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(54) VEHICLE SEAT WITH CUSHIONING LAYER

(75) Inventors: **Gabriella Almasi**, Windsor (CA); **Evelina Grigore**, Bridgeville, PA (US); **Nick Brie**, Windsor (CA); **Ed Marlovits**, Windsor (CA); **Goran Bajic**, Windsor (CA); **Marinko Lazanja**, Windsor (CA); **Shaun Howick**, Windsor (CA)

Correspondence Address:
DOBRUSIN & THENNISCH PC
29 W LAWRENCE ST
SUITE 210
PONTIAC, MI 48342 (US)

(73) Assignee: **W.E.T. Automotive Systems, AG**

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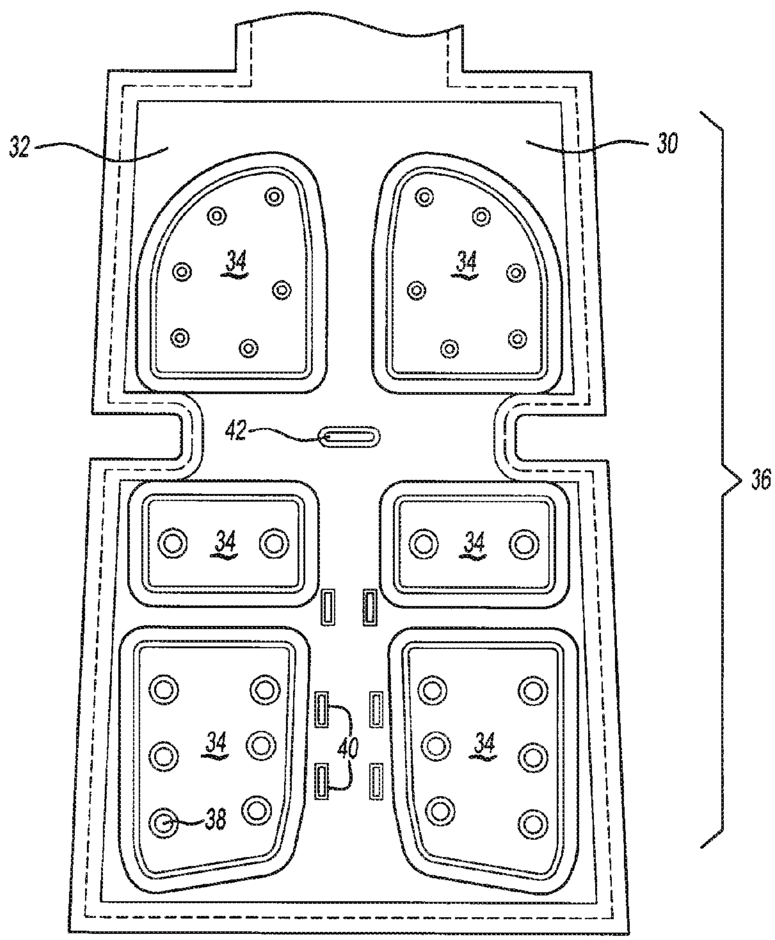
(57) **ABSTRACT**

The present invention comprises a seat for a vehicle having at least one temperature conditioned component. The temperature conditioned component comprises a cushion, a trim surface, an insert located beneath the trim surface and a cushioning layer. The cushioning layer comprises one or more pouches with a filler material, and preferably a liquid filler material, that distributes the downward pressure of the occupant across a larger area of the seat. This distribution of downward pressure reduces or eliminates pressure points in the seat. The seat may also include an air mover assembly that facilitates the heating, cooling or ventilation function of the seat by blowing air to or drawing air from the seat.



