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(54) Title: NECK WARMER WITH INFRARED AND CONVECTIVE HEATING

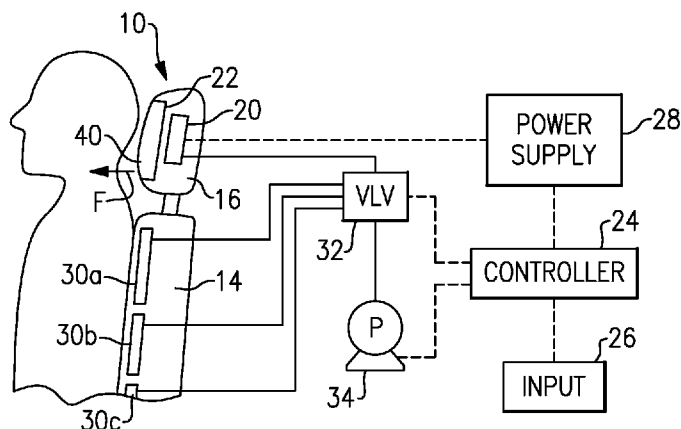


FIG.2

(57) Abstract: A seat includes a seat back and a headrest, an aesthetic covering that includes at least one hole for communicating fluid to a seated occupant, an inflatable support that is arranged in the seat back, an infrared heater that is arranged in a cavity beneath the at least one aesthetic covering, and a pump that is in fluid communication with the lumbar support and the cavity. The pump is configured to supply a fluid to the cavity to pass through the infrared heater and out the at least one hole.

NECK WARMER WITH INFRARED AND CONVECTIVE HEATING

CROSS-REFERENCE TO RELATED APPLICATION

[0001] This application claims priority to United States Provisional Patent Application No. 63/601,776 filed November 22, 2023.

TECHNICAL FIELD

[0002] This disclosure relates to a seat that provides personalized thermal comfort using infrared heating and convective heating.

BACKGROUND

[0003] Vehicles have become increasingly sophisticated, particularly in their use of personalized thermal conditioning for occupants. Vehicle seats have been a primary focal point for personalizing thermal comfort. Typically, simple conductive wire heating elements provide heat, and a thermoelectric device provides cooling through passages in the seat.

[0004] Extreme temperatures create a challenging environment to provide thermal comfort to the occupant. In extreme cold, it is desirable to bring seating surfaces and the environment immediately surrounding the occupant quickly up to a comfortable temperature. Infrared heaters have been proposed more recently for use in the seat headrest, but using infrared heating as proposed can result in hot spots on the back of the occupant's head.

SUMMARY

[0005] In one exemplary embodiment, a seat includes a seat back and a headrest, an aesthetic covering that includes at least one hole for communicating fluid to a seated occupant, an inflatable support that is arranged in the seat back, an infrared heater that is arranged in a cavity beneath the at least one aesthetic covering, and a pump that is in fluid communication with the lumbar support and the cavity. The pump is configured to supply a fluid to the cavity to pass through the infrared heater and out the at least one hole.

[0006] In a further embodiment of any of the above, the seat includes a valve module that is in communication with the pump, the cavity and the lumbar support. The valve module is configured to regulate a flow of the fluid to the cavity and the lumbar support in response to at least one input.

[0007] In a further embodiment of any of the above, the seat includes an aromatherapy module that is arranged fluidly between the pump and the cavity. The aromatherapy module includes at least one cartridge that includes a scented substance configured to be released through the at least one hole.

[0008] In a further embodiment of any of the above, the aromatherapy module includes an access cover that is removably arranged over the cartridge.

[0009] In a further embodiment of any of the above, the at least one hole is provided in the headrest and configured to be near a neck of the seated occupant.

[0010] In a further embodiment of any of the above, the headrest is integrated with the seat back, and includes a common aesthetic covering that is provided for the seat back and the headrest.

[0011] In a further embodiment of any of the above, the seat includes a distribution bag that provides the cavity. The distribution bag has an inlet and an outlet. The inlet is configured to receive the fluid from the pump, and the outlet is in fluid communication with the at least one hole.

[0012] In a further embodiment of any of the above, the distribution bag includes a spacer material that is arranged in the cavity.

[0013] In a further embodiment of any of the above, the infrared heater is arranged in the distribution bag.

[0014] In a further embodiment of any of the above, the infrared heater is sandwiched in between the spacer material.

[0015] In a further embodiment of any of the above, a spacer material is arranged between the distribution bag and the aesthetic covering.

