HEATING AND COOLING SYSTEM FOR VEHICLE SEAT

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ABSTRACT
A heating and cooling system for a vehicle seat, may include a heat exchanger cooling or heating air before the air is introduced into the seat, and a blower blowing air toward the heat exchanger, wherein the heat exchanger includes a positive temperature coefficient element assembly provided inside a housing of the heat exchanger to heat the air supplied from the blower, and wherein the positive temperature coefficient element assembly operates in a case of heating the seat but does not operate in a case of cooling the seat.
HEATING AND COOLING SYSTEM FOR VEHICLE SEAT

CROSS REFERENCE TO RELATED APPLICATION

[0001] The present application claims priority to Korean Patent Applications Number 10-2009-0088222 filed on Sep. 17, 2009 and 10-2010-0050013 filed on May 28, 2010 the entire contents of which applications are incorporated herein for all purposes by this reference.

BACKGROUND OF THE INVENTION

[0002] 1. Field of the Invention

[0003] The present invention relates to a heating and cooling system for a vehicle seat, and more particularly, to one which can enhance power efficiency by efficiently cooling and heating the vehicle seat.

[0004] 2. Description of Related Art

[0005] In general, a vehicle is equipped with an air-conditioning system including a cooler and a heater. The air-conditioning system serves to control the temperature inside the vehicle. However, the air-conditioning system does not have a function of controlling the temperature of a vehicle seat. In the summer, even if an occupant sitting on a vehicle seat lowers the temperature inside the vehicle by operating the cooler, the seat is relatively slowly cooled down. In addition, the seat is continuously warmed by the body heat of the occupant. Then, the occupant may sweat at the buttocks and the back, which would otherwise develop into heat rashes.

[0006] In the winter, even if the occupant sitting on the vehicle seat raises the temperature inside the vehicle by operating the heater, the occupant may feel chilly or cold at the buttocks or back since the seat has stayed cold for a long time before the heater is operated.

[0007] Accordingly, these days, a seat-dedicated heating and cooling system is additionally provided, which is designed to control the temperature of the seat. In particular, among such systems, which control both heating and cooling, most prominent is the technology that employs a thermoelectric element based on Peltier effect as a heat source.

[0008] In a conventional heating and cooling system for a vehicle seat using a thermoelectric element as a heat source, the vehicle seat has a porous structure or air passages through which air can freely flow. The heating and cooling system controls the temperature of the seat by blowing air, heated or cooled by the thermoelectric element, to the seat.

[0009] The heating and cooling system is configured to heat or cool air using only the thermoelectric element. However, the problem of the thermoelectric element is that the efficiency of a heating part is about 50% of that of a cooling part under the same power supply conditions.

[0010] The problem is not significant in the case of cooling the seat using the thermoelectric element. However, in the case of heating the seat, the low efficiency of the heating part of the thermoelectric element increases power consumption, thereby lowering the efficiency of the heating and cooling system.

[0011] Information disclosed in this Background of the Invention section is only for enhancement of understanding of the general background of the invention and should not be taken as an acknowledgement or any form of suggestion that this information forms the prior art already known to a person skilled in the art.

BRIEF SUMMARY OF THE INVENTION

[0012] Various aspects of the present invention are directed to provide a heating and cooling system for a vehicle seat, in which can ensure improvement in power efficiency and heating performance in the case of heating the vehicle seat.

[0013] In an aspect of the present invention, the heating and cooling system for a vehicle seat, may include a heat exchanger cooling or heating air before the air is introduced into the seat, and a blower blowing air toward the heat exchanger, wherein the heat exchanger includes a positive temperature coefficient element assembly provided inside a housing of the heat exchanger to heat the air supplied from the blower, and wherein the positive temperature coefficient element assembly operates in a case of heating the seat but does not operate in a case of cooling the seat.

[0014] The heat exchanger and the blower may be connected to each other by a duct, and the heat exchanger is detachably attached to the duct.

