A climate control device (15) influences at least one climatic parameter of a handle (5) of a steering device (2). The climate control device (15) comprises an air moving device (21) for providing a stream of air, a handle distributor (26) for distributing a stream of air within at least a part of the handle (5), and an air guidance device (22) for guiding air between the air moving device (21) and the distributor (26). It is planned that the air moving device (21) can be or is mounted on an area remaining static in relation to an adjustment movement of the steering device (2), the handle distributor (26) can be or is mounted on an area moving in relation to the static area, when the steering device (2) is subject to an adjustment movement, and the climate control device (15) is provided with a connecting device (30), allowing the air moving device (21) and the handle distributor (26) to move in relation to each other.
HEATING AND COOLING DEVICE FOR HANDLES, ESPECIALLY OF STEERING MECHANISM

BACKGROUND OF THE INVENTION

An object according to the present invention is a heating and cooling device for handles and steering mechanisms for influencing at least one climatic parameter. It can, for example, be used in the heating, cooling or ventilation of handles of vehicle doors, steering wheels or control sticks.

PRIOR ART

It is known from US 5,850,741 to cool a steering wheel by integrating heat pipes into the steering wheel. As the steering wheel has to meet a number of critical conditions, like crash-safety, stability, good grip for hands of different size or strength, it is difficult to put such a system into practice.

SUBJECT OF THE INVENTION

With this as background, a technical concept according to claim 1 is suggested.

The present teachings herein provide for a handle, vehicle or steering mechanism, equipped with at least one device according to any of the teachings herein.

The invention relates to a device for influencing at least one climatic parameter. If the device for influencing a zone to be gripped is provided, then surfaces touched by the user, especially handles, can be suitably temperature-controlled, especially steering wheels, door handles, steps, operating handles of machines, etc.

If the device has or is a heating, ventilation or cooling device, then, depending on the requirement, the temperature, the humidity or the air composition at the handle can be adjusted.

In addition, the invention relates to a handle, a vehicle or a steering device. If these are equipped with a device described above, this improves its capacity for use under climatically unfavorable conditions.
Additional advantageous embodiments can be gleaned from the additional claims and the specification that follows.

The present invention especially relates to a climate control device 15 for influencing at least one climatic parameter of a handle 5 of a steering device 2, the climate control device 15 having
- an air moving device 21 for providing a stream of air
- a handle distributor 26 for distributing a stream of air within at least a part of the handle 5
- an air guidance device 22 for guiding air between the air moving device 21 and the distributor 26.

It is suggested that
- the air moving device 21 can be or is mounted to an area remaining static in relation to an adjustment movement of the steering device 2
- the handle distributor 26 can be or is mounted to an area moving in relation to the static area, when the steering device 2 is subject to an adjustment movement and
- the climate control device 15 is provided with a connecting device 30, allowing the air moving device 21 and the handle distributor 26 to move in relation to each other.

This allows e.g. rotation and ventilation of a handle without integration of voluminous parts into the handle.

It is further suggested that the connecting device 30 allows a rotation of the handle device 26 of at least 180° around a pivot pole 3 of the steering device 2. That e.g. can be reached by providing an interface 40 that allows a shifting of at least two air guidance components relative to each other. For that purpose it is further suggested that the connecting device 30 is provided with ring-like connector channel 37 arranged concentrically in relation toward an axis of the pivot pole 3.

It can be helpful if the climate control device 15 is provided with at least two interfaces 40, 40' to create two air paths for allowing an exchange of at least two air streams between a handle distributor 26 and at least one connector device 30, at least a first air stream being directed toward the handle distributor 26 and at least a second air stream being directed away from the handle distributor 26. This allows efficient temperature control without blowing exhaust air toward a user.

It can be preferred that
the climate control device 15 is provided with at least one thermoelectric device, representing a temperature-control device 17,
- at least a first air path is provided for moving a first air stream along a first side of the temperature-control device 17 and
- at least a second air path is provided to moving a second air stream along a second side of the temperature-control device 17, the first side and the second side having a different temperature during at least one mode of operation.