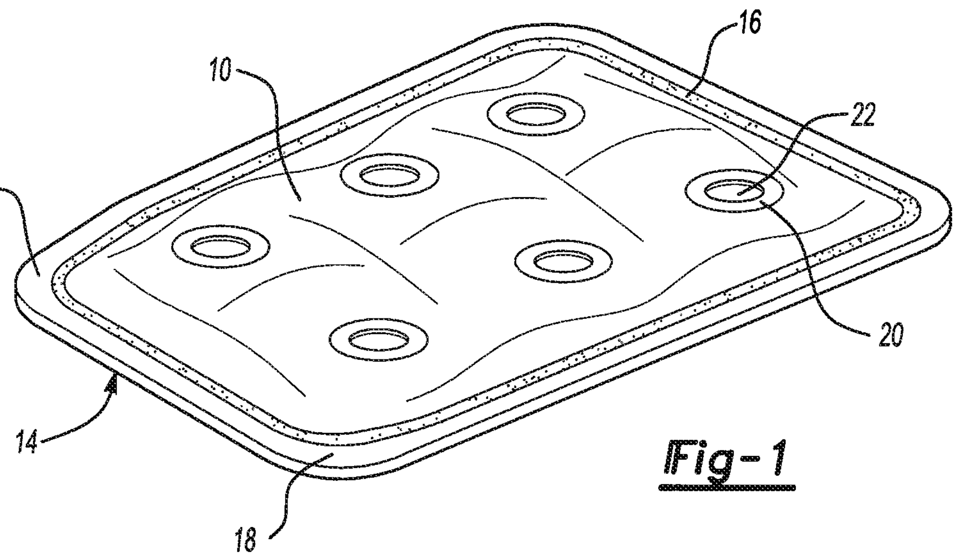


Fig-1

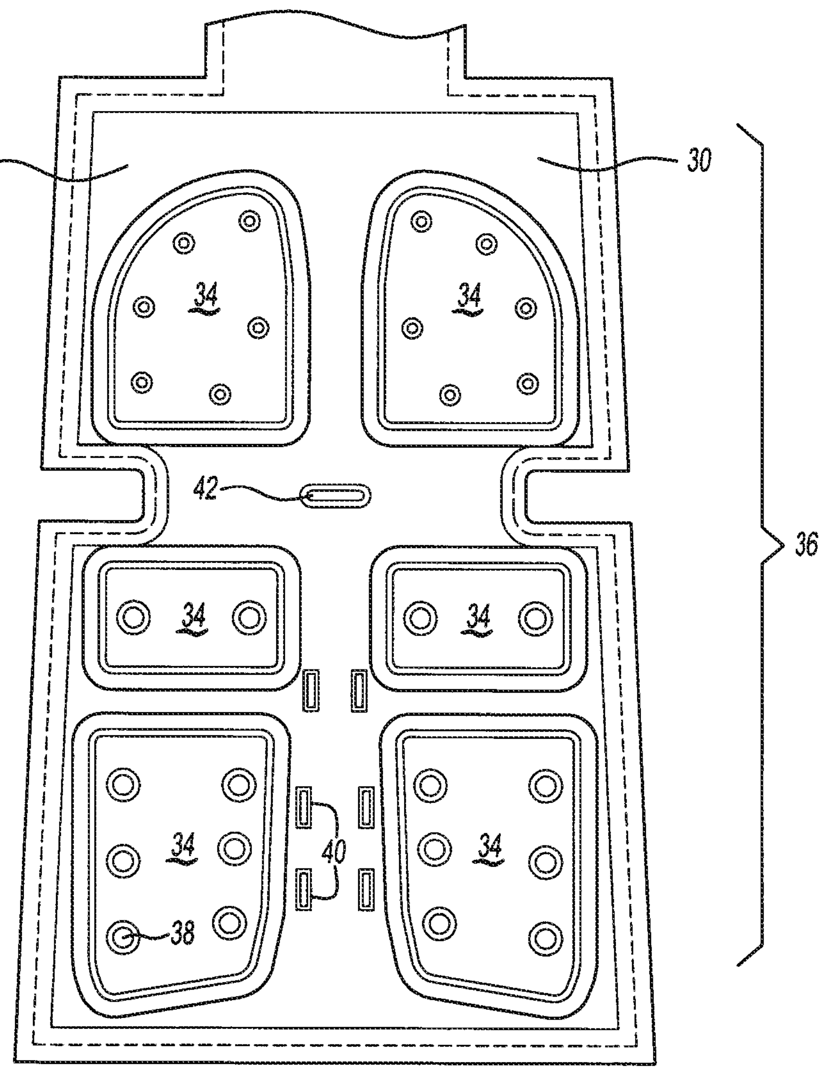


Fig-2

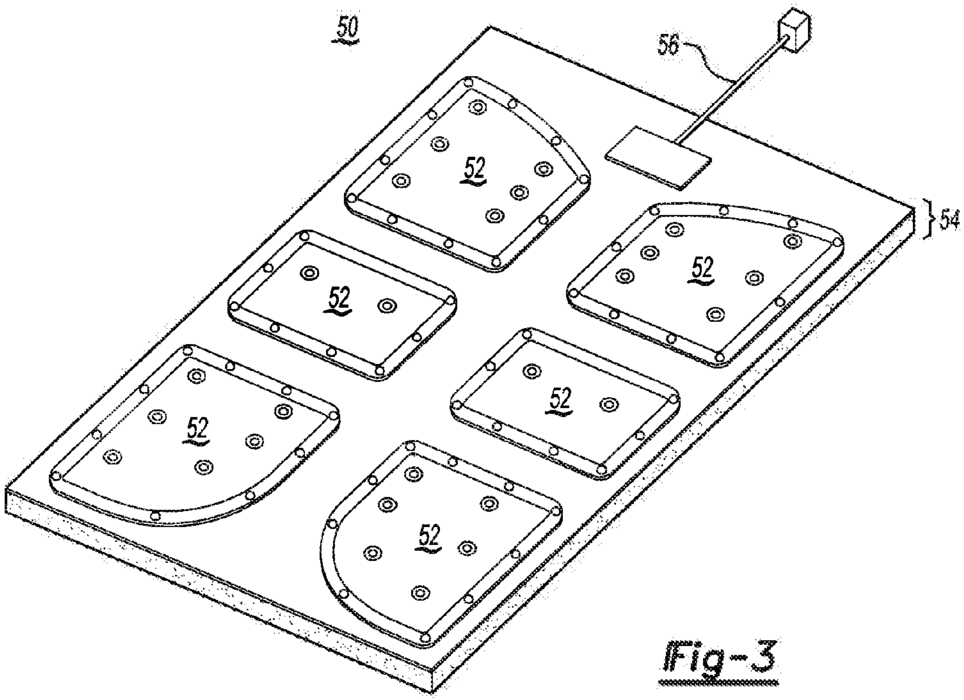


Fig-3

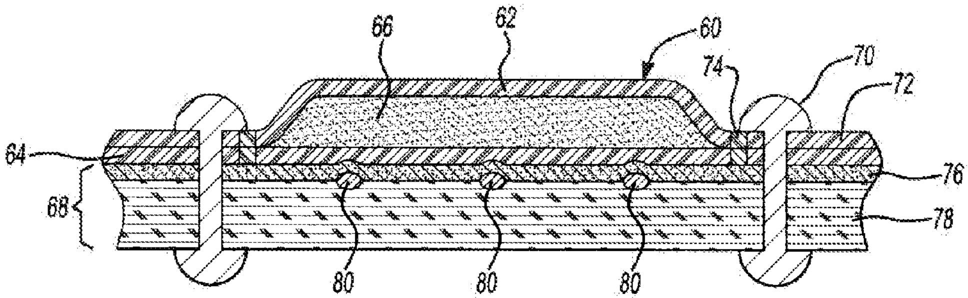


Fig-4

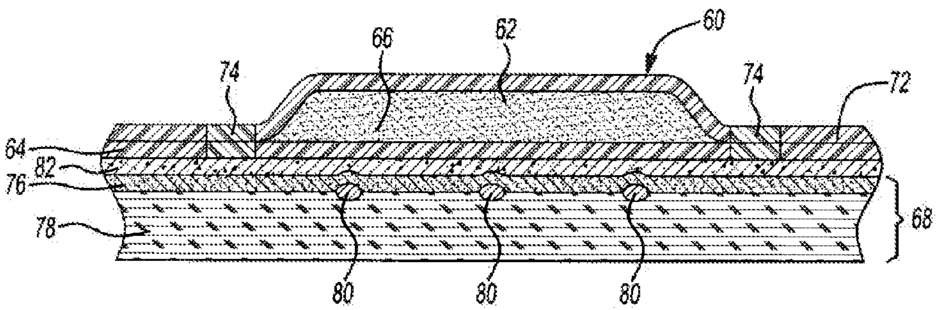


Fig-5

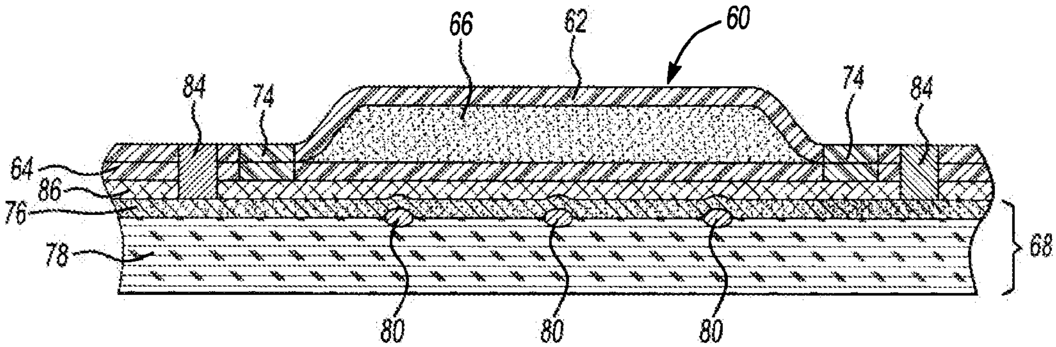


Fig-6

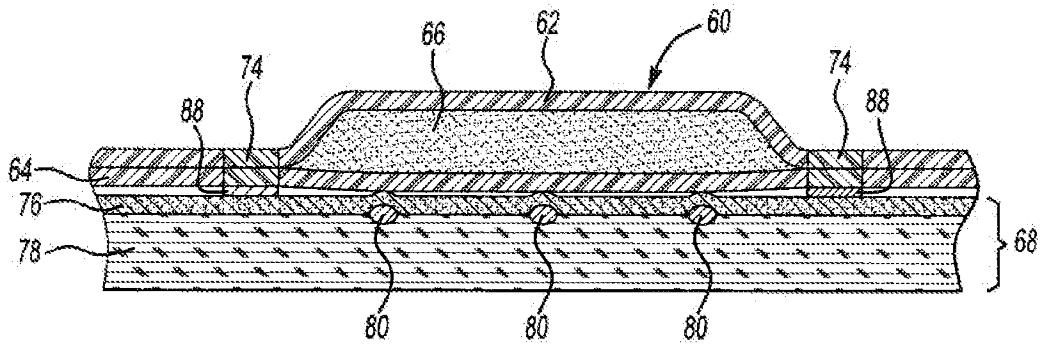


Fig-7

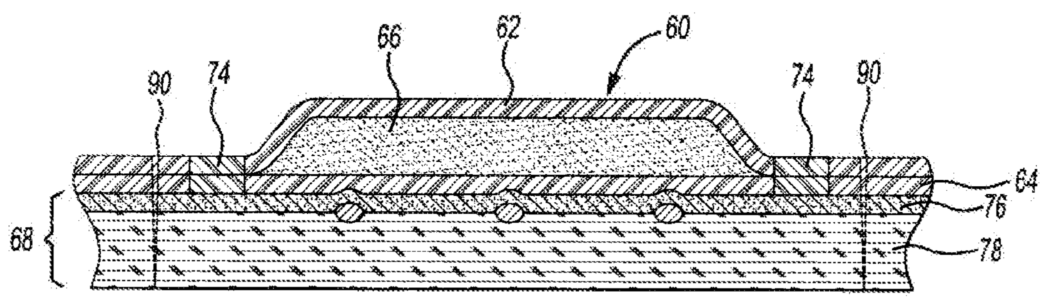


Fig- 8

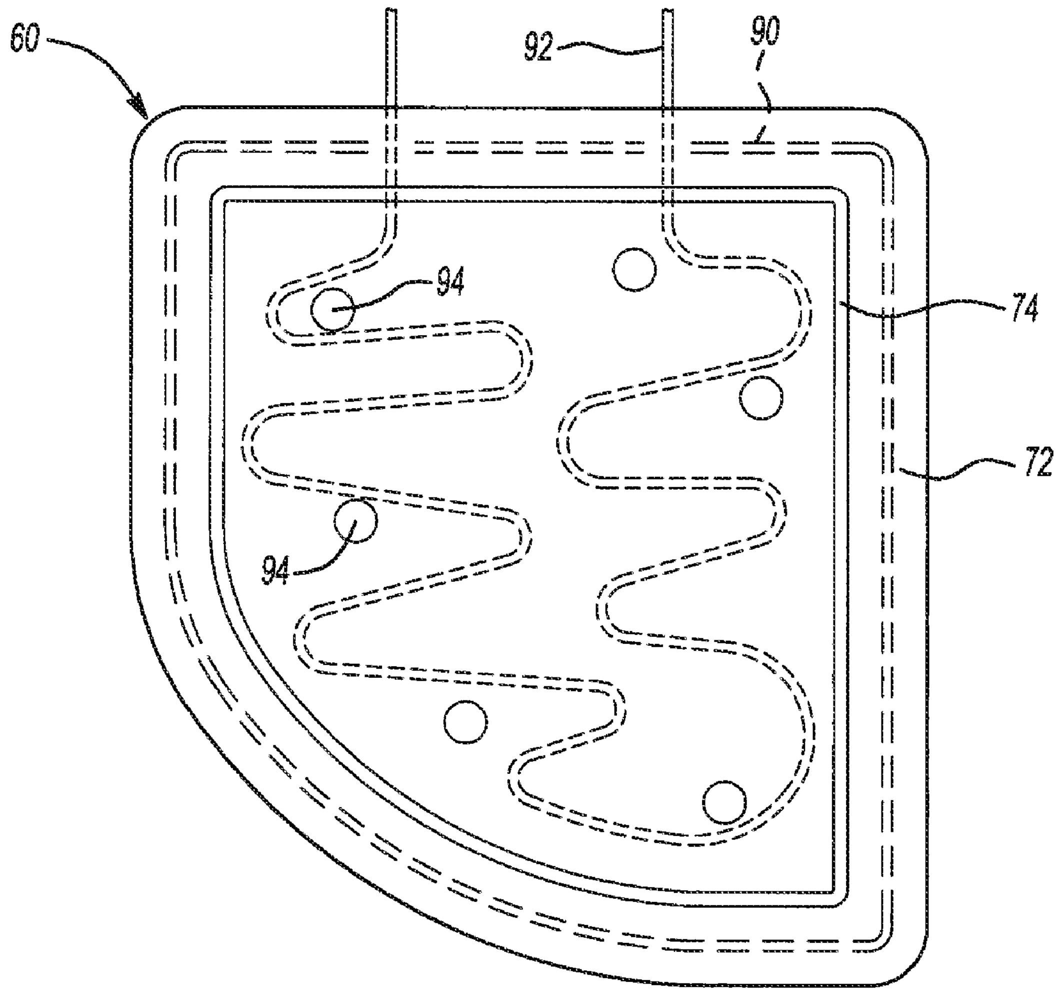


Fig-9

VEHICLE SEAT WITH CUSHIONING LAYER

CLAIM OF PRIORITY

[0001] This application claims the benefit of U.S. Provisional Application No. 60/736,103, filed on Nov. 10, 2005 and the benefit of U.S. Provisional Application No. 60/784,059, filed Mar. 17, 2006, both of which are incorporated by reference.

FIELD OF THE INVENTION

[0002] This invention relates to seats that include heating, cooling or ventilation, and more particularly to vehicle seats that include a cushioning layer that increases the comfort of the seat.

