

HEADREST STRUCTURE, HEADREST CUSHION AND PASSENGER SEAT

FIELD OF INVENTION

The present invention relates broadly to a headrest structure, a headrest cushion and to passenger seat

5 BACKGROUND

Headrests are commonly used on passenger seats, for example aircraft passenger seats, to provide support for the head of the seat occupant. To be effective, the headrest should be positioned at a correct distance above the backrest of the seat. The distance above the backrest will defer from person to person depending on the anthropometry and comfort preference of
10 an individual.

A conventional headrest for aircraft seating is a 2-way headrest where the seat occupant can adjust the headrest to be positioned to the correct distance above the backrest based on individual comfort and preference by upward and downward movement. To try and address issues encountered by the conventional 2-way headrest, a 4 and a 6-way headrest have been
15 developed.

The 4-way headrest, in addition to allowing upward and downward adjustment, allows its sides to be folded to provide sideways head support for the seat occupant.

In addition to the function described above for the 4-way headrest, the 6-way headrest provides forward and backward tilting of the headrest. As such a 6-way headrest offers the
20 seat occupant a wide range of headrest adjustment based on individual preference.

In existing headrest designs, the headrest cushion is typically shaped with a substantially flat support surface, i.e. the surface facing away from the headrest frame and towards the head of the seat occupant, to provide support for the head of the seat occupant. It has been found that strain and stiff neck continue to be experienced by many passengers, especially for long haul
25 flight where seat occupant typically tilt their head sideways while sleeping. As such, comfort of passenger seating is compromised.

DE 10113091A1 describes a motor vehicle seat with a seat back with a collapsible internal structure. AT506239A1 describes a headrest with a cushion that is connected to a seatback by way of a support element made of a thin strip or band of material. WO2005/009782 describes
30 a headrest simultaneously brought into contact with the lower surface part of the rear head part, upper cervical vertebrae part, and fifth cervical vertebrae part of an occupant. DE102004058788A1 describes a headrest with a fluid-fillable bladder. US2004/0217639 describes an adjustable headrest with height adjustment, forward and rearward adjustment and separate adjustable side-support members.

Embodiments of the present invention provide a headrest, a cushion for a head rest and a
35 passenger seat that seek to address at least one of the above problems.

SUMMARY

In accordance with a first aspect of the present invention, there is provided a headrest structure for a passenger seat, the headrest structure comprising an adjustable headrest frame for connection to a passenger seat; and a headrest cushion mounted to the adjustable headrest frame such that the headrest cushion is moveable relative to a seat back of the passenger seat by way of the adjustable headrest frame; wherein the headrest cushion comprises a support surface facing away from the headrest frame, the support surface comprising a concave upper part and a convex bottom part relative to the passenger seat.

In accordance with a second aspect of the present invention, there is provided a headrest cushion for an adjustable headrest frame for a passenger seat, the headrest cushion being configured for mounting to the adjustable headrest frame such that the headrest cushion is moveable relative to a seat back of the passenger seat by way of the adjustable headrest frame, and wherein the headrest cushion comprises a support surface disposed for facing away from the headrest frame, the support surface comprising a concave upper part and a convex bottom part relative to the passenger seat.

In accordance with a third aspect of the present invention, there is provided a passenger seat comprising a headrest structure of the first aspect.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will be better understood and readily apparent to one of ordinary skill in the art from the following written description, by way of example only, and in conjunction with the drawings, in which:

Figure 1a) shows a schematic exploded isometric view of a headrest structure according to an example embodiment.

Figure 1b) shows a schematic side view of the headrest structure of Figure 1.

Figures 2a) and b) shows schematic side views of the headrest frame of the headrest structure of Figure 1, in different respective tilt orientations.

Figures 3a) and b) show schematic side views of the headrest cushion of the headrest structure of Figure 1 in respective different tilt orientations.

Figure 4 shows a schematic isometric view of the headrest structure of Figure 1.

Figures 5a) and b) show schematic front and side views respectively of the headrest structure of Figure 1.

DETAILED DESCRIPTION

An embodiment of the present invention provides a 6 way headrest coupled with a tear drop shaped cushion. The 6 way headrest allows the seat occupant to adjust the headrest to their preferred configuration while the headrest cushion has a support surface with a concave upper

part and a convex bottom part relative to the passenger seat, which preferably provides both head and neck support.