This allows efficient distribution within the handle distributor simultaneously with a simple operation of a thermal device.

A handle, vehicle, or steering mechanism, equipped with at least one climate control device 15 provides good thermal comfort, while ensuring safety operation and compact packaging.

FIGURES

In what follows, the particulars of the invention are explained. These embodiments should make the invention understandable. However, they are of only an exemplary nature. Naturally, within the framework of the invention defined by the independent claims, certain individual or multiple features described can be left out, altered or supplemented. Also, the features of differing embodiment forms could be combined with each other. What is decisive is that the concept of the invention is implemented in its essence. If one feature is to be implemented at least partially, then it includes this feature being implemented fully also, or being essentially implemented in full.

"Essentially" especially means that the implementation permits the desired feature to be attained to a perceptible degree. This can especially mean that a corresponding feature is attained at least by 50 %, 90 %, 95 % or 99 %. If a minimum amount is indicated, then naturally more than this minimum amount can also be used. If the number of a component is indicated by at least one or by indefinite article, then this especially includes embodiment forms also with two, three or some other plurality of components. What is described for one object can also be applied for the preponderant part of the totality of all other objects identical in nature. If nothing otherwise is indicated, intervals include their end points. In what follows, reference is made to:

Figure 1 illustrates a vehicle 1 with a heated and cooled steering device in a partial longitudinal section.
Figure 2 illustrates a steering device from figure 1, in a side view with an air-distribution device under a removed cover.

Figure 3 is an enlarged side view of the steering device of figure 2 with the side covers completely removed.

Figure 4 is a top view on an open steering wheel of figures 1 - 3.

Figure 5 is a perspective view of an explosion view on an air flow connection device for the steering wheel of figures 1 - 4.

Figure 6 is an enlarged cross-section of the air flow connection device of figure 5.

Figure 7 is a perspective view of the air flow connection device of figure 5 and 6 from a different angle.

Figure 8 is a perspective view of a further embodiment of the climate control device, having two air moving devices and a fluid loop between the handle and one air moving device.

Figure 9 is a perspective explosion view of a first air moving device and an air intake device for the climate control device of figure 8.

SPECIFICATION

The invention related especially to a vehicle 1 as per figure 1. A vehicle means a device for transport of persons and/or freight, such as vehicles on land, water, railways and in the air, especially aircraft, ships and automotive vehicles.

The invention additionally relates to a steering device 2, such as steering wheels of motor vehicles as per figure 2, control sticks or aircraft or drag links of motorcycles.

Preferably the at least one control mechanism has a pivot pole 3. Pivot pole means the reference point or the reference axis about which a steering mechanism is moved to generate a steering signal. Examples are a so-called front end for a motorcycle steering bar or the steering wheel cup with a steering wheel, a centering point with a multidimensional-operation control stick or some other reference point with a nonrotary-operating steering system such as slide controls.
Preferably the at least one steering mechanism has at least one handle. Handle means a device for grasping and applying adjustment forces, especially for manual adjustment of steering devices, of doors, or for operation of motors. Examples are steering handles on motorcycles or steering wheel rings on steering wheels. Especially suited for this are knobs, rods or annular or arc-shaped round profiles made for example of wood, plastic or metal.

In addition, the invention also relates to a climate control device. Climate control device means an object that is suited to influence an area to be influenced with regard to at least one climatic parameter, for example for heating, ventilation, moisturizing or removal of moisture, and/or cooling.

Preferably at least one climate control device has at least one temperature-control device. Temperature-control device means a device which serves for deliberate temperature control of a user or of an object to be heated, especially for raising, maintaining or lowering the temperature, such as heating, cooling or ventilating devices.

In addition, the invention relates to a heating device, which preferably represents the temperature control device or a component part of it. A heating device means a device that provides thermal energy for specific heating of its surroundings, and emits that energy conductively, convectively and/or through thermal radiation to its surroundings. Examples are devices with at least one electrical resistance heater, a heat pump, a radiator, or a heating spiral, with multiples of these components, also of differing types, also possibly being present. It is favorable if a planar heating element is provided in a jacket for heating a handle surface and additionally a Peltier element or a PTC heating module is provided in an air flow for heating an air flow directed to the steering device.