BACKGROUND OF THE INVENTION

[0003] For many years the transportation industry has been concerned with designing seats for automotive vehicles that provide added comfort to occupants in the seats. Various innovations in providing seating comfort are discussed in U.S. Pat. Nos. 6,893,086; 6,872,882; 6,869,139; 6,857,697; 6,828,528; 6,676,207; 6,619,736; 6,439,658; 6,164,719; 6,064,037; 5,921,314; 6,064,037; 5,921,314; 5,403,065; 6,048,024 and 6,003,950, all of which are expressly incorporated herein by reference. In addition, other innovations in providing seating comfort are discussed in U.S. Publication No. 2002/0096931, filed Jan. 5, 2001, titled "Ventilated Seat"; U.S. Pat. No. 6,629,724, issued Oct. 7, 2003, titled "Portable Ventilated Seat"; U.S. Patent Publication 2004/0070236, filed Oct. 8, 2003, titled "Automotive Vehicle Seating Comfort System", U.S. Patent Publication 2005/0067862, filed: Apr. 12, 2004, titled "Ventilated Seat"; and U.S. Patent Publication 2005/0066505, filed: Apr. 12, 2004, titled "A Method For Ventilating A Seat", each of which are expressly incorporated herein by reference for all purposes.

[0004] In the interest of continuing such innovation, the present invention provides an improved insert and system for a seat, which are preferably suitable for employment within or as part of an automotive vehicle seat and which assist in providing comfort control to an occupant in the seat.

SUMMARY OF THE INVENTION

[0005] The present invention includes a seat for a vehicle having at least one temperature conditioned component. The temperature conditioned component comprises a cushion, a trim surface, an insert located beneath the trim surface and a cushioning layer. The cushioning layer comprises one or more pouches with a filler material, and preferably a liquid filler material, that distributes the downward pressure of the occupant across a larger area of the seat. This distribution of downward pressure reduces or eliminates pressure points in the seat. The seat may also include an air mover assembly that facilitates the heating, cooling or ventilation function of the seat by blowing air to or drawing air from the seat.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] In the drawings:

[0007] FIG. **1** shows a perspective view of one embodiment of a pouch useful in a cushioning layer, the pouch having through holes;

[0008] FIG. **2** shows a top view of one embodiment of a ventilating insert with a cushioning layer located on the occupant side of the insert;

[0009] FIG. **3** shows a perspective view of a non-ventilating insert with a cushioning layer on a base layer;

[0010] FIG. **4** shows a cross section of a pouch in a non-ventilating insert attached using rivets;

[0011] FIG. **5** shows a cross section of a pouch in a non-ventilating insert attached using two-sided tape;

[0012] FIG. **6** shows a cross section of a pouch in a non-ventilating insert attached using welding to a polyurethane film;

[0013] FIG. **7** shows a cross section of a pouch in a non-ventilating insert attached using an adhesive;

[0014] FIG. **8** shows a cross section of a pouch in a non-ventilating insert attached using a sewing method;

[0015] FIG. **9** shows a top view of a pouch attached using a sewing method with a heating element.

DETAILED DESCRIPTION

[0016] Vehicle seats may comprise at least one temperature conditioned component such as a seat component, a backrest component, a bolster, an armrest, a headrest or the like. In one embodiment, the temperature conditioned component is a non-ventilated component which does not utilize a mechanism to move air into, out of or through the component. Each non-ventilated component may provide heating, cooling or combinations thereof to the occupant. For example, a heating element may provide heat to the occupant.

[0017] In another embodiment, the temperature conditioned component is a ventilated component which utilizes a mechanism to move air into, out of or through the component, such as a blower in an HVAC system of the vehicle or a blower in the seat. Each ventilated component may provide heating, cooling, ventilation or combinations thereof to the occupant. For example, a blower may blow cooled air from a thermoelectric device to the occupant.

[0018] Each temperature conditioned component comprises a cushion and a trim surface to cover the component, as well as an insert. The insert may be a non-ventilating insert or a ventilating insert. The present invention relates to a cushioning layer for incorporation into the seat, and preferably, for attachment to or incorporation into the insert.

[0019] As seen in FIG. **1**, the cushioning layer may comprise at least one pouch **10** or bag of two or more layers **12**, **14** of material that form containing a filler material (not shown), where a seal **16** is used to prevent against leakage of the filler material. The material of the pouch is selected to be leak proof (vis a vis the filler material) and to have sufficient durability to withstand repeated entering and exiting of the seat by the occupant. The illustrated seal is a perimeter seal with a flange **18** of material external to the seal to facilitate attachment of the pouch to the other components of the insert or seat. In an alternate embodiment, a single layer of material is sealed to itself to form the pouch. Internal to the seal, the pouch may include one or more baffles **20**, where the baffles are points, lines or areas where the two layers of the pouch are attached to one another. For ventilating components, and as illustrated in FIG. 1, the baffles may also be a through hole 22 in the pouch to allow air movement from one side of the pouch to the other.

[0020] The filler material in the pouch helps distributes vertical pressure exerted by the occupant of the seat in manner that reduces or eliminates localized pressure points of the occupant on the seat. When an occupant sits in a seat, the occupant's body contacts the seat in a limited manner in that the majority of the occupant's weight is placed in a small area. For example, the occupant's hips and pelvis support the majority of the occupant's weight in a sitting position, leading to pressure points. The pressure points, over time, may lead to discomfort of the occupant. The use of a cushioning layer helps reduce or eliminate the discomfort associated with the pressure points, thus allowing the occupant to sit for longer periods of time or otherwise reducing the fatigue associated with long periods of sitting. For example, the cushioning layer may distribute the vertical pressure from the occupant in a horizontal manner.

[0021] The characteristic of the filler material that is important is that it distributes pressure exerted by an occupant throughout the material. The filler material of the cushioning layer may be in any physical state, whether liquid, gelatinous, solid or otherwise and combinations thereof. Suitable filler materials include neat water and combinations of water with agents that suppress the freezing point of water such as surfactants or heat transfer fluids. For example, freezing point suppression agents may contain a non-ionic surfactant like a polyol (e.g. a glycol or a polyglycol), with those having a molecular weight of than 350 being more suitable. Suitable glycols and polyglycols include polyethylene glycols.

[0022] The filler material preferably remains a liquid across a larger range of temperature such as between −40° C. to above 100° C., although this is not necessarily the case.

[0023] Combinations of water and freezing point suppression agents suitably have a viscosity that ranges from about 0.01 cP to about 2.00 cP, with a range between about 0.50 cP and about 1.50 cP being more suitable, and a range of between about 0.90 cP and about 1.10 cP being most suitable. Moreover, the viscosity of the filler material is relatively temperature independent. A preferred filler material is Liquicell® from LiquiCell Technologies of Eden Prairie, Minn.