[0016] In a further embodiment of any of the above, the at least one hole is provided by perforations arranged in front of the outlet.

[0017] In a further embodiment of any of the above, the outlet is provided by laterally spaced apart outlets that are configured to be arranged on either side of a head and/or neck of the seated occupant.

[0018] In another exemplary embodiment, a method of heating an occupant includes directing a radiant heat from an infrared heater in a seat toward an occupant, regulating air from a pump to a location proximate to the infrared heater, the pump is fluidly connected to a lumbar support, and blowing the air proximate to the infrared heater to convectively heat the occupant.

[0019] In a further embodiment of any of the above, the method includes a step of delivering the air to a distribution bag through an inlet, and the blowing step includes supplying the air from an outlet in the distribution bag through perforations in an aesthetic covering.

[0020] In a further embodiment of any of the above, the method includes the step of flowing the air through the infrared heater.

[0021] In a further embodiment of any of the above, the infrared heater is arranged in the distribution bag.

[0022] In a further embodiment of any of the above, the infrared heater is arranged outside of the distribution bag.

[0023] In a further embodiment of any of the above, the method includes the step of inflating a support with the pump.

[0024] In a further embodiment of any of the above, the method includes a step of releasing a scent from an aromatherapy module fluidly downstream from the pump prior to performing the blowing step.

BRIEF DESCRIPTION OF THE DRAWINGS

[0025] The disclosure can be further understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

[0026] Figures 1A and 1B schematically illustrate example seats using an infrared (IR) heater in a headrest as well as convective heating.

[0027] Figure 2 schematically illustrates a disclosed thermal conditioning system for the seat.

[0028] Figure 3A and 3B are respectively side and top views of one example IR heater with convective heating.

[0029] Figure 4 is a side view of another example IR heater with convective heating.

[0030] Figure 5 is a schematic view of the control system for the IR heater with convective heating.

[0031] Figure 6 illustrates an access cover on the seat for aromatherapy cartridges housed therein.

[0032] The embodiments, examples and alternatives of the preceding paragraphs, the claims, or the following description and drawings, including any of their various aspects or respective individual features, may be taken independently or in any combination. Features described in connection with one embodiment are applicable to all embodiments, unless such features are incompatible. Like reference numbers and designations in the various drawings indicate like elements.

DETAILED DESCRIPTION

[0033] Example seats 10, 110 are respectively illustrated in Figures 1A and 1B. For the seat 10, a seat back 14 is secured to a seat cushion 12. A non-integrated, adjustable headrest 16 is supported relative to the seat back 14 by one or more posts 18. The seat 110 illustrated in Figure 1B has its headrest 16 integrated with the seat back 114, which is connected to the seat cushion 112. Both types of seats are referred to generally as “seat 10”.

[0034] Regardless of seating configuration, the headrest 16, 116 (generally, “headrest 16”) includes an infrared heater 20 that may be comprised of one or more IR heating elements. The disclosed IR heater 20, as contrasted with a typical conductive wire heater, has a much greater power density, for example, at least 1,000 W/m² or 1,800 W/m², and in one example, in a range of 1000 W/m² to 4000 W/m². In one example, a heater designed with 1000 W/m² in the perimeter and 500 W/m² in the center could be what is needed to maintain a 100 C/50 C surface temperature, but so

could a 2000 W/m²/1000 W/m² heater config pulse width modulated to 50%. The advantage to higher power density is the fast time to temperature. The IR heater 20 is able to provide a heat flux configured to provide an occupant skin temperature target in a range of 33 C to 43 C, for example. This can be achieved by a variety of approaches, as the above examples illustrate. One suitable type of conductive wire heating element is provided by Gentherm's Mechanical Structuring Process (MSP) technology, which allows a higher power density and may employ a foil element, if desired.

[0035] A material stack 22 (e.g., spacer material 42 and one or more other layers) is arranged over the IR heater 20. An aesthetic covering 44 is also part of the material stack 22 in that it affects the infrared heating provided to the occupant by the IR heater. The density, layering, and materials of the various material stacks provided in the headrest 16 can be varied to vary the IR heating provided by different regions to different zones of the occupant (e.g., head (back and/or sides of head) and/or neck (back and/or sides of neck)). In applications in which the headrest 16 is integrated with the seat back 14, a common aesthetic covering 44 may be provided for both the seat back 14 covering and the headrest 16. In applications in which the headrest 16 is discrete from and adjustable relative to the seat back 14, separate aesthetic coverings are provided for each.