[0015] The housing may be an integral housing enclosing the blower and the heat exchanger therein, wherein the heat exchanger is disposed in an output port of the integral housing and the positive temperature coefficient element assembly and the Peltier element assembly of the heat exchanger are aligned in series along a longitudinal direction of the output port, and wherein one or more of the integral housings are provided in one or more of a sitting part and a back of the seat.

[0016] The heating and cooling system may include two of the heat exchangers coupled to both ends of the blower, wherein one or more of the heat exchangers are provided in one or more of a sitting part and a back of the seat.

[0017] In another aspect of the present invention, the heating and cooling system for a vehicle seat, may include a heat exchanger cooling or heating air before the air is introduced into the seat, and a blower blowing air toward the heat exchanger, wherein the heat exchanger includes: a positive temperature coefficient element assembly provided inside a housing of the heat exchanger to heat the air supplied from the blower, and a Peltier element assembly provided adjacent to the positive temperature coefficient element assembly to cool or heat air supplied from the blower, wherein the positive temperature coefficient element assembly operates in a case of heating the seat, and the Peltier element assembly operates in a case of cooling or heating the seat.

[0018] The housing of the heat exchanger may have a seat inlet passage, through which cooled or heated air in the housing is introduced toward the seat, and an outlet passage, through which air in the housing is exhausted from the seat, wherein the housing further has a partition forming a boundary between the seat inlet passage and the outlet passage, and the Peltier element assembly is arranged to extend from the partition toward an entrance of the housing to guide air into the seat inlet passage and the outlet passage respectively.

[0019] The housing may further have an entrance-side partition provided in an entrance area of the housing and extending from the Peltier element assembly toward the entrance to prevent air heat-controlled by the Peltier element assembly and air heat-controlled by the Peltier element assembly from being mixed with each other, and the positive temperature coefficient element assembly is arranged along one lateral
The positive temperature coefficient element assembly may be located more adjacent to the blower than the Peltier element assembly is, and the positive temperature coefficient element assembly selectively operates to evaporate condensed water, which is produced due to the Peltier element assembly, in case of cooling the seat.

The positive temperature coefficient element assembly may be arranged in series from the Peltier element assembly toward the entrance of the housing and the heating and cooling system may further include heat sink fins attached to one lateral side of the Peltier element assembly, which faces the seat inlet passage.

The heating and cooling system may further include heat sink fins attached to both sides of the Peltier element assembly and the positive temperature coefficient element assembly.

The heat exchanger and the blower may be connected to each other by a duct, and the heat exchanger is detachably attached to the duct.

The housing may be an integral housing enclosing the blower and the heat exchanger therein, wherein the heat exchanger is disposed in an output port of the integral housing and the positive temperature coefficient element assembly and the Peltier element assembly of the heat exchanger are aligned in series along a longitudinal direction of the output port, and wherein one or more of the integral housings are provided in one or more of a sitting part and a back of the seat.

The heating and cooling system may include two of the heat exchangers coupled to both ends of the blower, wherein one or more of the heat exchangers are provided in one or more of a sitting part and a back of the seat.

According to various aspects of the present invention as set forth above, the heating and cooling system for a vehicle seat has the following effects:

First, since the seat is heated using the PTC element having excellent heating performance, the efficiency of the heater can be raised when compared to the conventional heating using the Peltier element. Accordingly, the heating of the vehicle seat and the power efficiency can be improved.

Second, since the heating is performed using the PTC element, it is not necessary to convert the direction of a current supplied to the Peltier element unlike the related art. As a result, the circuit configuration is simplified.

The methods and apparatuses of the present invention have other features and advantages which will be apparent from or are set forth in more detail in the accompanying drawings, which are incorporated herein, and the following Detailed Description of the Invention, which together serve to explain certain principles of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic configuration view showing an exemplary heating and cooling system for a vehicle seat of the present invention.

FIG. 2 is a perspective view showing important parts of the exemplary heating and cooling system for a vehicle seat shown in FIG. 1.

FIG. 3 is a side cross-sectional view showing a heat exchanger in accordance with an exemplary heating and cooling system for a vehicle seat of the present invention.