Preferably at least one heating device has at least one heating resistor for direct or indirect heating of a handle. Heating resistor implies an ohmic resistance or some other electrical component which converts electrical into thermal energy when current passes through. Examples are a plurality of heating sections made of carbon fibers, PTC heating modules connected in an air flow, layers made of an electrically conducting plastic, metal foils such as those made of aluminum or individual large-area heating sections made of metallic strands, especially in a grip zone of a surface of a handle.

Preferably at least one temperature-control device has at least one cooling device for removal of excess thermal energy, especially through insolation. Cooling device
means a device to lower the temperature of a surface to be cooled or an object to be
cooled, such as Peltier elements, thermal conduction pipes or ventilation devices such
fans. A position at a distance from temperature-controlled zones promotes simple
assembly and reduced structural space, for example in the direction of flow
immediately behind a fan, especially close to, or in, a pivot pole of the steering
mechanism. Fans with integrated Peltier modules are favorable for a modular
combination of the fan and cooling device.

Preferably at least one heating or cooling device has at least one ventilation device 20.
Ventilation device means a device that can be used for deliberate alteration of the air
composition or the air flows in a specific two-dimensional or three-dimensional area.

Preferably at least one ventilation device has at least one air moving device 21. Air
moving device means a device for moving of air. Examples are fans, especially a radial
fan as or an onboard air conditioner.

Preferably at least one ventilation or air conditioning device has at least one air
guidance device 22. Air guidance means a device which can guide air in at least one
direction between a zone to be air conditioned and an air feed device or along a zone
to be ventilated.

Preferably the at least one ventilation device exhibits at least one handle distributor 26
for ventilation or back-ventilation of a handle. Handle distributor means a device for
collecting, distributing and/or directing air within or along the handle, for example,
through pipes or gaps which connect one or more attachment or ventilation openings
with one another.

Preferably an air guidance device 22 has at least one connecting device 30, to movably
connect a ventilation device 20 and a handle distributor 26. A connecting device 30
preferably has a disc-like shape. Preferably its center axis is identical with the pivot
pole 3. Preferably it is arranged in a plain perpendicular to the pivot pole 3.

A connection device 30 is provided with at least two separate parts 31' and 32', of
which at least one is movable relative to the other by sliding or pivoting. One part 31'
supplies air, the other part 32' receives that air. Which one is supplying and which one
is receiving depends upon the direction of a passing air flow. So in case the air flow is
switched in an opposite direction, the parts would have the respective opposite function,
too.
Preferably a connecting device 30 has a supply portion 31 for supplying air, which usually corresponds to one of the parts 31' and a receiver portion 32 for receiving air, which usually corresponds to the at least second part 32'. At least one of those portions is movable relative to the other portion, without significant loss of air. So a relative movement between the portions is possible while at the same time essentially the whole supplied air of the supply portion 31 is transferred to the receiver portion 32.

Both parts 31' and 32' share at least one joint interface 40 to exchange air between them. For that purpose, the parts 31' and 32' are at least partly open toward each other along the joint interface 40. If that interface 40 is arranged at least partly along a cylindrical surface concentric to the pivot pole 3, such openings allow a transfer of air from one part 31', 32' to the other perpendicular to the axis of the pivot pole 3.

If that interface 40 is arranged at least partly along a plain perpendicular to the axis of the pivot pole 3, as in figures 5 - 7, such openings allow a transfer of air from one part 31', 32' to the other by a stream of air, having a direction along the axis of the pivot pole 3. Especially in this case, preferably both parts intermesh with each other, to improve air tightness of their connection. This e.g. can be achieved by inserting them into each other during assembly by movement along the axis of the pivot pole 3.

Preferable at least one supply portion 31 has at least one supply channel 33, to provide air along at least a part of a path of relative movement. It is preferably a circular channel with rectangular or trapezoid cross-section and one open side.