In an example embodiment, the shape of the headrest cushion is designed to account for the anatomy of the human head and neck, more particular, the cushion has a concave top half and a convex bottom half which follows the posterior outline of human head and neck region. Advantageously, the concave top half provides support for the head, while the convex bottom half provides support for the seat occupant's neck.

Figure 1a) shows a schematic exploded isometric view of a headrest 100 according to an example embodiment. The headrest 100 allows upward, downward adjustments, forward tilt, backward tilt and folding along tow fold lines. The headrest 100 comprises a headrest frame 102 and a headrest cushion 104. With the 6-way headrest frame 102 and the shaped cushion 104, the example embodiment is preferably capable of providing both head and neck support for a wide range of seat occupants with different anthropometry. The folding of the headrest frame side flaps 106, 108 by way of hinges e.g. 109 can also advantageously provide support to the head and the neck region against or to limit sideways tilting of the head.

In the example embodiment, the headrest cushion 104 has a concave upper portion 105 and a convex bottom portion 107. Furthermore, the headrest cushion 106 in this embodiment has a softer material or materials in the center portion 110 and a stiffer material or materials at the side flap portions 112, 114. This can advantageously provide the seat occupant a comfortable feel at the posterior head and neck regions while providing adequate support to the head and neck regions against or to limit sideways tilting of the head by way of the stiffer material or materials at the side flap portions. In one embodiment, for the center portion 110 of the headrest cushion 104, memory foam is preferably implemented to enhance the conformity of the headrest to individual occupant's anthropometry.

The headrest cushion 104 in the example embodiment has voids in the form of substantially V-shaped cutouts 116, 118 formed in a support surface 120 thereof, which faces away from the headrest frame 102, i.e. towards a seat occupant, to accommodate folding of the side flap portions 112, 114, together with the side flaps 106, 108. Preferably, the cutouts 116, 118 will eliminate or at least reduce "wrinkle" on the headrest cushion when the side flaps 106, 108 are folded. The voids are not limited to the cutouts 116, 118 shown in Figure 1, but may additionally or alternatively be differently shaped, may extend continuously or discontinuously, may be partially or fully buried in the foam body, and/or may be formed in the surface 122 facing the headrest frame 102 in different embodiments. Forming the voids in the support surface 120 may be preferred for minimizing wrinkles.

With reference to Figure 1b), in this embodiment, the concave top portion 105 of the support surface 120 directly meets the convex bottom portion 107 of the support surface 120 such that a cross-section of the headrest cushion along the vertical axis relative to the passenger seat is substantially reverse S-shaped. The curvature 124 of the concave upper portion 105 is shallower than the curvature 126 of the convex lower portion 107. The concave top portion

105 and the convex bottom portion 107 each extend substantially across the horizontal width of the headrest cushion 104 relative to the passenger seat.

With reference to Figures 2a) and b), the forward and backward tilting of the headrest frame 102 around the hinge 200 in the example embodiment advantageously allows the seat occupant to adjust the position of the headrest cushion 104 (Figure 1) to fit to the concave outline of the posterior of the neck and optionally to fit to the convex outline of the back of the head, thus providing specific neck and head support. The hinge 200 is configured in this embodiment to create an axis of rotation along about the top $\frac{1}{4}$ of the height of the headrest frame 102. The tilting angle of the headrest frame 102 can be, but is not limited to, between about 0° to about 90° from vertical (with reference to the seat back in a substantially upright position). A mounting brace 202 is provided for mounting the headrest frame 102 to the seat back of a passenger seat. Moveable blocks 204, 206 are guided in tracks (hidden in Figure 2) formed on the back of the headrest frame 102 for adjustment in upward and downward directions.

Figures 3a) and b) illustrate the headrest cushion 104 in two different tilt orientations to fit two heads 300, 302 with different anthropometry, i.e. a shallower and a steeper neck curvature respectively. In Figure 3a), the headrest cushion 104 can be adjusted such that the lower convex portion 107 extends into and fits the concave neck outline 306, while the concave upper portion 105 "cradles" the convex outline 306 of the back of the head 300. Similarly, in Figure 3b), the headrest cushion 104 can be adjusted such that the lower convex portion 107 extends into and fits the steeper concave neck outline 310, while the concave upper portion 105 "cradles" the convex outline 308 of the back of the head 302.