FIG. 4 is a side cross-sectional view showing a heat exchanger in accordance with an exemplary heating and cooling system for a vehicle seat of the present invention.

FIG. 5 is a side cross-sectional view showing a heat exchanger in accordance with an exemplary heating and cooling system for a vehicle seat of the present invention.

FIG. 6 is a side cross-sectional view showing a heat exchanger in accordance with an exemplary heating and cooling system for a vehicle seat of the present invention.

FIG. 7 is a side cross-sectional view showing a heat exchanger in accordance with an exemplary heating and cooling system for a vehicle seat of the present invention.

FIG. 8 is a side cross-sectional view showing a sixth exemplary embodiment of the heating and cooling system for a vehicle seat of the invention; and

FIG. 9 is a perspective view showing important parts of the heating and cooling system for the vehicle seat shown in FIG. 8.

It should be understood that the appended drawings are not necessarily to scale, presenting a somewhat simplified representation of various features illustrative of the basic principles of the invention. The specific design features of the present invention as disclosed herein, including, for example, specific dimensions, orientations, locations, and shapes will be determined in part by the particular intended application and use environment.

In the figures, reference numbers refer to the same or equivalent parts of the present invention throughout the several figures of the drawing.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made in detail to various embodiments of the present invention(s), examples of which are illustrated in the accompanying drawings and described below. While the invention(s) will be described in conjunction with exemplary embodiments, it will be understood that present description is not intended to limit the invention(s) to those exemplary embodiments. On the contrary, the invention(s) is/are intended to cover not only the exemplary embodiments, but also various alternatives, modifications, equivalents and other embodiments, which may be included within the spirit and scope of the invention as defined by the appended claims. Above all, reference should be made to the drawings, in which the same reference numerals and signs are used throughout the different drawings to designate the same or similar components. In the following description of the present invention, a detailed description of known functions and components incorporated herein will be omitted when it may make the subject matter of the present invention rather unclear.

FIG. 1 is a schematic configuration view showing a heating and cooling system for a vehicle seat of the present invention, FIG. 2 is a perspective view showing important parts of the heating and cooling system for a vehicle seat shown in FIG. 1, and FIG. 3 is a side cross-sectional view showing a heat exchanger in accordance with a first exemplary embodiment of the heating and cooling system for a vehicle seat of the present invention.

Referring to FIG. 1, the heating and cooling system 1 for a vehicle seat of the present exemplary embodiment is provided in the rear side of a vehicle seat S, and supplies air into the seat S by heating or cooling it. The seat S includes a sitting part S1 and a back S2. The sitting part S1 and the back
S2 has a number of pores such that air, supplied from the heating and seating system I, can uniformly spread across the seat S.

[0044] The heating and cooling system I for a vehicle seat includes two heat exchangers 10 and 20, a blower 30, and ducts 41 and 42. The heat exchanger 10 is provided inside the rear side of the back S2 of the seat S, and the heat exchanger 20 is provided inside the rear side of the sitting part S1 of the seat S. The heat exchangers 10 and 20 heat or cool air, which is directed toward the pores of the seat S. The blower 30 blows air toward the heat exchangers 10 and 20. The ducts 41 and 42 connect the blower 30 with the heat exchangers 10 and 20, respectively.

[0045] The heat exchanger 10 and 20 perform heat exchange in order to convert air, supplied from the blower 30, into cold or warm air.

[0046] More in detail, the heat exchangers 10 and 20 include the first heat exchanger 10, which is provided in the rear side of the back S2 to supply cold or warm air to the back S2, and the second heat exchanger 20, which is provided in the rear side of the sitting part S1 to supply cold or warm air to the sitting part S1.

[0047] The heat exchangers 10 and 20 are connected to the blower 30 by the first duct 41 and the second duct 42, respectively. The ducts 41 and 42 serve as passages that deliver air, blown by the blower 30, to the heat exchangers 10 and 20, respectively. The ducts 41 and 42 and the heat exchangers 10 and 20 can be provided so as to be attachable to and detachable from each other.