[0036] A simple system schematic is illustrated in Figure 2. The system includes a controller 24 that receives a signal from an input 26, which may be a switch, touchscreen, or other device typically found in a modern vehicle to control thermal conditioning. A power supply 28 is in communication with the controller 24 and the IR heater 20. The controller 24 is configured to energize the IR heater 20 via the power supply 28 in response to the signal from the input 26. That is, the signal may be used to initiate and/or terminate heating. A feedback sensor can also be used once heating has commenced. The feedback sensor can be accomplished with PTC materials (self-regulates as temperatures rise) and/or a thermostat in the IR heater 20. In one example, the controller 24 and the power supply 28 are provided in or on the seat 10. The input 26 is typically provided on the vehicle's instrument panel, although the input 26 may be located elsewhere if desired.

[0037] As shown in Figures 1A-2, the seat back 14 includes one or more inflatable bladders 30a, 30b, 30c (generally, "bladder(s) 30"). The bladders 30 may be located anywhere on the seat (e.g., beneath the seating surface on the seat back and/or seat cushion) and can be used to support and/or massage the occupant. In one non-limiting example, the bladders 30 are lumbar bladders. A pump 34 is fluidly connected to the bladders 30 by a valve module 32, which includes one or more valves for selectively directing the flow of pressurized air from the pump 34 to the desired bladder 30 in response to an input, which may be the same or different than input 26. The controller 24 is in communication with the valve module 32 and pump 34.

[0038] In the disclosed thermal conditioning system, the same pump 34 used for the lumbar bladders 30 is also used to provide conditioned air F to a region near the IR heater 20 to provide convective heating to the occupant in the head and/or neck zones. This approach increases the effectiveness of the heating provided by the IR heater 20 while minimizing any additional cost for doing so by leveraging the rarely used lumbar pump.

[0039] One example air distribution arrangement for convective heating is shown in Figures 3A and 3B. The distribution bag 36 may be provided by a ventilated trim bag ("VTB") arranged in the headrest 16. A spacer material 39 (e.g., a three-dimensional woven spacer material or similar material providing low effusivity along with IR transparency, commonly used in the seating industry) is arranged in the distribution bag 36 to create an expanded, mesh-like volume that better communicates fluid therethrough. An inlet 38 is provided in the distribution bag 36 to receive the air from the pump 34. The hose feeding the distribution bag 36 and wires to the IR heater 20 may be routed through a post 18 in adjustable headrest 16 applications.

[0040] One or more outlets 40 are provided in the distribution bag 36 near the regions of the aesthetic covering 44 from which heated air is desired to be provided to the occupant. Centering the inlet 38 relative to laterally spaced outlets 40 forces air to flow laterally across the IR heater 20 and out to the sides of the occupant's head, neck and/or ears. The VTB includes small holes or perforations in addition to the outlets 40 and are "tunable" to control air exit velocity through the outlets 40 and therefore how far the air will project. Smaller holes create high bag pressure and higher

velocity out the outlets 40, while larger holes create higher flow rates with lower speed out the outlets 40. In the example shown, an outlet 40 may be provided on both lateral sides of the distribution bag, which would correspond to a region next to the occupant's head and neck, but other configurations may be used.

[0041] In the example shown, the infrared heater 20 is arranged outside the distribution bag 36 such that the air exiting the outlets 40 must pass through the infrared heater 20, and then through the material stack 22. Perforations 46 can be provided in the aesthetic covering 44 (e.g., behind both neck and ears) to enable the air heated by the infrared heater 20 to escape the headrest and flow toward the occupant. The hollow arrows indicate radiant heating, and the small, solid arrows indicate the supplemental convective heating.

[0042] Another example arrangement as shown in Figure 4 in which the IR heater 20 is arranged inside the distribution bag 136, which may be a VTB construction, as described above. It may be desirable to sandwich the IR heater 20 between the spacer material 39. Again, the air flows through the IR heater before exiting one or more perforation 46 in the aesthetic covering 44. The air F may also or instead be provided proximate to the IR heater 20, that is, the air F need not flow through the IR heater 20, but heat energy may need to be added in other ways.

[0043] An overall schematic of the system is shown in Figure 5 in more detail than Figure 2. The system may also include an aromatherapy module 50 in fluid communication with the air provided by the pump 34. In the example, the aromatherapy module 50 is arranged fluidly between the valve module 32 and the distribution bag 36. A noise suppression element 58, such as a muffler, is arranged upstream from the distribution bag 36 to reduce any noise communicated from the pump 34, particularly since the air exits the headrest 16 near the occupant's ears.