Preferably at least one receiver portion 32 has at least one collector channel 34, to collect air along at least a part of a path of relative movement. At least a part of its cross-section corresponds to at least a part of the cross-section of supply channel 33. It is preferably a circular channel with rectangular or trapezoid cross-section and one open side, which faces toward the open side of the supply channel 33.

Preferably a supply portion 31 and/or a supply channel 33 have an air outlet 35, e.g. represented by one or more openings. It e.g. can be of circular, rectangular or long narrow form. Preferably it is ring-like, with its center arranged on the pivot pole 3 of the steering device 2.

Preferably a receiver portion 32 and/or a collector channel 34 have an air inlet 36, e.g. by one or more openings. It e.g. can be of circular, rectangular or long narrow form.
Preferably it is ring-like, with its center arranged on the pivot pole 3 of the steering device 2.

In a preferred embodiment a supply channel 33 of a supply portion 31 and a collector channel 34 of a receiver portion 32 are at least part from a common connector channel 37. While being slidable or pivotable moveable relative to each other, both parts work together to keep guided air within the common connection channel and not let it escape from the border between both parts.

To enable a smooth relative movement between portions 31 and 32 at least one rolling element 38 is arranged between at least one border wall of the supply portion 31 and at least one border wall of the receiver portion 32. Preferably a multitude of rolling elements 38 is arranged along the joint border walls of the common connection channel 37, preferably on both of its sides, so on the inner as well as on the outer side relative to the pivot pole 3.

A rolling element 38 preferably has a ball-like, a cylindric or a cone-shaped form. To save space cylindric rolling elements are preferred.

To prevent an exchange of air between the rolling elements, preferably the connection device 30 is provided with one or more sealing devices 39, e. g. seals or gaskets. Such sealing devices 39 are preferably positioned along or in parallel to the arrangement of the rolling elements (e. g. a bearing).

Preferably a radial ventilator is used as an air moving device 21. It is mounted in a zone, which is static in relation to an adjustment movement of a steering device 2. At the discharge side of the air moving device 21 a temperature control device 17 is provided. It could also be provided within or attached to an air guidance device 22 or further along an air path connected to the air moving device 21. That temperature control device 17 could be a first heat resistor, e. g. a PTC heater, mounted to heat the air stream of the air moving device 21.

Preferably the temperature control device is a thermoelectric device 16a to selectively heat or cool the discharged air.

Preferably the air moving device 21 is connected to one side of the thermoelectric device 16a, to provide an air stream with heating or cooling energy.
Preferably the temperature-control device 17 is connected via two or more tubes or channels and one or more connection devices 30. This creates a multitude of air streams and works as one or more air guidance devices 22 between the temperature-control device 17 and the one or more connection devices 30.

Preferably the one or more air guidance devices 22 are connected with one or more distributor portions 31 and/or supply channels 33 or one or more connection devices 30. The stream of air within the air guidance device 22 is perpendicular to the direction within the supply channel 33.

If there are two or more air guidance devices connected with the same supply channel 33, their connection points are preferably separated from each other to improve a homogenous air distribution within supply channel 33. If that supply channel has a ring-like form, the connection points preferably are separated a number of degrees from each other, which essentially corresponds to 360° divided by the number of connection points or the number of connected air guidance devices 22. So in the present example the two connection points are separated roughly by 180° from each other.

The supply channel 33 of the supply portion 31 in the present example also forms the collector channel 34 of the receiver portion 32. So in this section the resulting air stream forms a ring-like hollow room representing a common connector channel 37. It allows an air movement along the axis of the pivot pole 3 as well as an air movement around the pivot pole 3.

A receiver portion 32 and/or a collector channel 34 is preferably connected via one or more tubes, representing further air guidance devices 22′, 22″ with a handle distributor 26 within the steering device 2 and/or a handle 5.

To allow a homogenous distribution of air within a handle 5, the stream of air can be split up via a multitude of air guidance devices 22′. Preferably their number is similar or even higher than the number of air guidance devices 22 between the air moving device 21 and the connecting device 30. Preferably their number is twice as high to allow a distribution of air in more than one direction along a handle 5.