[0048] The blower 30 supplies wind to the heat exchangers 10 and 20 through the ducts 41 and 42 by taking in air from outside. A fan, which operates when electric power is supplied, is provided inside the blower 30 to generate a flow of air. For this, an air intake port, from which air is introduced from outside, can be formed in one side of the blower 30, and an air blowing port communicating with the respective ducts 41 and 42 can be formed in the other side of the blower 30.

[0049] The first heat exchanger 10 is connected with the first duct 41 to supply wind, blown from the blower 30, to the back S2 by heating or cooling it. For this, a heater and a cooler are provided inside the first heat exchanger 10 in order to heat and cool air, which is supplied from the blower 30.

[0050] As shown in FIG. 3, the first heat exchanger 10 includes a housing 11 defining the outline of the first heat exchanger 10, a seat inlet passage A through which air heated or cooled inside the housing 11 is introduced into the back S2 of the seat S, and an outlet passage B through which air is exhausted from the seat S.

[0051] The seat inlet passage A forms one passage inside the housing 11, and the distal end of the passage defines a seat inlet port 11a, through which air is supplied into the pores of the seat S.

[0052] The outlet passage B is located adjacent to the seat inlet passage A, forming a passage through which air is exhausted. The distal end of the outlet passage B defines an outlet port 11b. Another connector such as a duct can be connected to the outlet port 11b such that air exhausted through the outlet port 11b does not flow back into the seat S.

[0053] The second heat exchanger 20 is for introducing air, which is heated or cooled down, into the sitting part S1 of the seat S. Except for this feature, the second heat exchanger 20 has substantially the same function and structure as the first heat exchanger 10.

[0054] The most important feature of the present invention is that the heater and the cooler are provided in the first heat exchanger 10 and in the second heat exchanger 20, respectively, in order to heat and cool air to be supplied into the seat S. A Peltier element 13 is used as a main cooler, and a Positive Temperature Coefficient (PTC) element 16 is used as a heater.

[0055] As is well known in the art, when a current is passed around the Peltier element, one side is heated and the other side is cooled. The side to be heated is changed according to the direction of the current applied.

[0056] Accordingly, when the current is supplied to the Peltier element 13 of the present exemplary embodiment, one side of the Peltier element 13, which is heated, and one group of heat sink fins 14 adjacent thereto serves as a heater. At the same time, the other side of the Peltier element 13, which is cooled, and the other group of the heat sink fins 14 adjacent thereto serve as a cooler.

[0057] The PTC element is a semiconductor element that experiences a rapid increase in electrical resistance at a temperature equal to or more than Curie temperature. The PTC element has a self-temperature control function that maintains a constant heating temperature regardless of surrounding temperature when a voltage is applied.

[0058] The heat sink fins 14 are attached to both sides of the Peltier element 13 in a heat conductive structure, thereby constructing a Peltier element assembly 12. The heat sink fins 14 are constructed to maximize the contact area between heat or cold air created by the Peltier element 13 and air flowing inside the heat exchanger 10.

[0059] In addition, heat sink fins 17 are also attached to both sides of the PTC element 16, thereby producing a PTC element assembly 15. The heat sink fins 17 raise the heat exchange efficiency between heat generated by the PTC element 16 and air flowing inside the heat exchanger 10.

[0060] Although the heat sink fins 14 and 17 are shaped as corrugated plates, they can be modified into fin shapes. The heat sink fins 14 and 17 can have any shape that allows air to come into contact with the heat sink fins 14 and 17 while flowing inside the heat exchanger 10.

[0061] The housing 11 also has a partition 11d defining the boundary between the seat inlet passage A and the outlet passage B, and the Peltier element 13 extends in the longitudinal direction of the partition 11d. Specifically, the Peltier element 13 is oriented such that one side faces the seat inlet passage A and the other side faces the outlet passage B. Accordingly, the opposite sides of the Peltier element 13 form the boundary of the seat inlet passage A and the boundary of the outlet passage B.