As can be seen from Figures 3a) and b), the 6 way headrest 100 (Figure 1) of the example embodiment allows the seat occupant to adjust the headrest configuration to provide support for the head and neck based on their comfort preference and anthropometry, which can advantageously achieve improved comfort for the occupant.

Figure 4 shows a schematic isometric view of the headrest 100 with the headrest cushion 104 mounted to the headrest frame 102 using, for example, Velcro and/or a number of rivets e.g. 400 in this example embodiment, with a transparent view through the headrest cushion 104.

In different embodiment, the dimensions of the headrest structure and cushion depend on the dimensions and aesthetics of the seat, as will be appreciated by a person skilled in the art. As illustrated in Figures 5a) and b), one example implementation of a 6-way headrest 500 can have the following dimensions:

- width 502 about 450mm
- height 504 about 183mm
- maximum depth 506 about 55mm
- depth 508 at top about 25mm

- minimum depth 510 in upper concave portion about 15mm
- depth 512 at the bottom about 40mm

5 In one embodiment, a headrest structure for a passenger seat comprises an adjustable headrest frame for connection to a passenger seat; and a headrest cushion mounted to the adjustable headrest frame such that the headrest cushion is moveable relative to a seat back of the passenger seat by way of the adjustable headrest frame; wherein the headrest cushion comprises a support surface facing away from the headrest frame, the support surface comprising a concave upper part and a convex bottom part relative to the passenger seat.

10 The headrest cushion can comprise voids formed in a body thereof, the voids being aligned with respective folding joints of the adjustable headrest frame for folding side portions of the headrest frames relative to a mid-portion of the headrest frame. The headrest cushion can comprise a mid-portion having a first compressive strength, and side portions having a second compressive strength different from the first compressive strength. The first compressive strength can be higher than the second compressive strength. The mid-portion of the headrest
15 cushion can be mounted to a center mounting plate of the adjustable headrest frame. The side portions of the headrest cushion can be mounted to respective side mounting plates of the adjustable headrest frame.

In one embodiment, the concave upper part of the support surface directly meets the convex bottom part of the support surface such that a cross-section of the headrest cushion along a vertical axis relative to the passenger seat is substantially reverse S-shaped. The curvature of
20 the concave upper part is shallower than the curvature of the convex lower part.

In one embodiment, the concave upper part and the convex bottom part each extend substantially across the horizontal width of the headrest cushion relative to the passenger seat.

25 The adjustable headrest frame can comprise a 4-way headrest frame. The adjustable headrest frame can comprise a 6-way headrest frame. The headrest frame can be configured such that the headrest cushion is moveable in upward and downward directions, in forward and backward tilt, and folding along two fold lines.

30 In one embodiment, a headrest cushion for an adjustable headrest frame for a passenger seat is provided, the headrest cushion being configured for mounting to the adjustable headrest frame such that the headrest cushion is moveable relative to a seat back of the passenger seat by way of the adjustable headrest frame, and wherein the headrest cushion comprises a support surface disposed for facing away from the headrest frame, the support surface comprising a concave upper part and a convex bottom part relative to the passenger seat.

35 The headrest cushion can comprise voids formed in a body thereof, the voids being aligned with respective folding joints of the adjustable headrest frame for folding side portions of the headrest frames relative to a mid-portion of the headrest frame. The headrest cushion can comprise a mid-portion having a first compressive strength, and side portions having a second compressive strength different from the first compressive strength. The first compressive

strength can be higher than the second compressive strength. The mid-portion of the headrest cushion can be configured for mounting to a center mounting plate of the adjustable headrest frame. The side portions of the headrest cushion can be configured for mounting to respective side mounting plates of the adjustable headrest frame.

- 5 In one embodiment, the concave upper part of the support surface directly meets the convex bottom part of the support surface such that a cross-section of the headrest cushion along a vertical axis relative to the passenger seat is substantially reverse S-shaped. The curvature of the concave upper part can be shallower than the curvature of the convex lower part. The concave upper part and the convex bottom part can each extend substantially across the
- 10 horizontal width of the headrest cushion relative to the passenger seat.

It will be appreciated by a person skilled in the art that numerous variations and/or modifications may be made to the present invention as shown in the specific embodiments without departing from the spirit or scope of the invention as broadly described. The present embodiments are, therefore, to be considered in all respects to be illustrative and not

15 restrictive.