[0024] In one embodiment, the filler material may be contained in a relatively planar pouch (e.g. a perimeter sealed pouch). The inclusion of baffles is used to limit the movement of the filler material within the pouch, which helps to minimize pressure build up in the pouch away from the pressure points created by the occupant. The baffles may be a web of material located in the pouch that at least partially restricts the flow of the filler material through the pouch where the web material is located. Alternately, the baffles may include one or more seal points, lines or areas where the layers of the pouch are sealed together to create obstructions to the flow of the filler material. The pouch may include one or more through holes through which air may be moved. The through holes would typically be aligned with ventilation holes in the remainder of a ventilating insert. Because the edges around the through holes are sealed against leakage, they may also act as baffles.

[0025] Typically, the insert will include at least one other layer besides the cushioning layer, and preferably multiple (e.g. three) layers. Each of the layers may be a monolayer or a plurality of layers (e.g. a laminate). The plurality of layers need not be attached to each other but preferably are. More preferably, non-ventilating inserts include a base layer, a temperature conditioning device and the cushioning layer. More preferably, ventilating inserts include layers that are attached to each other at least at their edges to form an edge-sealed bag, although this is not necessarily the case as open edged ventilating inserts are also suitable. The layers of the insert are typically co-extensive, although partial layers that are not co-extensive with the other layers or the insert are also suitable.

[0026] The insert and the layers that make up the insert have a seat portion and, optionally, an extension in ventilating inserts. The seat portion generally is the area of the insert that will provide temperature conditioning (e.g. heating, cooling, ventilation or combinations thereof) to the area of the seat used by the occupant, whether the insert is located in the seat component, in the armrest component, in the bolster or elsewhere. The extension permits the air moving components of a ventilating system that includes the insert to be remote from the seat portion. This allows the components to be conveniently located so that they do not interfere with the comfort of the seat. For example, the extension permits fluid movers and/or thermoelectric device to be located underneath the cushion where they will not be noticeable to the occupant, underneath being relative to the occupant side of the insert. While typically the extension is located at the back edge of the seat, it may be located on either side, in the front of the seat, on a corner or absent altogether. Multiple extensions may also be used on an insert. To save on materials, the cushioning layer preferably does not include an extension, but rather covers an area up to being co-extensive to an area covered by an occupant sitting or resting on the component. In one embodiment, the cushioning layer covers an area that is generally co-extensive with a seat portion of a seat component.

[0027] Typically, the insert is supported by a cushion. The cushion may include one or more ducts that extend partially or completely through the cushion, or the cushions may be free of ducts that extend through the cushion. A preferred cushion is a molded plastic foam, which is preferably free of a molded or cut-out fluid distribution ducting network, but may be adapted with a trench or opening for passing the extension from one side of the cushion to the another side (e.g. from top to bottom). The cushion may in turn be supported by a seat frame. Multiple inserts may be used on a single seat or backrest cushion, where inserts may accomplish the same or different functions (e.g. one insert may only cool, while another insert may both heat and cool). Further, one insert may include a cushioning layer while another does not.

[0028] In an alternative to the extension of the insert, a bellows or other conduit may be used to provide connection between the insert and the air moving components of the system. The bellows provides similar functionality as the extension, e.g. to permit components of the system to be conveniently located remotely from the occupant contacts areas of the seat. The bellows or conduits may be located in a duct extending through the cushion that supporting the insert. Thus, the bellows may be located underneath the seat portion of the insert or connected to an edge of the insert. As with the extension, two or more bellows may be used in conjunction with each insert, each in a separate duct through the cushion or the ducts sharing one or more bellows. The bellows are preferably connected to the insert in a relatively air tight manner, such as through a snap-fit attachment mechanism. In an alternate embodiment, an air moving assembly is directly attached to the insert. For example, one or more blowers may be attached to the non-occupant side of the insert, with those blowers placed in recesses in the cushion. Such an embodiment eliminates the need to supply a duct or conduit between the blowers and the insert.

[0029] For non-ventilating inserts, the base layer may be made of any suitable material to which a temperature conditioning device (e.g. a resistance wire heater) may be attached. Thus, the base layer may be any material that is dimensionally stable enough to hold the temperature conditioning device and cushioning layer in place through the repeated use of the component (e.g. occupant entering and exiting a seat). Suitable base layers include spacers (described below), foams (e.g. open cell foam, closed cell foam, etc.), films (e.g. polymeric films), textiles (e.g. felts or fabrics), combinations thereof and the like.

[0030] For ventilating inserts, one or more barrier layers may be included in the insert and are typically formed of a plastic or polymeric material (e.g. a film) that may soften or melt upon exposure to heat or radio frequencies to assist the layers to adhere to one or more other layers in the insert. Alternatively, the barrier layers may be formed of fabrics, woven materials (e.g. Gore-Tex or microfibers), nylon, closed pore foam or other materials. Preferably, the barrier layers are substantially impermeable to air. Dimensionally, for a film barrier layer, it is preferable for the filmthickness to be about 0.1 mm to about 2.0 mm thick and more preferably about 0.7 mm to about 1.0 mm thick. Of course, it is contemplated that the film barrier layer may have a variable thickness and may be outside of the aforementioned ranges. The barrier layers may include through holes to permit air flow across the barrier layers such as ventilation holes or ports.

[0031] The ventilating insert may include a spacer, which may be located between two barrier layers of the insert. The spacer may be any structure, material or combination of materials and/or structures that permits fluid flow through the material while also providing a measure of support for a seat occupant. The spacers should not collapse under the weight of a seat occupant and maintain the fluid communication through the spacer. As one example, the spacer may include rubber, foam plastic or the like. In one aspect, the spacer may include a reticulated foam.

[0032] The spacer may include a plurality of members or fibers that are preferably spaced apart from each other to provide open space therebetween while still being close enough together to provide cushion and support. One preferred spacer is formed of polymeric (e.g., polyester) strand material that is interwoven to provide opposing honeycomb structures (e.g., fabric panels), which are interconnected by several additional polymeric strand materials to provide open space between the structures while still providing cushion and support. As an example, one preferred material is sold under the tradename 3MESH® and is commercially available from Müller Textil GmbH, Germany or Müller Textiles, Inc., Rhode Island, USA.