[0044] In one example, the aromatherapy module 50 includes multiple cartridges, such as first, second and third cartridges 52, 54, 56, which include various scents (e.g., mint, lavender, ginger, scent-neutralizer) that may be selectively released into the air provided to distribution bag 36. The scents may be provided in solid form and which are activated by heat to prevent a scent from being released when not

desired. In such an arrangement, the cartridges may have small heaters associated with them which are also activated when the associated valve is switched.

[0045] As shown in Figure 6, the cartridges 52, 54, 56 are integrated into the seat 10, such as the seat back 14. An access cover 16 may be provided on the seat 10 and may be removed to enable replacement of the cartridges.

[0046] The controller 24 may be a hardware device for executing software, particularly software stored in memory. The controller 24 can be a custom made or commercially available processor, a central processing unit (CPU), an auxiliary processor among several processors associated with the controller, a semiconductor-based microprocessor (in the form of a microchip or chip set) or generally any device for executing software instructions.

[0047] In terms of hardware architecture, such a computing device can include a processor, memory, and one or more input and/or output (I/O) device interface(s) that are communicatively coupled via a local interface. The local interface can include, for example but not limited to, one or more buses and/or other wired or wireless connections. The local interface may have additional elements, which are omitted for simplicity, such as controllers, buffers (caches), drivers, repeaters, and receivers to enable communications. Further, the local interface may include address, control, and/or data connections to enable appropriate communications among the aforementioned components.

[0048] The memory can include any one or combination of volatile memory elements (e.g., random access memory (RAM, such as DRAM, SRAM, SDRAM, VRAM, etc.)) and/or nonvolatile memory elements (e.g., ROM, hard drive, tape, CD-ROM, etc.). Moreover, the memory may incorporate electronic, magnetic, optical, and/or other types of storage media. The memory can also have a distributed architecture, where various components are situated remotely from one another, but can be accessed by the processor.

[0049] The software in the memory may include one or more separate programs, each of which includes an ordered listing of executable instructions for implementing logical functions. A system component embodied as software may also be construed as a source program, executable program (object code), script, or any

other entity comprising a set of instructions to be performed. When constructed as a source program, the program is translated via a compiler, assembler, interpreter, or the like, which may or may not be included within the memory.

[0050] The disclosed input and output devices that may be coupled to system I/O interface(s) may include input devices, for example but not limited to, a keyboard, mouse, scanner, microphone, camera, mobile device, proximity device, etc. Further, the output devices, for example but not limited to, a printer, display, etc. Finally, the input and output devices may further include devices that communicate both as inputs and outputs, for instance but not limited to, a modulator/demodulator (modem; for accessing another device, system, or network), a radio frequency (RF) or other transceiver, a telephonic interface, a bridge, a router, etc.

[0051] When the controller 24 is in operation, the processor can be configured to execute software stored within the memory, to communicate data to and from the memory, and to generally control operations of the computing device pursuant to the software. Software in memory, in whole or in part, is read by the processor, perhaps buffered within the processor, and then executed.

[0052] It should also be understood that although a particular component arrangement is disclosed in the illustrated embodiment, other arrangements will benefit herefrom. Although particular step sequences are shown, described, and claimed, it should be understood that steps may be performed in any order, separated or combined unless otherwise indicated and will still benefit from the present invention.

[0053] Although the different examples have specific components shown in the illustrations, embodiments of this invention are not limited to those particular combinations. It is possible to use some of the components or features from one of the examples in combination with features or components from another one of the examples.

[0054] Although an example embodiment has been disclosed, a worker of ordinary skill in this art would recognize that certain modifications would come within the scope of the claims. For that reason, the following claims should be studied to determine their true scope and content.

CLAIMS

What is claimed is:

1. A seat comprising:
a seat back and a headrest;
an aesthetic covering including at least one hole for communicating fluid to a seated occupant;
an inflatable support arranged in the seat back;
an infrared heater arranged in a cavity beneath the at least one aesthetic covering; and
a pump in fluid communication with the lumbar support and the cavity, the pump configured to supply a fluid to the cavity to pass through the infrared heater and out the at least one hole.
2. The seat of claim 1, comprising a valve module in communication with the pump, the cavity and the lumbar support, the valve module configured to regulate a flow of the fluid to the cavity and the lumbar support in response to at least one input.
3. The seat of claim 1, comprising an aromatherapy module arranged fluidly between the pump and the cavity, the aromatherapy module including at least one cartridge including a scented substance configured to be release through the at least one hole.
4. The seat of claim 3, wherein the aromatherapy module includes an access cover removably arranged over the cartridge.
5. The seat of claim 1, wherein the at least one hole is provided in the headrest and configured to be near a neck of the seated occupant.
6. The seat of claim 5, wherein the headrest is integrated with the seat back, and including a common aesthetic covering provided for the seat back and the headrest.

