said remote communication module comprises a telephone.

8. An improved control system according to Claim 6, wherein said remote communication module is structured to be hand carried.

9. An improved control system according to Claim 8, wherein said remote communication module comprises a cellular telephone.

10. In an automotive vehicle equipped with primary and auxiliary heating systems and primary and auxiliary cooling systems, the primary heating and cooling systems being structured and arranged for operation in association with operation of an internal combustion engine of the vehicle and the auxiliary heating and cooling systems being structured and arranged for operation independent of operation of said internal combustion engine, an improved control system for said auxiliary heating and cooling systems comprising:

first electronic circuitry, operably associated with said auxiliary heating and cooling systems to effect selective enablement and disablement of a said auxiliary heating or cooling system in response to electronic control signals applied to said first electronic circuitry; and

second electronic circuitry, operable from locations remote from said vehicle, constructed and arranged to generate selected control signals, and to apply said control signals to said first electronic circuitry.

11. An improved control system according to Claim 10, wherein said second electronic circuitry includes a transmitter component.
12. An improved control system according to Claim 10, wherein said second electronic circuitry comprises a signal generating component addressable telephonically from a remote location and is structured and arranged to generate said control signals and to apply said control signals to said first electronic circuitry.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) : F25B 29/00
US CL. : 165/42, 43, 236/51
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. : 165/42, 43, 236/51, 62/244

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

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<tbody>
<tr>
<td>Y</td>
<td>US 4,909,044 A (GUDMUNDSEN) 20 MARCH 1990, SEE ENTIRE DOCUMENT.</td>
<td>1-12</td>
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<tr>
<td>Y</td>
<td>US 3,455,403 A (HAWTHORNE) 15 JULY 1969, SEE ENTIRE DOCUMENT.</td>
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<tr>
<td>Y</td>
<td>GB 2,278,463 A (MCNAIR ET AL.) 30 NOVEMBER 1994, SEE Figure 14 and page 19, lines 3-21.</td>
<td>2-4, 7-9 and 12</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C. See patent family annex.

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