[0033] Another preferred spacer is formed of a polymeric material in a helix held between two sheets of material. Preferably, the helix is oblong in order to provide increased area on the helix for attachment of the helix to the sheets of material. The helix may be tightly wound such that adjacent courses of the helix touch or loosely wound such that there is no touching of adjacent courses of the helix. Typically, multiple helices are placed adjacent (abutting or otherwise) to one another in order to form a spacer. Exemplary helical material is discussed in international applications PCT/DE04/000540 and PCT/DE04/000541, both files Mar. 17, 2004, both of which are incorporated by references.

[0034] The insert of the present invention may be a separate unit that is assembled in a space between a seat cushion and the trim surface, integrally formed in the seat cushion, integrally formed in the trim surface, or any combination thereof.

[0035] One or more adhesive layers may be used to assist in the assembly of the inserts. The adhesive layers are preferably formed of a hot melt adhesive although this is not necessarily required. The adhesive may be provided as a web or otherwise and may be continuous or non continuous (e.g., may be applied in drops, dabs or the like). The adhesive sub-layers may include polyamides, polyesters, elastomers, urethanes, olefin polymers or a combination thereof. Moreover, the adhesives may be formulated as desired for particular processing parameters or conditions. Preferably, the adhesive sub-layers are substantially free of anti-blocking solutions, blowing additives, process contaminants or the like which might interfere with adhesive performance. As an example, one suitable hot melt adhesive is commercially available as a non-woven web under the tradename SPUNFAB® from Spunfab, Ltd. 175 Muffin Lane, Cuyahoga Falls, Ohio 44223. Other techniques instead of or in addition to adhesive may be used, such a thermal, ultrasonic, or RF welding.

[0036] The temperature condition device may be attached to or incorporated into the insert. For example, the temperature conditioning device may be a heater. Various different types of heaters are suitable for incorporation into a car seat and it is contemplated that any of such heaters may be incorporated into the inserts of the present invention. Such heaters typically incorporate flexible, electrical heating elements that are preferably thin, flat, non-obtrusive or a combination thereof. As examples, a lay-wire heater, a resistance wire heater, a carbon fiber heater, a positive thermal coefficient (PTC) heater, a thermoelectric heater or the like, which are typically supported with a backing (e.g., a cloth or fabric type backing) may be used within the insert. In a preferred embodiment of the non-ventilating insert, the backing of the heater is the base layer for the insert. In a preferred embodiment, the heater is a carbon fiber type heater with a backing (e.g., a non-woven layer). One exemplary preferred heater is sold under the tradename CARBOTEX® and commercially available from W.E.T. Automotive Systems, Inc. in Germany. An example of such a heater is disclosed in U.S. Pat. No. 6,064,037, issued May 16, 2000, herein expressly incorporated by reference for all purposes.

[0037] The temperature conditioning device may also be a heater/cooler combination such as a plurality of thermoelectric devices (TEDs) or a flexible sheet of TEDs. Flexible sheet TEDs include those discussed in U.S. Pat. No. 6,700, 052, which is incorporated by reference. TEDs are discussed in more detail below. Further, the temperature conditioning device may also be a cooler, such as those described in U.S. provisional application 60/505,806, filed Sep. 25, 2003, which is incorporated by reference. Other coolers include phase change materials (PCMs), particularly those that have a phase change temperature near human body temperature. Such materials will absorb large amounts of heat without changing temperature, thus providing a cooling sensation to the occupant. Suitable materials include those provided by Rubitherm (Kyritz, Germany), PCM Energy (Mumbai, India) and Climator AB (Skovde, Sweden).

[0038] In addition to the heater or other temperature conditioning device attached to or incorporated into the insert, the temperature conditioning device may be included in a ventilating system that provides heating, cooling, ventilation or combinations thereof. Typically, the temperature conditioning device is combined with an air mover assembly as a means for moving air into, out of or through the insert, ventilated component or seat. In addition, one or more conduits may be used to provide fluid communication between components of the system such as between the fan and the insert or between the insert and the temperature conditioning device.

[0039] The air mover assembly provides motive force to move air (whether conditioned, ambient, pushed, pulled and combinations thereof) to, from or through the insert. The assembly may be used to push air to the insert or pull air from the insert. The assembly may also be used to both push and pull air. For example, an assembly with a blower having at least two sets of fan blades (e.g. with vanes that are opposite in direction) that share a common axis and form a binary blower that is able to both push and pull air may be used. Multiple blowers may also be used in the assembly. The assembly may also include an annular inlet, although assemblies that are free of annular inlets are also contemplated. Included in the definition of blower are impellers (including bidirectional impellers), blowers, or the like. The blower also refers to devices that provide motive force to move other fluids (e.g. liquids) through the insert. The blower may provide a steady fluid flow, a pulsating fluid flow, an oscillating fluid flow, or the like.

[0040] The temperature conditioning device used with the ventilating insert may be any device that heats and/or cools fluid. The device may be a combination of devices where one component provides heating and another component provides cooling (e.g. as resistance wire heater and a thermoelectric device). Preferably, one device or system provides both heating and cooling. The device may be an external device such as the HVAC system in the building or vehicle where the seat is located or an internal device meaning that the device is not connected (other than to a power supply) to the building or vehicle where the seat is located. In addition to providing temperature conditioning, the temperature conditioning device may also dehumidify the fluid (e.g. air).

[0041] Preferably, the temperature conditioning device is a self contained or solid state device that both cools and heats air. The most preferred device is a TED (also called a peltier). TEDs are commercially available devices that provide solid state heating and cooling by passing electricity through the device. TEDs include a waste side and an active side, which are relative designations depending whether warm or cool temperature conditioned air is desired. Any supplier of TEDs would be able to provide suitable devices for use in the present invention. The TED may be combined with any useful heat dissipation device; e.g. heat sinks, heat exchangers, blowers, heat pipes or the like. A refrigeration absorption system may also be used as a temperature conditioning device.

[0042] The ventilating system may include one or more attachment components used to help secure the insert or portions of the system to the insert, the cushion, the seat frame or the seat. For example, a frame member preferably defines a location for the attachment of the air mover assembly, temperature conditioning device, a conduit, a bellows or other component to the insert. It is contemplated that the frame member may be in a variety of configurations (e.g., annular, rectangular, square, polygonal or otherwise) and may be formed of a variety of preferably rigid or semi-rigid materials (e.g. metal, plastic or the like). In some aspects, the attachment component also helps define a port in the insert or extension. In one preferred embodiment, the attachment component cooperates with structures and/or materials (e.g. snap fit fasteners) on the blower, the temperature conditioning device or other components to connect the device or component to the attachment component.

[0043] The ventilating system may include one or more valves that may be used to redirect air flow through the system to make use of unused energy (i.e. the air is hotter than ambient) or energy capacity (i.e. the air is colder than ambient) in the air. For example, the valves may be used to vent air to ambient to dispose of un-needed energy stored in the air. The valves may also be used to redirect air to components of the system (e.g. the temperature conditioning device) to either warm or cool such components. In addition, a valve may be used to optionally recirculate air within system to create a closed or partially closed system.