Preferably a climate control device 15 is provided with more than one connecting device 30. Preferably a climate control device 15 and/or a connecting device 30 could additionally or alternatively be provided with more than one supply portion 31 and/or
receiver portion 32. This allows to increase the volume of the resulting air supply by a plurality of parallel air streams.

Sometimes it is also favorable to have a climate control device 15 and/or a connecting device 30 provided with means to allow two or more air streams simultaneously, especially in opposing directions. Then one air stream could be directed from the air moving device 21 toward a handle 5 and distributed within a handle distributor 26. At the same time, a backward stream could be guided from the handle distributor 26 back toward a parallel second connector device, a second interface 40' or a second connector channel 37'. From there the air stream could be guided via a further guidance device 22" toward a second side of the thermoelectric device 16a. Thus it could serve as exhaust air stream removing unwanted exhaust heat or exhaust cold from the thermoelectric device 16a. Its discharge could then take place, e.g. via a discharge tube, where it does not disturb, e.g. in the foot area of a cabin or outside of the vehicle 1.

Preferably a climate control device 15 is equipped with two air moving devices 21. Preferably a first air moving device 21' is associated or coupled to a first side of a thermoelectric device 16a. Preferably a second air moving device 21" is associated or coupled to a second side of a thermoelectric device 16a. The first side and the second side of the thermoelectric device 16a differ in temperature during operation. The first air moving device 21' is provided for moving air towards the steering wheel. The second air moving device 21" is provided for moving exhaust air the way from the steering wheel and towards the floor of a vehicle or some kind of exhaust air exit (e.g. via the HVAC (heating/ventilating/air conditioning) system of the vehicle).

The first air moving device 21' is connected with the handle distributor 26 via the connecting device 30 and supply duct 22a. Preferably the first air moving device 21' is a radial ventilator and the supply ducts 22a, the connecting device 30 and the handle distributor 26 are coupled to an air discharge opening of the air moving device 21'. In this kind of arrangement preferably the handle distributor has no air discharge openings towards the hands of a driver. Instead, air entering the handle distributor 26 via supply ducts 22a passes through the handle distributor 26 and is then removed via recirculation ducts 22b. The recirculation ducts 22b are coupled via the connecting device 30 with the first air moving device 21'. Preferably the recirculation ducts 22b are connected towards an air intake of the air moving device 21'. So the one side of the thermoelectric device 16a, which is responsible for the thermal performance of the
handle distributor, is coupled with an airstream that forms an at least partly closed loop to recirculate air. In this way, if the thermoelectric device 16a is used for heating, the heating performance of the climate control device is increased. Because already warmed air is recirculated towards the warm side of the thermoelectric device 16a. If the climate control device is used for cooling, then the cooling performance is increased. Because the cold side of the thermoelectric device 16a is provided with already pre-cooled air from the handle distributor 26. Preferably the first and the second air moving device 21', 21" are both attached to the thermoelectric device. Preferably they are coupled to different ends of the thermoelectric device 16a. So the resulting two airstreams differ in direction. Preferably they oppose each other.

The first air moving device 21' could be provided with an air intake device 92. This air intake device 92 is coupled to an air intake opening of the first air moving device 21'. The air intake device 92 has a recirculation intake 95, which is coupled with the recirculation ducts 22b. So this recirculation intake 95 connects the handle distributor 26 with the air intake of the first air moving device 21'. The air intake device 92 can further be provided with a second air intake opening 94. Via this air intake opening 94, the air loop is connected to surrounding air. So via the second air intake opening 94 the first air moving device 21' can be supplied with surrounding air in addition to the recirculated air. That allows to level out air loses or to more easily adjust the air supply volume and air pressure within the fluid loop.