7. The seat of claim 1, comprising a distribution bag providing the cavity, the distribution bag having an inlet and an outlet, the inlet configured to receive the fluid from the pump, and the outlet in fluid communication with the at least one hole.

8. The seat of claim 7, wherein the distribution bag includes a spacer material arranged in the cavity.

9. The seat of claim 8, wherein the infrared heater is arranged in the distribution bag.

10. The seat of claim 9, wherein the infrared heater is sandwiched in between the spacer material.

11. The seat of claim 7, wherein a spacer material is arranged between the distribution bag and the aesthetic covering.

12. The seat of claim 7, wherein the at least one hole is provided by perforations arranged in front of the outlet.

13. The seat of claim 12, wherein the outlet is provided by laterally spaced apart outlets configured to be arranged on either side of a head and/or neck of the seated occupant.

14. A method of heating an occupant, comprising:
directing a radiant heat from an infrared heater in a seat toward an occupant;
regulating air from a pump to a location proximate to the infrared heater,
wherein the pump is fluidly connected to a lumbar support; and
blowing the air proximate to the infrared heater to convectively heat the occupant.

15. The method of claim 14, comprising a step of delivering the air to a distribution bag through an inlet, and the blowing step includes supplying the air from an outlet in the distribution bag through perforations in an aesthetic covering.

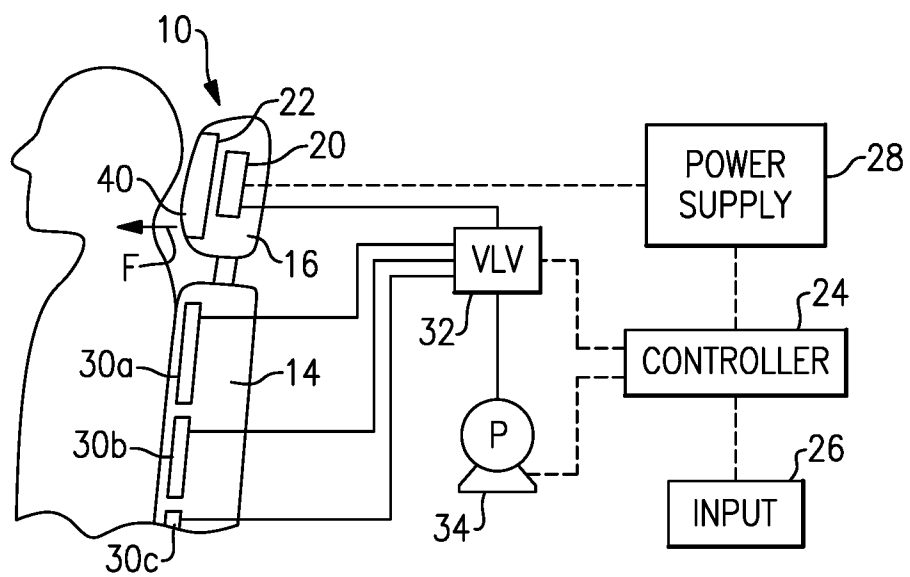
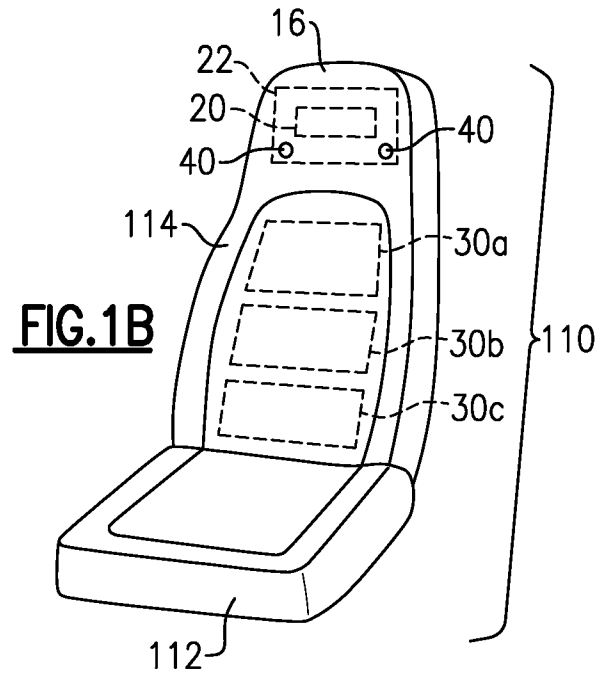
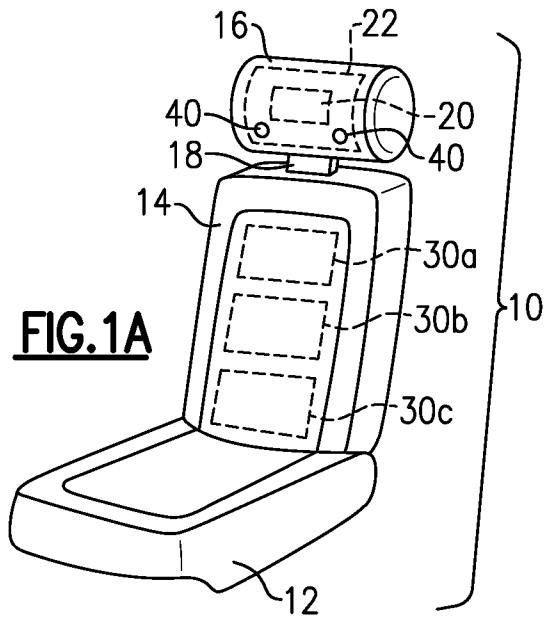
16. The method of claim 15, comprising the step of flowing the air through the infrared heater.

