(54) AIR DISTRIBUTION SYSTEM FOR A VEHICLE SEAT

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(21) Appl. No.: 11/007,120
(22) Filed: Dec. 8, 2004

(30) Foreign Application Priority Data
Dec. 8, 2003 (DE)......................... DE 103 57 583.9

Publication Classification

(51) Int. Cl. ....................................................... A47C 7/02
(52) U.S. Cl. ....................................................... 297/452.42

(57) ABSTRACT

An air distribution system (20) for distributing air through a vehicle component such as a vehicle seat pad (6). The system (20) includes an air distribution layer (4) defining a base area and a first layer (2) arranged on the air distribution layer (4). The first layer (2) projects beyond the base area along at least a portion of an edge thereof to form a flange (25). A side of the flange (25) facing towards the air distribution layer (4) includes an adhesion area (5). During assembly, the adhesion area (5) engages the seat pad (6) along a pad elevation (41) surrounding a portion of the recess (35) formed in the seat pad (6) to fix the air distribution system (20) within the seat pad (6).
AIR DISTRIBUTION SYSTEM FOR A VEHICLE SEAT

TECHNICAL FIELD

[0001] The present invention relates to an air distribution system for a vehicle component having an air distribution layer and an accompanying layer thereon. Such arrangements are employed, for example, in air-conditioned seats, to distribute air in the seating surface underneath a seat covering and thereby direct the flow towards a passenger.

BACKGROUND OF THE INVENTION

[0002] U.S. Pat. No. 5,902,014 discloses air-conditioned seats in which a ventilating layer made of a highly porous air-permeable material is sewn between a seat pad and a covering. In another example, DE 197 26 810 provides an areal heating element between such a ventilating layer and the covering. Such seats are very costly to fabricate, since several layers must be sewn up, at least in part, successively. Such operations are time consuming and inefficient. Furthermore, positioning the ventilating layer on the pad poses difficulties in terms of accuracy.

[0003] EP 1,352,780 discloses a seat in which parts of a pad of a seat are replaced by insertions of reticular material. These parts are supplied with air. This arrangement has disadvantages, too, as such parts may slip or require separate fastening elements.

[0004] Accordingly, there exists a need for an improved air distribution system for ventilated components in the passenger compartment such as vehicle seats.

SUMMARY OF THE INVENTION

[0005] The present invention provides an air distribution system that is simple to install, logistically simple to manage, and is secure in operation. In one embodiment, the invention provides an air distribution system for distributing air in a component such as a vehicle seat. The system includes an air distribution layer and a first layer arranged thereon. The first layer projects beyond the base area or perimeter of the air distribution layer to form at least one projection or flange. An adhesive is arranged on the flange on the side facing towards the air distribution layer. The air distribution system can be arranged between a seat pad and a seat cover. The pad can include a recess to accommodate the air distribution layer. The recess can also correspond in depth to the air distribution layer. Because the adhesive flange projects beyond the air distribution layer which is secured to the first layer, the unit can be easily positioned and secured to the seat pad during further manufacturing steps.

[0006] The seat pad can include various pad zones separated by seat features such as depressions, elevations and/or height differences. At least one of the pad zones includes a recess substantially corresponding in size and depth to the air distribution layer. The recess can extend as far as the edge of the pad zone and be bounded along its borders by a pad elevation. The pad elevation can substantially correspond with the flange such that the adhesive area can bind to the pad elevation surrounding the recess. In this way, the air distribution system can advantageously be registered in position and fixed within the seat pad zone of interest. The seat pad zone may be a seat cushion or backrest portion of a vehicle seat.

[0007] In another example, the air distribution layer can comprise at least two segments with the first layer arranged over the segments such that the segments are spaced from each other. The segments can be separated from each other within the same plane along the first layer. An electrical conductor such as a heating conductor can run from the first segment to the second segment of the air distribution layer. The conductor can be arranged at an angle with respect to the shortest path between the two segments and can also meander about its principal, angled direction to permit flexion during assembly and in operation or use of the seat.

[0008] The adhesive can be provided as an adhesive layer on at least half of the flange such that at least one adhesive edge is provided around the air distribution layer. The adhesive area can comprise a self-adhesive or a knotted surface.

[0009] The first layer can be formed essentially by the adhesion area and/or may include constituents such as pad material essentially covering the air distribution layer completely.

[0010] In another embodiment, an areal heating element is arranged on the air distribution layer, either in the first layer or between the first layer and air distribution layer.