CLAIMS

1. A headrest structure for a passenger seat, the headrest structure comprising:

an adjustable headrest frame, with folding joints of the adjustable headrest frame for folding side portions of the adjustable headrest frame relative to a mid-portion of the adjustable headrest frame, for connection to a passenger seat; and

a headrest cushion mounted to the adjustable headrest frame such that the headrest cushion is moveable relative to a seat back of the passenger seat by way of the adjustable headrest frame;

wherein the headrest cushion comprises a support surface facing away from the headrest frame, the support surface comprising a concave upper part and a convex bottom part relative to the passenger seat, the concave upper part having a minimum depth perpendicular to the headrest frame that is smaller than a depth perpendicular to the headrest frame at a top of the headrest cushion

wherein the headrest cushion comprises cutouts formed in the support surface, the cutouts being aligned with the respective folding joints.

2. The headrest structure as claimed in claim 1, wherein the headrest cushion comprises a mid-portion made from a softer material compared to side portions of the headrest cushion.
3. The headrest structure as claimed in claim 2, wherein the mid-portion of the headrest cushion is mounted to a center mounting plate of the adjustable headrest frame.
4. The headrest structure as claimed in any one of claims 2 to 3, wherein the side portions of the headrest cushion are mounted to respective side mounting plates of the adjustable headrest frame.
5. The headrest structure as claimed in any one of the preceding claims, wherein the concave upper part of the support surface directly meets the convex bottom part of the support surface such that a cross-section of the headrest cushion along a vertical axis relative to the passenger seat is substantially reverse S-shaped.
6. The headrest structure as claimed in any one of the preceding claims, wherein the curvature of the concave upper part is shallower than the curvature of the convex lower part.
7. The headrest structure as claimed in any one of the preceding claims, wherein the concave upper part and the convex bottom part each extend substantially across the horizontal width of the headrest cushion relative to the passenger seat.
8. The headrest structure as claimed in any one of the preceding claims, wherein the adjustable headrest frame comprises a 4-way headrest frame for allowing upward and downward movements, as well as folding to provide sideways head support.

9. The headrest structure as claimed in any one of claims 1 to 7, wherein the adjustable headrest frame comprises a 6-way headrest frame for allowing upward and downward movements, folding to provide sideways head support and forward and backward tilt.

10. The headrest structure as claimed in claim 9, wherein the headrest frame is configured such that the headrest cushion is moveable in upward and downward directions, in forward and backward tilt, and folding along two fold lines.

11. A headrest cushion for an adjustable headrest frame for a passenger seat, the headrest cushion being configured for mounting to the adjustable headrest frame such that the headrest cushion is moveable relative to a seat back of the passenger seat by way of the adjustable headrest frame, with folding joints of the adjustable headrest frame for folding side portions of the adjustable headrest frame relative to a mid-portion of the adjustable headrest frame, and wherein the headrest cushion comprises a support surface disposed for facing away from the headrest frame, the support surface comprising a concave upper part and a convex bottom part relative to the passenger seat, the concave upper part having a minimum depth perpendicular to the headrest frame that is smaller than a depth perpendicular to the headrest frame at a top of the headrest cushion

wherein the headrest cushion comprises cutouts formed in the support surface, the cutouts being aligned with the respective folding joints.

12. The headrest cushion as claimed in claim 11, wherein the headrest cushion comprises a mid-portion made from a softer material compared to side portions of the headrest cushion.

13. The headrest cushion as claimed in claims 12, wherein the mid-portion of the headrest cushion is configured for mounting to a center mounting plate of the adjustable headrest frame.

14. The headrest cushion as claimed in any one of claims 12 to 13, wherein the side portions of the headrest cushion are configured for mounting to respective side mounting plates of the adjustable headrest frame.

15. The headrest cushion as claimed in any one of claims 11 to 14, wherein the concave upper part of the support surface directly meets the convex bottom part of the support surface such that a cross-section of the headrest cushion along a vertical axis relative to the passenger seat is substantially reverse S-shaped.

16. The headrest cushion as claimed in any one of claims 11 to 15, wherein the curvature of the concave upper part is shallower than the curvature of the convex lower part.

17. The headrest cushion as claimed in any one of claims 11 to 16, wherein the concave upper part and the convex bottom part each extend substantially across the horizontal width of the headrest cushion relative to the passenger seat.

18. A passenger seat comprising a headrest structure as claimed in any one of claims 1 to 10.

19. A passenger seat comprising a headrest cushion as claimed in any one of claims 11 to 17.