17. The method of claim 16, wherein the infrared heater is arranged in the distribution bag.

18. The method of claim 16, wherein the infrared heater is arranged outside of the distribution bag.

19. The method of claim 14, comprising the step of inflating a support with the pump.

20. The method of claim 14, comprising a step of releasing a scent from an aromatherapy module fluidly downstream from the pump prior to performing the blowing step.



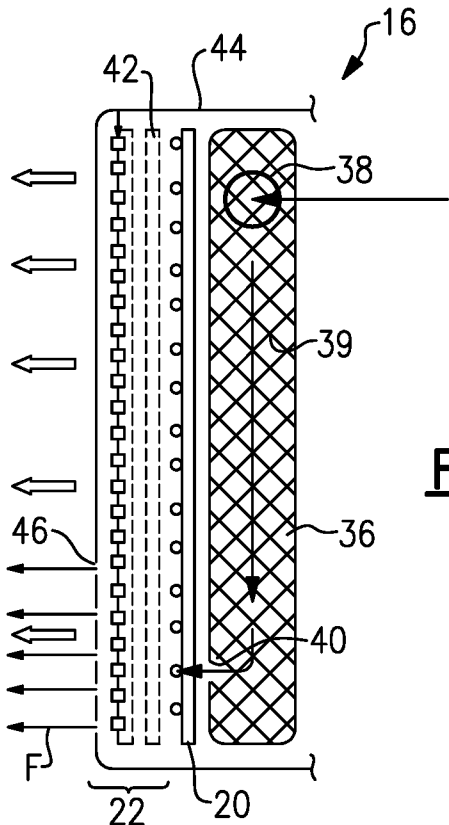


FIG. 3A

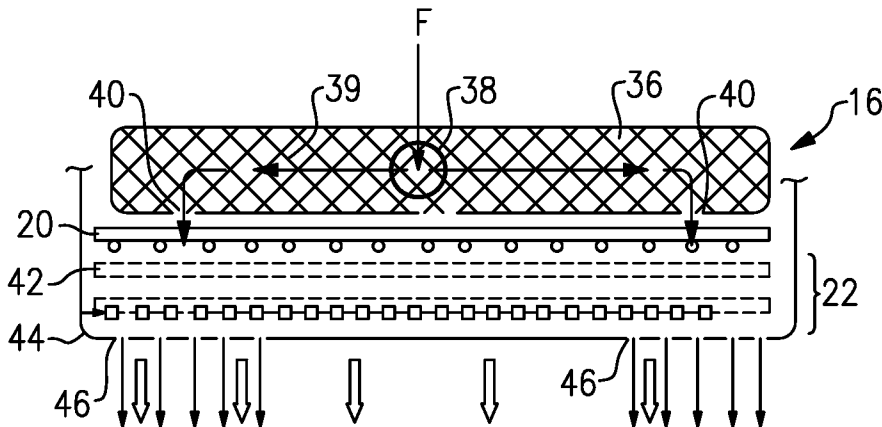
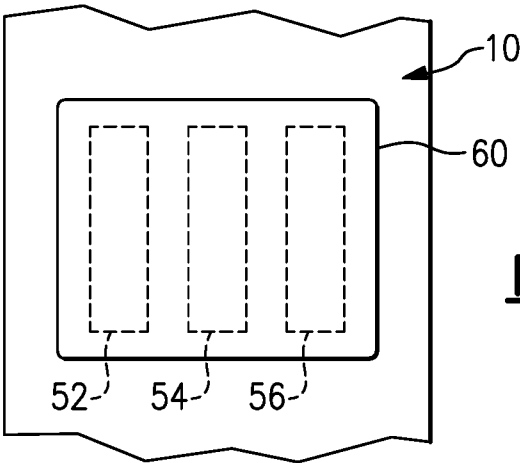
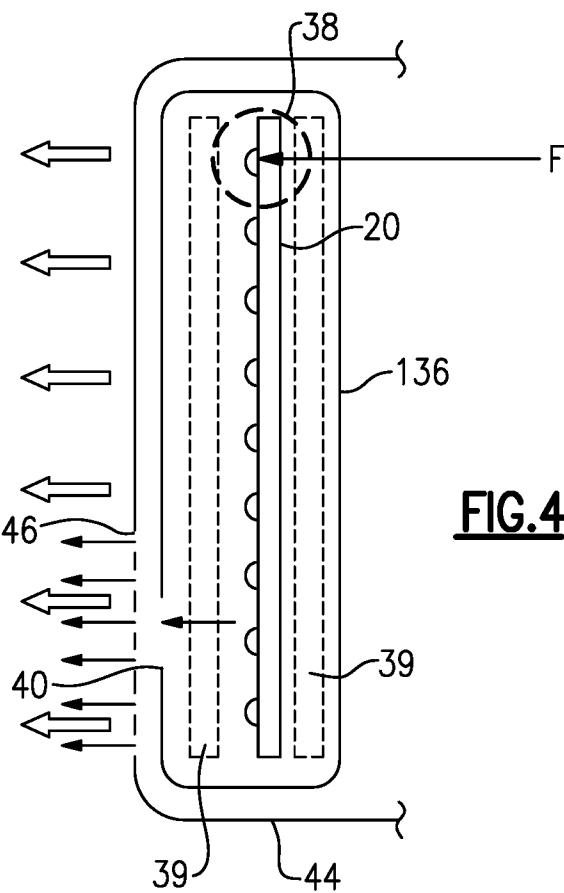
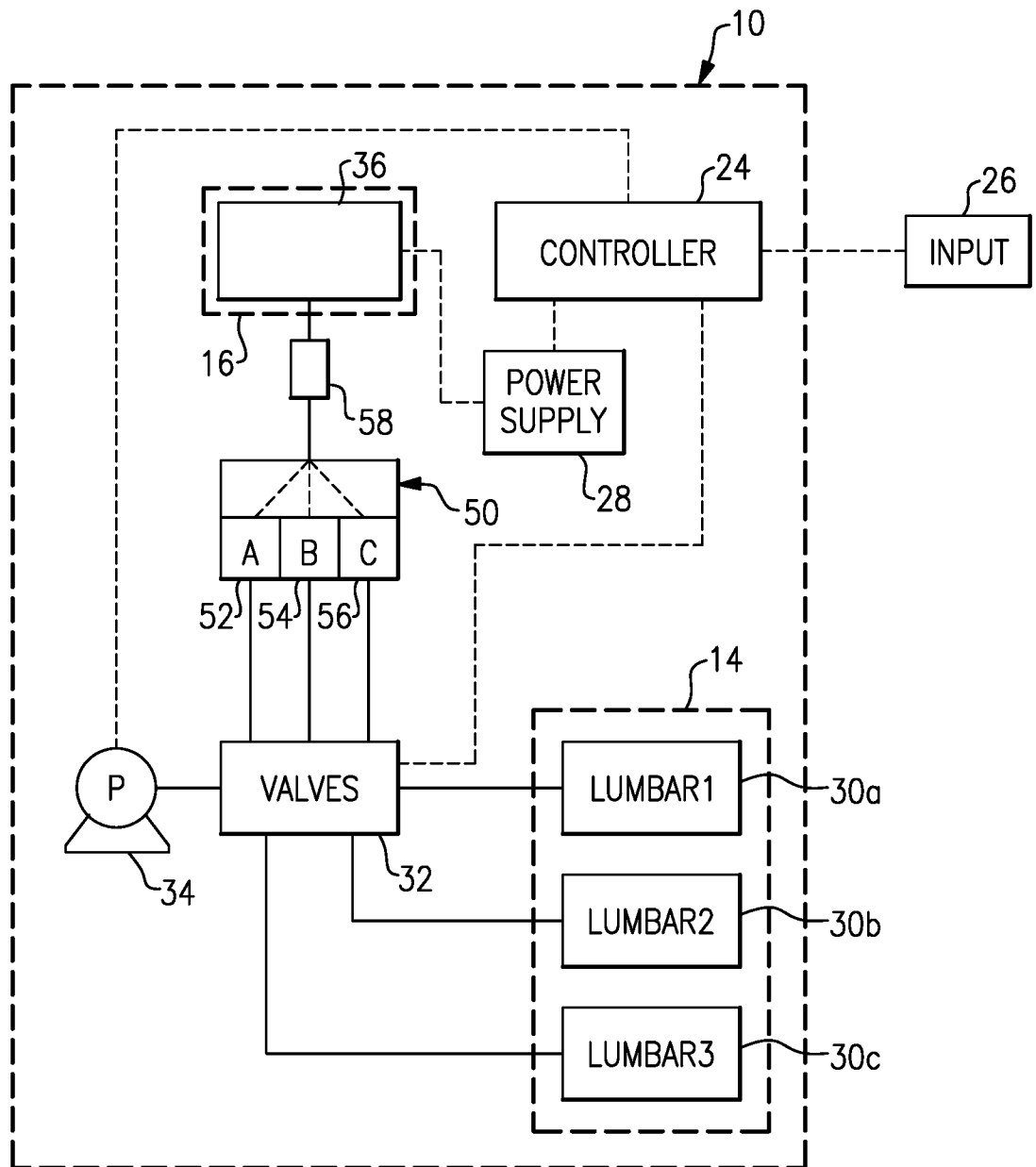