[0011] In another example, a vehicle seat including at least one pad having a recess formed therein, and an air distribution system is provided. The air distribution system includes an air distribution layer secured to a first layer. The air distribution layer defines a base area substantially corresponding in size to the recess. The first layer projects beyond the base area along at least a portion of an edge thereof to form a flange. A side of the flange facing towards the pad includes an adhesion area. The air distribution system can also include an areal heating element arranged between the air distribution layer and the first layer. The adhesion area includes a self-adhesive or a knotted surface for engaging the pad along a pad elevation surrounding a portion of the recess.

[0012] A method of assembling a ventilated vehicle seat is also provided. The method includes providing at least one vehicle seat pad having a recess formed therein, and providing an air distribution system comprising an air distribution layer secured to a first layer. The air distribution layer defines a base area substantially corresponding in size to the recess. The first layer projects beyond the base area along at least a portion of an edge thereof to form a flange, wherein a side of the flange facing towards the pad includes an adhesion area. Thereafter, the air distribution system is positioned within the recess and the flange adhesion area is engaged to the pad along a pad elevation surrounding a portion of the recess to fix the air distribution system within the seat pad.

[0013] The present invention is advantageous in that it provides an economical air distributing system that can be easily handled during seat manufacturing and can be accurately positioned with respect to a seat pad. Other objects and advantages will become apparent with reference to the following detailed description, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] For a more complete understanding of this invention reference should now be had to the embodiments
illustrated in greater detail in the accompanying figures and described below by way of examples of the invention wherein:

[0015] FIG. 1 shows a cross-sectional of a seat with an air distribution system according to one embodiment of the present invention.

[0016] FIG. 2 shows a longitudinal section through the seat of FIG. 1.

[0017] FIG. 3 shows a perspective view of a seat in an opened condition having an air distribution system according to another embodiment of the present invention.

[0018] FIG. 4 shows a top view of an air distribution system according to an embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0019] While the present invention is described with respect to an air distribution system for a vehicle seat, the present invention may be adapted and utilized for other ventilated components such as arm rests, door trim, armature panels as well as non-automotive seat and ventilated components applications. In the following description, various operating parameters and components are described for two embodiments. These specific parameters and components are included as examples and are not meant to be limiting.

[0020] FIGS. 1 and 2 show a cross-section and longitudinal section, respectively, of a component 30 in the passenger compartment of a vehicle, in this case a seat 31. A pad 6 is provided in the seat 31. The pad 6, on its side facing the passenger, comprises a recess 35. The recess 35 is bounded by pad elevations 41. On the side of the pad elevations 41 away from the recess 35, depressions 7 are provided. The recess 35 and the pad elevations 41 are provided in a first pad zone 16. A second pad zone 17 is also provided, and is formed like the first pad zone 16 such that it includes a recess 35, pad elevations 41 and depressions 7. Thus, the pad zones 16, 17 are separated from each other by depressions 7 or other variations in height. The recesses 35, 35’ can extend almost as far as the edge 37 of the pad zones 16, 17, as shown. The elevations 41, however, provide a boundary or border region 39 along at least one side of each recess 35, 35’.

[0021] In the example shown, the base area of the second recess 35’ is displaced from that of the first recess 35. On the seat pad 6, an air distribution system 20 is disposed. The air distribution system 20 comprises an air distribution layer 4 and a first layer 12 arranged thereon. The air distribution layer 4 can be made up, for example, of a knit spacer (as here), rubber filaments, foam or a plurality of spirals arranged side by side, or some other material through which air can flow.

[0022] The air distribution layer 4 comprises, in the present embodiment by way of example, two segments 43, 43’ separated and distanced from each other by the depression 7 (FIG. 2). The size of each air distribution layer segment 43, 43’ corresponds more or less to the base area of the respective recesses 35, 35’. The thickness of the segments 43, 43’ also corresponds more or less to the depth of the recesses 35, 35’. The segments 43, 43’ are so arranged as to be accommodated in the recesses 35, 35’. The two segments 43, 43’ in the present example are of the same material and of like configuration. They may, however, e.g. to optimize pad firmness or load capacity, comprise a differential elasticity or various materials or thicknesses of material. In other words, the thickness of each segment can be greater or less than that of the corresponding recess, and the material of each segment 43, 43’ can also be different.