So it is of advantage to have a climate control device 15 with an air moving device 21, which is provided with a first air exchange opening 97, which is connected via at least one supply duct 22a and the connecting device 30 with the handle distributor 26, where
- the air moving device 21 is provided with a second air exchange opening 98,
- the climate control device is provided with at least one recirculation duct 22b, which connects the handle distributor 26 via the connecting device 30 with the second air intake opening 98, and
- the climate control device 15 therefore is provided with a channel loop, circulating air between the air moving device 21, the thermoelectric device 16a and the handle distributor 26.
## LIST OF REFERENCES

<table>
<thead>
<tr>
<th>Reference</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vehicle</td>
</tr>
<tr>
<td>2</td>
<td>Steering device</td>
</tr>
<tr>
<td>3</td>
<td>Pivot pole</td>
</tr>
<tr>
<td>5</td>
<td>Handle</td>
</tr>
<tr>
<td>15</td>
<td>Climate control device</td>
</tr>
<tr>
<td>16</td>
<td>Heating device</td>
</tr>
<tr>
<td>16a</td>
<td>Thermoelectric device</td>
</tr>
<tr>
<td>16b</td>
<td>Planar heating element</td>
</tr>
<tr>
<td>17</td>
<td>Temperature-control device</td>
</tr>
<tr>
<td>18</td>
<td>Heating resistor</td>
</tr>
<tr>
<td>20</td>
<td>Ventilation device</td>
</tr>
<tr>
<td>21, 21', 21&quot;</td>
<td>Air moving device</td>
</tr>
<tr>
<td>22, 22', 22&quot;</td>
<td>Air guidance devices</td>
</tr>
<tr>
<td>22a</td>
<td>Supply duct</td>
</tr>
<tr>
<td>22b</td>
<td>Recirculation duct</td>
</tr>
<tr>
<td>26</td>
<td>Handle distributor</td>
</tr>
<tr>
<td>30</td>
<td>Connecting device</td>
</tr>
<tr>
<td>31</td>
<td>Supply portion</td>
</tr>
<tr>
<td>31'</td>
<td>Part (of the connecting device)</td>
</tr>
<tr>
<td>32</td>
<td>Receiver portion</td>
</tr>
<tr>
<td>32'</td>
<td>Part (of the connecting device)</td>
</tr>
<tr>
<td>33</td>
<td>Supply channel</td>
</tr>
<tr>
<td>34</td>
<td>Collector channel</td>
</tr>
<tr>
<td>35</td>
<td>Air outlet</td>
</tr>
<tr>
<td>37, 37'</td>
<td>Connector channel</td>
</tr>
<tr>
<td>38</td>
<td>Rolling element</td>
</tr>
<tr>
<td>39</td>
<td>Sealing devices</td>
</tr>
<tr>
<td>40, 40'</td>
<td>Interface</td>
</tr>
<tr>
<td>92</td>
<td>Air intake device</td>
</tr>
<tr>
<td>94</td>
<td>Air intake opening</td>
</tr>
<tr>
<td>95</td>
<td>Recirculation intake</td>
</tr>
<tr>
<td>97</td>
<td>First air exchange opening</td>
</tr>
<tr>
<td>98</td>
<td>Second air exchange opening</td>
</tr>
</tbody>
</table>
CLAIMS

1. A climate control device (15) for influencing at least one climatic parameter of a handle (5) of a steering device (2), the climate control device (15) having
   - an air moving device (21) for providing a stream of air
   - a handle distributor (26) for distributing a stream of air within at least a part of the handle (5)
   - an air guidance device (22) for guiding air between the air moving device (21) and the distributor (26),
characterized in that
   - the air moving device (21) can be or is mounted to an area remaining static in relation to an adjustment movement of the steering device (2)
   - the handle distributor (26) can be or is mounted to an area moving in relation to the static area, when the steering device (2) is subject to an adjustment movement and
   - the climate control device (15) is provided with a connecting device (30), allowing the air moving device (21) and the handle distributor (26) to move in relation to each other.

2. Climate control device (15) according to claim 1, characterized in that the connecting device (30) allows a rotation of the handle device (26) of at least 180° around a pivot pole (3) of the steering device (2).

3. Climate control device (15) according to claim 1 or 2, characterized in that the connecting device (30) is provided with a ring-like connector channel (37) arranged concentrically in relation toward an axis of the pivot pole (3).