[0062] An entrance-side partition 11d, which extends from the Peltier element 13, is also provided adjacent to an entrance 11c of the housing 11. The entrance-side partition 11d further separates the seat inlet passage A from the outlet passage B so that air heated by the Peltier element 13 and air cooled by the Peltier element 13 are not mixed with each other inside the housing 11.

[0063] The PTC element assembly 15 is arranged along one side of the entrance-side partition 11d and is located inside the seat inlet passage A. Among the two passages A and B in the heat exchanger 10, the seat inlet passage A extends from the area of the entrance 11c of the housing 11 to the seat inlet port 11a or 21a.

[0064] This is because the PTC element assembly 15 generates only heat unlike the Peltier element assembly 12. Thus,
it is not necessary to exhaust air, heated by the PTC element assembly 15, through the outlet port 11b or 21b while the seat S is being heated.

[0065] When the PTC element assembly 15 is located in the passage A extending from the entrance 11c of the housing 11 to the seat inlet port 11a as described above, it is possible to exclusively supply air, heated by the PTC element assembly 15, to the seat S through the seat inlet port 11a. This, as a result, can raise heating efficiency and power efficiency by reducing heat loss.

[0066] Below, a description will be given of the operation of the heating and cooling system for a vehicle seat in accordance with the first exemplary embodiment of the present invention with reference to the above-described components.

[0067] First, in the case of attempting to supply cold air to the seat S in the summer, a controller of the vehicle controls the heating and cooling system 1 so that the Peltier element 13 operates but the PTC element 16 does not operate.

[0068] When a current is applied to the Peltier element 13, one side of the Peltier element 13 adjacent to the seat inlet port 11a is cooled down and the other side of the Peltier element 13 adjacent to the outlet port 11b is heated. At the same time, the heat sink fins 14 in contact with the Peltier element 13 are cooled or heated according to their position and perform heat exchange with air, which flows inside the heat exchanger 10.

[0069] Air performs heat exchange with the cooler of the Peltier element assembly 12 while it is flowing along the passage A, which extends from the entrance 11c of the heat exchanger 10 to the seat inlet port 11a. As a result, cooled air is supplied to the seat S. In contrast, air performs heat exchange with the heater of the Peltier element assembly 12 while it is flowing along the passage B, which extends from the entrance 11c of the heat exchanger 10 to the outlet port 11b. As a result, heated air is exhausted from the seat S through outlet port 11b.

[0070] Next, in the case of attempting to supply warm air to the seat S in the winter, the controller of the vehicle controls the heating and cooling system 1 so that the PTC element 16 operates but the Peltier element 13 does not operate.

[0071] When a current is applied to the PTC element 16, the PTC element 16 is heated and the heat sink fins 17 in contact with the PTC element 16 are heated along with the PTC element 16 so as to perform heat exchange with air introduced into the heater 10. Since the PTC element assembly 15 is located in the passage A, which extends from the entrance of the heat exchanger 10 to the seat inlet port 11a, the PTC element assembly 15 heats only a portion of air, which is exhausted to the seat inlet port 11a, while the air is introduced into the heater exchanger 10. In contrast, the remaining portion of the air simply passes through the heater exchanger 10 without heat exchange, and is then exhausted to the outlet port 11b.

[0072] As such, the Peltier element 13 cools the air in the case of attempting to supply cold air to the seat S, and the PTC element 16 having excellent power efficiency heats the air in the case of attempting to supply warm air to the seat S. This, as a result, makes it possible to improve heating and cooling efficiency as well as to raise power efficiency.

[0073] FIG. 4 is a side cross-sectional view showing a heat exchanger in accordance with a second exemplary embodiment of the heating and cooling system for a vehicle seat of the present invention. The present exemplary embodiment will be described mainly with reference to the parts different from those of the foregoing embodiment.

[0074] Unlike the foregoing embodiment, a heat exchanger 10a of the present exemplary embodiment does not include the entrance-side partition 11d (see FIG. 3), but a PTC element 16a further extends in the longitudinal direction of a Peltier element 13a. Thus, PTC element 16a is located more adjacent to an entrance 11c, that is, the blower 30.