FIG. 3B

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**FIG.5**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US2024/055919

A. CLASSIFICATION OF SUBJECT MATTER B60N 2/879(2018.01)i; B60N 2/56(2006.01)i; B60N 2/90(2018.01)i; B60N 2/66(2006.01)i; A47C 9/00(2006.01)i; A47C 31/00(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) B60N 2/879(2018.01); A47C 4/54(2006.01); B60H 1/22(2006.01); B60N 2/44(2006.01); B60N 2/56(2006.01); H05B 3/14(2006.01) Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean utility models and applications for utility models Japanese utility models and applications for utility models Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS(KIPO internal) & Keywords: seat, aesthetic cover, lumbar support, infrared heater, pump, vavle, aromatherapy, headrest, distribution bag, spacer		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	CN 212921234 U (TIANJIN SHENGSHI TIANCHI AUTOMOBILE TECHNOLOGY CO., LTD.) 09 April 2021 (2021-04-09) paragraphs [0017], [0019], [0020]-[0023] and figure 1	1-20
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Y	US 2022-0288997 A1 (GENTHERM INCORPORATED) 15 September 2022 (2022-09-15) paragraphs [0045], [0051], [0060], [0063] and figure 1	5,6,8-11,13
A	US 2014-0159442 A1 (W.E.T. AUTOMOTIVE SYSTEMS AG.) 12 June 2014 (2014-06-12) paragraphs [0019]-[0048] and figures 2-5	1-20
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents: “A” document defining the general state of the art which is not considered to be of particular relevance “D” document cited by the applicant in the international application “E” earlier application or patent but published on or after the international filing date “L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) “O” document referring to an oral disclosure, use, exhibition or other means “P” document published prior to the international filing date but later than the priority date claimed “T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention “X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone “Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art “&” document member of the same patent family		
Date of the actual completion of the international search 05 March 2025		Date of mailing of the international search report 05 March 2025
Name and mailing address of the ISA/KR Korean Intellectual Property Office 189 Cheongsa-ro, Seo-gu, Daejeon 35208, Republic of Korea Facsimile No. +82-42-481-8578		Authorized officer HWANG, Chan Yoon Telephone No. +82-42-481-3347

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Information on patent family members

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