4. Climate control device (15) according to any of the proceeding claims, characterized in that the climate control device (15) is provided with at least two interfaces (40, 40') to create two air paths for allowing an exchange of at least two air streams between a handle distributor (26) and at least one connector device (30), at least a first air stream being directed toward the handle distributor (26) and at least a second air stream being directed away from the handle distributor (26).

5. Climate control device (15) according to claim 4, characterized in that
- the climate control device (15) is provided with at least one thermoelectric device, representing at least a part of a temperature-control device (17),
- at least a first air path is provided for moving a first air stream along a first side of the thermoelectric device and
- at least a second air path is provided to moving a second air stream along a second side of the thermoelectric device, the first side and the second side having a different temperature during at least one mode of operation.

6. Climate control device (15) according to any of the proceeding claims, characterized in that
- the air moving device (21) is provided with a first air exchange opening (97), which is connected via at least one supply duct (22a) and the connecting device (30) with the handle distributor (26),
- the air moving device (21) is provided with a second air exchange opening (98),
- the climate control device is provided with at least one recirculation duct (22b) which connects the handle distributor (26) via the connecting device (30) with the second air intake opening (98),
- the climate control device (15) therefore is provided with a channel loop, circulating air between the air moving device (21), the thermoelectric device (16a) and the handle distributor (26).

7. A handle, vehicle, or steering mechanism, equipped with at least one climate control device (15) according to any of the proceeding claims.
A. CLASSIFICATION OF SUBJECT MATTER

B60H 1/00 (2006.01) i; B62D 1/06 (2006.01) i

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)

B60H, B62D, F24F

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

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

CNPAT, EPDOC, WPL, CNKI, GOOGLE, CLIMATE, HEAT+, THERMAL+, COOL+, VENTILAT+, TEMPERATURE, CONTROL+, STEERING, HANDLE?, AIR CONDITION+, AIR DISTRIBUT+

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>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>GB 2362203 A (WRIGHT, PETER) 14 November 2001 (2001-1 1-14) description, lines 1-3 in page 1, line 1 in page 4 to line 16 in page 6, figures 1, 3-6</td>
<td>1-3, 7</td>
</tr>
<tr>
<td>A</td>
<td>JP 11235981 A (NARA, M.) 31 August 1999 (1999-08-31) the whole document</td>
<td>1-7</td>
</tr>
<tr>
<td>A</td>
<td>DE 202012009655 U1 (W.E.T. AUTOMOTIVE SYSTEMS AG.) 20 February 2014 (2014-02-20) the whole document</td>
<td>1-7</td>
</tr>
</tbody>
</table>

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

Date of the actual completion of the international search

31 December 2014

Date of mailing of the international search report

28 January 2015

Name and mailing address of the ISA/CN

STATE INTELLECTUAL PROPERTY OFFICE OF THE P.R.CHINA (ISA/CN)
6, Xituocheng Rd., Jimen Bridge, Haidian District, Beijing 100088 China

Authorized officer

YANG, Yan

Facsimile No. (86-10)62019451

Telephone No. (86-10)62414051

Form PCT/ISA/210 (second sheet) (July 2009)
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date (day/month/year)</th>
<th>Patent family member(s)</th>
<th>Publication date (day/month/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GB 2362203 A</td>
<td>14 November 2001</td>
<td>Non e</td>
<td></td>
</tr>
<tr>
<td>US 2013180354 A1</td>
<td>18 July 2013</td>
<td>CN 203111289 U</td>
<td>07 August 2013</td>
</tr>
<tr>
<td>US 6382712 B1</td>
<td>07 May 2002</td>
<td>Non e</td>
<td></td>
</tr>
<tr>
<td>JP 11235981 A</td>
<td>31 August 1999</td>
<td>Non e</td>
<td></td>
</tr>
<tr>
<td>DE 202012009655 U1</td>
<td>20 February 2014</td>
<td>Non e</td>
<td></td>
</tr>
</tbody>
</table>