[0075] Like the foregoing embodiment, heat sink fins 14 and 17a are attached to both sides of the Peltier element 13a and the PTC element 16a, thereby constructing a Peltier element assembly 12a and a PTC element assembly 15a. However, in the present exemplary embodiment, the PTC element 16a also forms the boundary between the seat inlet passage A and the outlet passage B. Accordingly, the PTC element 16a also acts as the entrance-side partition 11c of the foregoing embodiment.

[0076] Like the foregoing embodiment, in the case of attempting to supply cold air to the seat S in the summer, the heating and cooling system 1 of the present exemplary embodiment is controlled by a controller of the vehicle in order to operate the Peltier element 13a without operating the PTC element 16a.

[0077] In addition, in the case of attempting to supply warm air to the seat S, the controller of the vehicle controls the heating and cooling system 1 so that the PTC element 16a operates but the Peltier element 13a does not operate.

[0078] FIG. 5 is a side cross-sectional view showing a heat exchanger in accordance with a third exemplary embodiment of the heating and cooling system for a vehicle seat of the present invention. The present exemplary embodiment will be described mainly with reference to the parts different from those of the foregoing second embodiment.

[0079] Unlike the foregoing embodiment, in a heat exchanger 10b of the present exemplary embodiment, heat sink fins 14a are attached to one side of a Peltier element 13a, which faces a seat inlet passage A. However, heat sink fins are not attached to the other side of the Peltier element 13a, which faces an outlet passage B.

[0080] According to this configuration, in the case of attempting to supply warm air to the seat S, a controller of the vehicle controls the heating and cooling system 1 so that the PTC element 16a operates but the Peltier element 13a does not operate. This, as a result, can prevent heat loss, i.e., heat generated by the PTC element 16a is transmitted to the Peltier element 13a, from which the heat is exhausted through the outlet passage.

[0081] Meanwhile, the heat exchangers 10, 10a, and 10b of the first to third exemplary embodiments can be controlled so that only the Peltier element 13, 13a operates in the case of cooling the seat S but both the Peltier element 13 and the PTC element 16a operate in the case of heating the seat S.

[0082] In addition, if condensed water is produced due to the Peltier element 13 in the case of cooling the seat S, the heat exchanger can be controlled so that also the PTC element 16 operates to evaporate the condensed water.

[0083] FIG. 6 is a side cross-sectional view showing a heat exchanger in accordance with a fourth exemplary embodiment of the heating and cooling system for a vehicle seat of the present invention. The present exemplary embodiment will be described mainly with reference to the parts different from those of the foregoing embodiments.

[0084] Unlike the foregoing embodiments, in a heat exchanger 10c of the present exemplary embodiment, only a seat inlet port 11a is formed in a housing 11 but an outlet port is not formed. In addition, although a PTC element assembly
A heating and cooling system of the present exemplary embodiment is operated differently from those of the foregoing embodiments, i.e., the PTC element 16 is operated in the case of heating the seat S, but cooling is performed by operating only the blower 30 without operating the PTC element 16 in the case of cooling the seat S.

FIG. 7 is a side cross-sectional view showing a heat exchanger in accordance with a fifth exemplary embodiment of the heating and cooling system for a vehicle seat of the present invention.

Unlike the foregoing embodiments, according to the feature of the present exemplary embodiment, an integral housing H, which encloses a heat exchanger and a blower therein, is provided. The integral housing H may include an entrance 22 at one side thereof and the positive temperature coefficient element 15 and the Peltier element 12 may be disposed in an output port 24 aligned in series along a longitudinal direction of the output port 24.

As a result, the configuration of the heating and cooling system for a vehicle seat is simplified.

In other words, the foregoing embodiments are realized inside one housing by arranging a blower 30 in the center of the housing and heat exchanging components, including a Peltier element assembly 12 and a PTC element assembly 15, on both sides of the blower.

As such, according to the heating and cooling system of the present exemplary embodiment, one simple device can replace complicated components. Accordingly, the heating and cooling system can be easily installed in and separated from the seat, and the maintenance of the heating and cooling system is made easier. It should be understood that the configuration shown in FIG. 7 is only a schematic illustration and the configurations of the foregoing embodiments can be adopted for the heat exchanger unit of the present exemplary embodiment.