[0023] On the air distribution layer 4, a first layer 2 is arranged. The first layer 2 is located on the side of the air distribution layer 4 away from the pad 6. The first layer 2 projects at least partly beyond the base area or boundary of the air distribution layer 4 to create a projection or flange 25. The flange 25 should extend beyond at least one edge of the air distribution layer and, preferably, beyond the entire periphery of the air distribution layer. On the flange 25 so formed, an adhesion area 5 is provided. This extends, in the embodiment shown by way of example, around the segments 43, 43’ of the air distribution layer 4. It is expediently formed by a strip of self-adhesive film. The adhesive area 5 is at least on the side of the first layer 2 facing toward the air distribution layer 4, but can be on both sides of the first layer 2. The first layer 2 may be made up exclusively of the adhesion area 5. In the present example, however, it comprises a pad layer 3 of pad material.

[0024] Additionally, an areal heating element 12 is arranged on the first layer 2. The pad layer 3 and the heating element 12 may be bonded, sewn, knitted or knotted to each other. The segments 43, 43’ and the first layer 2 are so arranged on each other that the segments 43, 43’ are covered over their entire area in the pad zones 16, 17 and so that the first layer 2 extends as far as the base of the depression 7 between the two pad zones 16, 17. This depression 7 in the present case is a relaxation pit. The adhesion area 5 adheres to the elevations 41 defining the boundary of each recess 35, 35’. In this way, a stepless transition between the elevations 41 and the air distribution layer 4 is ensured, and the air distribution layer 4 is firmly and undischageably fixed when placed within the corresponding recess.

[0025] The air distribution system 20, particularly in the air distribution layer 4, provides a low flow resistance air current along the air distribution layer, i.e., transverse to the air distribution layer. In addition, it has a high vapor transmissivity and/or air transmissivity perpendicular to the air distribution layer 4.

[0026] The air distribution system 20 is covered by a seat covering 1. The seat cover 1 may be pasted on the pad 6 and the air distribution system 20. In the present example, however, it is stitched along the depressions 7.

[0027] FIG. 3, in another embodiment by way of example, shows a seat 31, a pad 6 having a recess 35 and an air distribution system 20. The components are substantially similar to the first embodiment, however, the air distribution layer 4 comprises only one segment 43.

[0028] In the recess 35, a passage 47 is provided for accommodating an electric connection cable 9 of the air distribution system 20. The passage 47 extends from the base of the recess 35 through the pad 6 and emerges from the pad 6 again in a suitable place, e.g. on the reverse or face of the pad 6.

[0029] In the recess 35, an opening 49 is provided as well. This serves for passage of air and connects the air distribu-
tion layer 4 to the surroundings of the seat 31. Expediently, therefore, air travels as directly and rectilinearly as possible to the side of the pad 6 away from the air distribution system 20.

[0030] In the opening 49, a blower or fan 8 is provided. The fan 8 serves to supply air to the air distribution system 20 or aspirate air from the system 20.

[0031] It will be apparent that the air distribution system 20 comprising the air distribution layer 4, the first layer 2 with adhesion area 5 and the other functional elements such as the electric heating element 12 will form a coherent, simply handled component. This component may simply be fitted into the recess 35, held in place by the adhesion area 5, and then may be permanently secured during subsequent operations.

[0032] FIG. 4 shows another example of an air distribution system 20 corresponding to the first embodiment. In the top view, electrical conductors 11 are shown, leading from the first segment 43 of the air distribution layer 4 to the second segment 43. These electric conductors 11 are fixed on the first layer 2. They do not extend linearly or on the shortest path from one segment to the other. Rather, their principal direction is at an angle to the shortest possible connection, and they meander about that principal direction. In this way, the conductors 11 acquire sufficient freedom of motion to bridge relaxation pits or other depressions 7 and seams without being damaged by overextension or stress under load. The invention is not limited to seats. In adapted form, it may for example be provided also for arm rests, door trim and armature panels.

[0033] The air distribution system 20 may alternatively comprise a moist, interstorage layer, e.g. a fleece of active carbon particles. Further, the air distribution system may be fitted with sensors, fans or other functional elements. Also, pad distribution elements or multi-zone foams may be arranged therein. Molded parts of rubber filament are especially suitable for the seat level.

[0034] Another fastening alternative can be provided by foaming parts of an adhesive shield into the pad and providing the corresponding parts on the adhesion area of the air distribution system, and/or making the first layer a textile, bondable material. The adhesion area 5 of the first layer 2 will then interlock with the pad 6 rather than bond thereto in the case of an adhesive. As used herein, however, the term adhesion contemplates both bonding and material interlocking.