[0044] For both ventilating and non-ventilating embodiments, a variety of sensors may be included such as temperature sensors, humidity sensors, current sensors, occupant detection sensor, weight sensors or the like. Sensors may be placed throughout the seat. For example, temperature sensors may be place within the spacer, between spacers, between the spacer and the cushioning layer, between the base layer and the temperature condition device or other optional layer (e.g. reticulated foam or seat cover), near the temperature conditioning device, near the blower, and combinations thereof.

[0045] One or more controllers may be used to receive inputs from the sensors or a control device, to issue instructions to the blower and/or temperature conditioning device, and/or to otherwise coordinate the operation of the system.

[0046] Suitable trim surfaces include seat covers that are part of the insert or separate from the insert, but generally separate the insert from the seat occupant. The trim surface may be any suitable material, including but not limited to at least one synthetic material, natural material (e.g., wool, leather or otherwise), or combination thereof. In one embodiment the trim surface includes perforations over at least a portion of the seating surface through which air or other fluid may pass. In another embodiment the cover is substantially free of perforations. For example, perforated or non-perforated leather may be used to separate the seat occupant from the insert, while a fleece material may be used as part of the insert to increase moisture wicking or otherwise provide a protective layer.

[0047] The cushioning layer may be integral with the insert such that they form a single component that may be incorporated into the seat. For example, the cushioning layer may be attached through the use of an adhesive (e.g. spray on or double stick tape) or through mechanical fasteners. Exemplary mechanical fasteners include rivets, snap-fit fasteners, hoop-and-loop fasteners, sewing, tie downs or the like. The cushioning layer may also be welded through the use of heat, RF, IR or ultrasonic welding of two plastics together. Alternately, the cushioning layer may be integral, attached to the trim surface or held within a pocket of material attached to the trim cover to ease installation. Alternately, the insert, cushioning layer and/or the trim surface may be held in position through the use of tie downs that anchor the components to the cushion or frame of the seat.

[0048] While the figures illustrate specific embodiments of the present invention, the figures are not meant to be limiting.

[0049] FIG. **2** illustrates a top view of a ventilating insert **30** that may be used in a ventilated seat that provides heating, cooling and/or ventilation to the occupant. The insert comprises an edge sealed bag **32** of a spacer sandwiched between two barrier layers. Attached to the occupant side of the edge sealed bag are a plurality of pouches **34** that make up the cushioning layer **36**. Each of the pouches includes one or more through holes **38** that align with ventilation holes in the occupant side of the edge sealed bag. Additional ventilation holes **40** that do not align with through holes in the pouches may also be included in the edge sealed bag. A through hole **42** that is sealed from the rest of the edge sealed bag may be used with a tie down to secure the insert to the cushion or seat frame.

[0050] FIG. **3** illustrates a perspective view of a non-ventilating insert **50**. The pouches **52** of the cushioning layer are arranged on base layer **54**. A wiring harness **56** is used to connect the heating element (not shown) contained within the base layer to the electrical system of the vehicle.

[0051] As seen in FIGS. **4-8**, the pouches **60** having two layers **62**, **64** with a filler material **66** may be attached to the base layer **68** using a variety of methods. These same methods may be used to attach pouches to the sealed edge bag of a ventilating insert. In FIG. **4**, shown in cross section, rivets **70** are placed on the flange **72** outside the perimeter seal **74** of the pouch **60**. The rivets penetrate the flange and the remaining layers of the insert or base layer; in this embodiment, the base layer **68** includes a felt layer **76** and a foam layer **78**. A heating element **80** is located between the felt and foam. Rivets may also be used in any baffles so long as they do not permit leakage of the filler material.

[0052] In FIG. **5**, shown in cross section, two-sided tape **8** is used between the pouch **60** and the base layer **68**. Unlike the rivets, the placement of the two-side tape is not limited to the flange or baffles. In this embodiment, the base layer comprises a heating element sandwiched between a felt layer and a foam layer.

[0053] In FIG. **6**, shown in cross section, a weld **84** is used to attach the pouch **60** to the base layer **68**. Preferably, an RF welding technique is used to connect a polyurethane containing (or other thermoplastic containing) portion **86** of the base layer **68**. Welding is preferably only used on the flange or baffles of the pouch as it may puncture or otherwise compromise the integrity of the pouch.

[0054] In FIG. **7**, shown in cross-section, an adhesive **88** is used to attach the pouch **60** to the base layer **68**. While preferably applied to align with the perimeter seal of the pouch, the adhesive may be applied in many different suitable patterns to insure secure attachment of the pouches to the base layer. The adhesive may be any suitable adhesive as described above.

[0055] In FIG. **8**, shown in cross-section, a sewn thread **90** is used to attach the pouch **60** to the base layer **68**. Like rivets, sewing penetrates the flange and the remaining layers of the insert or base layer. Sewing is preferably only used in the flange or baffles of the pouch. For sewing and other techniques that penetrate the flange or baffle, care should be taken not to damage the heating element contained within the base layer or insert. For example as seen in FIG. **9**, the sewn thread **90** has gaps to permit the heating element **92** to enter and exit the area under the pouch. This figure also illustrates baffles **94** without through holes in the form of spot welds.

[0056] In one embodiment of the cushioning layer combined with a ventilating insert, the underside of the cushioning layer forms the forward barrier layer of the insert. For example, a cushioning layer that comprises a plurality of pouches attached to a plastic film may be used as a barrier layer for an insert. Such a construction would reduce the number layers need to construct a ventilating insert and thus also reduce the cycle time for the manufacturing of the insert. Furthermore use of plastic films in the cushioning layer would permit the use of RF or other types of welding, further reducing the cycle time. A heater included in this type of embodiment may be attached to either side of the plastic film or to the spacer within the insert. Alternately, the heater (e.g. a PTC heater) may be printed on the plastic film. In one preferred embodiment, no adhesive is utilized in the construction of the insert, but rather only welding is used.

[0057] In addition to the embodiments discussed above, the cushioning layer may also be added on to the seats of U.S. Pat. Nos. 6,786,541; 6,629,724; 6,840,576, 6,869,140, and related applications and patents or to the seats of U.S. Patent Publication 2004-0189061. In addition, the cushioning layer may used in combination with the seats of U.S. Pat. Nos. 6,893,086; 6,869,139; 6,857,697; 6,676,207; 6,619,736; 6,604,426; 6,439,658; 6,164,719; 5,921,314, and related applications and patents, or U.S. Patent Publications 2005-0173950; 2005-0161986; 2005-0140189; 2005-0127723; 2005-0093347; 2005-0085968; 2005-0067862; 2005-0067401; 2005-0066505; 2004-0169028, and related applications. All patents and publications are hereby incorporated by reference. Further, the cushioning layer may be used as a substitute for components of these seats.