FIG. 8 is a side cross-sectional view showing a sixth exemplary embodiment of the heating and cooling system for a vehicle seat of the invention, and FIG. 9 is a perspective view showing important parts of the heating and cooling system for the vehicle seat shown in FIG. 8.

In this embodiment, a heat exchanger 10 includes a duct 27a, and a heat exchanger 20 includes a duct 27b. The ducts 27a and 27b introduce air, which is heated or cooled, to the seat. In addition, a PTC element assembly 15a, which heats air, is mounted on each of the heat exchangers 10 and 20.

As shown in FIG. 9, referring to the first heat exchanger 10 by way of example, a housing 110 has an air inlet port 11a, but an air outlet port is not provided.

In addition, a PTC element assembly 15a, which includes a PTC element 16a and heat sink fins 17a, is disposed inside the housing 11. However, a Peltier element is not provided inside the housing 11.

In addition, a blower 30 includes an integral housing H communicating with the ducts 27a and 27b, a blower fan 31 mounted inside the central portion of the integral housing H, and Peltier element assemblies 12 mounted inside the integral housing H. The Peltier element assemblies 12 are provided in the portions of the integral housing H that are connected to the ducts 27a and 27b.

Here, as in the foregoing exemplary embodiments, each of the Peltier element assemblies 12 can include a Peltier element (not shown) and heat sink fins (not shown) attached to one or both sides of the Peltier element.

In this exemplary embodiment, the PTC element 16a operates when the seat S is heated (or warmed), whereas the Peltier element operates when the seat S is cooled. Accordingly, in this exemplary embodiment, it is possible to immediately provide warm air to the seat S using the PTC elements 16a, located on the distal ends of the ducts 27a and 27b, during the heating. These characteristics of this exemplary embodiment can advantageously prevent hot air, which is supplied from the PTC element inside the integral housing H, from making the duct flexible. Otherwise, in the structure of the foregoing embodiment shown in FIG. 7, the hot air might make the duct flexible when it flows through the duct.

The foregoing descriptions of specific exemplary embodiments of the present invention have been presented for purposes of illustration and description. They are not intended to be exhaustive or to limit the invention to the precise forms disclosed, and obviously many modifications and variations are possible in light of the above teachings. The exemplary embodiments were chosen and described in order to explain certain principles of the invention and their practical application, to thereby enable others skilled in the art to make and utilize various exemplary embodiments of the present invention, as well as various alternatives and modifications thereof. It is intended that the scope of the invention be defined by the Claims appended hereto and their equivalents.

What is claimed is:

1. A heating and cooling system for a vehicle seat, comprising:
   a heat exchanger cooling or heating air before the air is introduced into the seat; and
   a blower blowing air toward the heat exchanger,
   wherein the heat exchanger includes a positive temperature coefficient element assembly provided inside a housing of the heat exchanger to heat the air supplied from the blower, and
   wherein the positive temperature coefficient element assembly operates in a case of heating the seat but does not operate in a case of cooling the seat.

2. The heating and cooling system in accordance with claim 1, wherein the heat exchanger and the blower are connected to each other by a duct, and the heat exchanger is detachably attached to the duct.

3. The heating and cooling system in accordance with claim 1, wherein the housing is an integral housing enclosing the blower and the heat exchanger therein,
   wherein the heat exchanger is disposed in an output port of the integral housing and the positive temperature coefficient element assembly and the Peltier element assembly of the heat exchanger are aligned in series along a longitudinal direction of the output port, and
   wherein one or more of the integral housings are provided in one or more of a sitting part and a back of the seat.