[0035] In operation, the air distribution system of the present invention provides assembly advantages over prior art vehicle seat assembly processes. In particular, the air distribution system 20 comprising the air distribution layer 4 and first layer 2 having an adhesive flange 25 can be easily handled by assembly operators. Further, because the seat pad recess 35 substantially corresponds in size to the air distribution layer 4, the air distribution layer 4 can easily and accurately be located on the vehicle seat pad 6. In addition, the adhesive flange 25 secures the air distribution system 20 to the pad 6 during further upholstery operations. In this way, it is ensured that the air distribution system will not shift or otherwise become dislocated during final assembly.

[0036] While the invention has been described in connection with one or more embodiments, it is to be understood that the specific mechanisms and techniques which have been described are merely illustrative of the principles of the invention, numerous modifications may be made to the apparatus described without departing from the spirit and scope of the invention as defined by the appended claims.

What is claimed is:

1. An air distribution system for distributing air through a vehicle component, the system comprising an air distribution layer defining a base area and a first layer arranged on the air distribution layer, the first layer projecting beyond the base area along at least a portion of an edge thereof to form a flange, wherein a side of the flange facing towards the air distribution layer includes an adhesion area.

2. A system according to claim 1 wherein the vehicle component is a vehicle seat comprising at least one pad including a recess formed therein and adapted to accommodate the air distribution layer, and wherein the air distribution layer is arranged between a cover and the pad, and wherein the recess, at least along its edges, corresponds in depth to the thickness of the air distribution layer such that a top surface of the air distribution layer is substantially coplanar with a pad elevation surrounding said recess.

3. A system according to claim 2 wherein said flange adhesion area is fixed to said pad elevation by adhesion or material interlocking.

4. A system according to claim 2 wherein said recess substantially corresponds in size to said air distribution layer base area.

5. A system according to claim 2 wherein the air distribution layer comprises two segments and said at least one pad includes two recesses formed therein, each substantially equal in size to a corresponding segment of said air distribution layer.

6. A system according to claim 2 wherein the pad comprises at least two pad zones separated from each other by a depression, at least one pad zone including a recess formed therein and substantially corresponding in size to the air distribution layer base area and extending at least to one edge of the pad zone where it is bounded by a pad elevation.

7. A system according to claim 6 wherein said flange adhesion area is fixed to said pad elevation by adhesion or material interlocking.

8. A system according to claim 1 wherein the air distribution layer comprises at least two segments distanced from one another in the same plane along the first layer.

9. A system according to claim 1 comprising an areal heating element arranged between the air distribution layer and the first layer.

10. A system according to claim 8 comprising an areal heating element arranged between at least one of said segments and the first layer.

11. A system according to claim 10 comprising at least one electrical conductor connecting the at least two segments of the air distribution layer.

12. A system according to claim 11 wherein said electrical conductor is arranged at an angle with respect to a shortest path between said segments and meanders about its principal direction to accommodate flexion in a region between said segments.

13. A system according to claim 1 wherein said flange extends along at least half of an edge length of said base area.

14. A system according to claim 1 wherein said adhesion area comprises a self-adhesive or knotted surface.
15. A system according to claim 1 wherein said first layer comprises said adhesion area and layers of pad material.

16. A vehicle seat comprising:
   at least one pad having a recess formed therein; and
   an air distribution system comprising an air distribution layer secured to a first layer, the air distribution layer defining a base area substantially corresponding in size to said recess, and the first layer projecting beyond the base area along at least a portion of an edge thereof to form a flange, wherein a side of the flange facing towards the pad includes an adhesion area.

17. A seat according to claim 16 wherein the air distribution system comprises an areal heating element arranged between said air distribution layer and said first layer.

18. A seat according to claim 16 wherein the adhesion area comprises a self-adhesive or a knotted surface for engaging the pad along a pad elevation surrounding a portion of said recess.

19. A seat according to claim 17 wherein the air distribution layer comprises at least two segments spaced apart from each other along the first layer, and wherein the air distribution system comprises an electrical conductor connecting the at least two segments.

20. A method of assembling a ventilated vehicle seat comprising:
   providing at least one seat pad having recess formed therein;
   providing an air distribution system comprising an air distribution layer secured to a first layer, the air distribution layer defining a base area substantially corresponding in size to said recess, and the first layer projecting beyond the base area along at least a portion of an edge thereof to form a flange, wherein a side of the flange facing towards the pad includes an adhesion area; and
   thereafter, positioning said air distribution system within said recess and engaging said flange adhesion area to the pad along a pad elevation surrounding a portion of said recess to fix said air distribution system within said seat pad.

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