[0058] In one embodiment, temperature conditioned air may be blown across the occupant through a permeable trim surface from the seat cushion thus providing convective heating or cooling to the seat and occupant. As shown in U.S. Pat. Nos. 6,869,139 and 6,857,697, the cushion may contain a passageway through the cushion for circulating temperature conditioned air to the seat surface through the insert. A variety of other optional features disclosed in these patents may be included in the seat systems of the present invention, such as sub-passageways, deflectors, air-impermeable linings or coating or the like. For example, an insert (e.g. an open edged insert) with through-holes may be placed over the sub-passageways to moderate or direct the air blown on the occupant. The cushioning layer in this system would include through holes so as to not impede the flow of air from the cushion to the occupant. A certain amount of conductive cooling may also be achieved through the use of this system.

[0059] In another embodiment, conductive heating or cooling may be provided to the occupant by providing temperature conditioned air to the insert such that the air is not blown across the occupant. For example, through the use of an air impermeable trim surface, temperature conditioned air is circulated to an insert having an open space is located underneath the impermeable trim surface, with air blown or drawn into the insert for the purpose of conductively heating or cooling the insert and thus the occupant. Here, if the cushioning layer is located between the trim surface and insert, it need not include through holes.

[0060] In another embodiment, conductive and convective heating or cooling may be provided to the occupant. The temperature conditioned air may be combined with ambient air drawn across the occupant and into the seat. Here, ambient air is drawn through the trim surface and into a mixing region underneath the trim surface where the ambient air is combined with the temperature conditioned air. The mixed air is then circulated away from the seat either to be exhausted or to be recirculated back to the evaporator and/or the mixing region. The ambient air provides convective cooling (or heating), while the temperature conditioned air provided conductive cooling or heating. A plurality of air movers may be used to draw ambient air into the mixing region and to provide temperature conditioned to the mixing region, whether by blowing or drawing. In one embodiment, the mixing region is an open space contained in an insert. Examples of seats comprising mixing regions include U.S. Patent Publication 2005-0067862 and 2005-0066505. Preferably, the cushioning layer is located between the trim surface and insert in this embodiment.

[0061] Although discussed in the context of a vehicle seat, the temperature conditioned components of the present invention may be incorporated into any type of seat or chair such as office chairs, wheel chairs, furniture, or any other seat where the occupant may benefit for the reduction of the discomfort associated with long term sitting.

[0062] The present invention also relates to methods of heating, cooling and ventilating a vehicle seat. The methods comprise heating or cooling a seat comprising a cushioning layer. The methods also comprise circulating air from a temperature conditioning device into, out of or through an insert, ventilated component or a seat.

[0063] It will be further appreciated that functions or structures of a plurality of components or steps may be combined into a single component or step, or the functions or structures of one-step or component may be split among plural steps or components. The present invention contemplates all of these combinations. Unless stated otherwise, dimensions and geometries of the various structures depicted herein are not intended to be restrictive of the invention, and other dimensions or geometries are possible. Plural structural components or steps can be provided by a single integrated structure or step. Alternatively, a single integrated structure or step might be divided into separate plural components or steps. In addition, while a feature of the present invention may have been described in the context of only one of the illustrated embodiments, such feature may be combined with one or more other features of other embodiments, for any given application. It will also be appreciated from the above that the fabrication of the unique structures herein and the operation thereof also constitute methods in accordance with the present invention. The present invention also encompasses intermediate and end products resulting from the practice of the methods herein. The use of "comprising" or "including" also contemplates embodiments that "consist essentially of" or "consist of" the recited feature.

[0064] The explanations and illustrations presented herein are intended to acquaint others skilled in the art with the invention, its principles, and its practical application. Those skilled in the art may adapt and apply the invention in its numerous forms, as may be best suited to the requirements of a particular use. Accordingly, the specific embodiments of the present invention as set forth are not intended as being exhaustive or limiting of the invention. The scope of the invention should, therefore, be determined not with reference to the above description, but should instead be determined with reference to the appended claims, along with the full scope of equivalents to which such claims are entitled. The disclosures of all articles and references, including patent applications and publications, are incorporated by reference for all purposes.

What is claimed is:

1. A temperature conditioned seat, comprising:

a seat having at least one temperature conditioned component having a cushion and a trim surface;

an insert located beneath the trim surface of each temperature conditioned component, the insert including a cushioning layer located between the cushion and the trim layer; and

a temperature conditioning device.

2. The seat of claim 1 wherein the cushioning layer comprises at least pouch containing a filler material.

3. The seat of claim 2 wherein the filler material is a liquid.

4. The seat of claim 3 wherein the liquid comprises a freezing point suppression agent.

5. The seat of claim 4 wherein the temperature conditioned component is a non-ventilating component.

6. The seat of claim 5 wherein the temperature conditioning device comprises a heater.

7. The seat of claim 6 wherein the heater is located between the cushion and cushioning layer.

8. The seat of claim 4 wherein the temperature conditioned component comprises a ventilating component.

9. The seat of claim 8 wherein the ventilating component comprises an air mover.

10. The seat of claim 9 wherein the temperature conditioning device comprises a source of cooled air.

11. The seat of claim 10 wherein the source of cooled air comprises a vehicle HVAC system, an absorption refrigeration system, a thermoelectric device and combination thereof.

12. A vehicle seat, comprising:

a seating component comprising a cushion and a trim surface;

a cushioning layer located between the cushion and the trim surface, comprising:

a plurality of edge sealed pouches containing a filler material attached to a base layer; and

a heater located underneath the pouches and attached to the base layer.

13. The vehicle seat of claim 12 wherein the filler material is liquid with a viscosity of about 1 cP.

14. The vehicle seat of claim 13 wherein the base layer comprises a foam or a film.

15. The vehicle seat of claim 14 wherein the pouches are attached to the substrate using one or more of mechanical fasteners, two-sided tape, adhesive, sewing, IR welding, RF welding or ultrasonic welding.

16. The vehicle seat of claim 15 further comprising a ventilating insert.

17. The vehicle seat of claim 16 wherein the cushioning layer and the insert are an integrated component.

18. The vehicle seat of claim 17 further comprising a temperature conditioning device and an air mover assembly.

19. The vehicle seat of claim 18 wherein the temperature conditioning device comprises a thermoelectric device.

20. The vehicle seat of claim 19 wherein the air mover assembly blows air through the ventilating insert to an occupant of the seat.

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