4. The heating and cooling system in accordance with claim 1, comprising two of the heat exchangers coupled to both ends of the blower, wherein one or more of the heat exchangers are provided in one or more of a sitting part and a back of the seat.
5. A heating and cooling system for a vehicle seat, comprising:
   a heat exchanger cooling or heating air before the air is introduced into the seat; and
   a blower blowing air toward the heat exchanger,
   wherein the heat exchanger includes:
   a positive temperature coefficient element assembly provided inside a housing of the heat exchanger to heat
   the air supplied from the blower; and
   a Peltier element assembly provided adjacent to the
   positive temperature coefficient element assembly to
cool or heat supplied from the blower,
   wherein the positive temperature coefficient element assembly operates in a case of heating the seat, and the
   Peltier element assembly operates in a case of cooling or heating the seat.

6. The heating and cooling system in accordance with claim 5, wherein the housing of the heat exchanger has a seat
   inlet passage, through which cooled or heated air in the housing is introduced toward the seat, and an outlet passage,
   through which air in the housing is exhausted from the seat.

7. The heating and cooling system in accordance with claim 6, wherein
   the housing further has a partition forming a boundary
   between the seat inlet passage and the outlet passage, and
   the Peltier element assembly is arranged to extend from the
   partition toward an entrance of the housing to guide air into the seat inlet passage and the outlet passage respectively.

8. The heating and cooling system in accordance with claim 7, wherein
   the housing further has an entrance-side partition provided
   in an entrance area of the housing and extending from
   the Peltier element assembly toward the entrance to prevent air heat-controlled by the Peltier element assembly
   and air heat-controlled by the Peltier element assembly from being mixed with each other, and
   the positive temperature coefficient element assembly is
   arranged along one lateral side of the entrance-side partition and is located in a passage leading to the seat inlet
   passage.

9. The heating and cooling system in accordance with claim 8, wherein
   the positive temperature coefficient element assembly is
   located more adjacent to the blower than the Peltier element assembly is, and
   the positive temperature coefficient element assembly
   selectively operates to evaporate condensed water,
   which is produced due to the Peltier element assembly, in case of cooling the seat.

10. The heating and cooling system in accordance with claim 5, wherein the positive temperature coefficient element
    assembly is arranged in series from the Peltier element assembly toward the entrance of the housing.

11. The heating and cooling system in accordance with claim 10, further comprising heat sink fins attached to one
    lateral side of the Peltier element assembly, which faces the seat inlet passage.

12. The heating and cooling system in accordance with claim 5, further comprising heat sink fins attached to both
    sides of the Peltier element assembly and the positive temperature coefficient element assembly.

13. The heating and cooling system in accordance with claim 5, wherein the heat exchanger and the blower are
    connected to each other by a duct, and the heat exchanger is detachably attached to the duct.

14. The heating and cooling system in accordance with claim 5, wherein the housing is an integral housing enclosing
    the blower and the heat exchanger therein,
    wherein the heat exchanger is disposed in an output port of
    the integral housing and the positive temperature coefficient element assembly and the Peltier element assembly
    of the heat exchanger are aligned in series along a longitudinal direction of the output port, and
    wherein one or more of the integral housings are provided
    in one or more of a sitting part and a back of the seat.

15. The heating and cooling system in accordance with claim 5, comprising two of the heat exchangers coupled to
    both ends of the blower, wherein one or more of the heat exchangers are provided in one or more of a sitting part and a
    back of the seat.

16. The heating and cooling system in accordance with claim 6, further comprising heat sink fins attached to the
    Peltier element assembly, wherein the heat sink fins adjacent to the outlet passage are larger than the heat sink fins adjacent
to the seat inlet passage in order to enhance heat dissipation from the seat.

17. A heating and cooling system for a vehicle seat, comprising:
   a heat exchanger cooling or heating air before the air is introduced into the seat, wherein the heat exchanger has
   a duct that introduces the air into the seat;
   a blower including an integral housing communicating
   with the ducts and a blower fan mounted inside the
   integral housing, wherein the blower fan blows air toward the heat exchanger;
   a positive temperature coefficient element provided inside
   the heat exchanger to heat air supplied from the blower;

   a Peltier element mounted inside the integral housing of the
   blower,
   wherein the positive temperature coefficient element operates
   when the seat is heated, and the Peltier element operates
   when the seat is cooled.

   * * * * *