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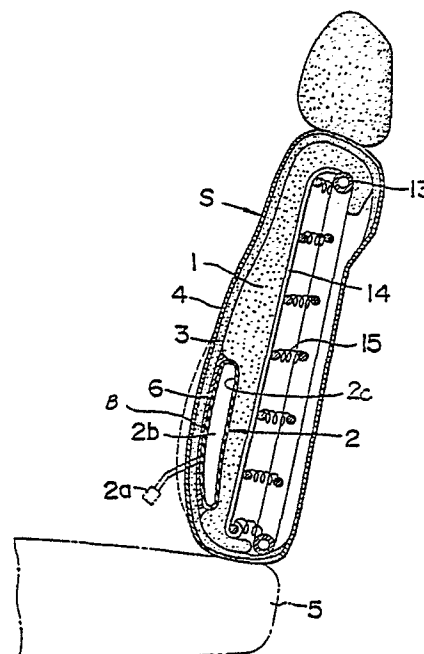
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⑤④ **Pneumatic lumbar support for a seat.**

⑤⑦ A pneumatic lumbar support for a vehicle seat has a pneumatic cushion (2) therein. The pneumatic cushion (2) is equipped with a board-like member (6) on the front side thereof. The board-like member (6) is sufficiently rigid and flexible to form a moderate curve on a lumbar support portion of the seat back (S).



The present invention relates generally to an adjustable lumbar support for a seat, such as a vehicle seat. More specifically, the invention relates to a pneumatically adjustable lumbar support which includes a pneumatic cushion.

U.S. Patent 3,770,315 to Smittle et al, issued November 6, 1973 shows a selectively adjustable lumbar support for aircraft seat and the like. Smith et al. discloses an aircraft seat having an adjustable support in the back opposite the seat occupant's lumbar region. The adjustable support comprises an impermeable, flexible bag filled with open-cell, elastically resilient foam, and means for controlling the gas pressure within the flexible bag. Lumbar support is provided by the combined resilience of the foam and air pressure within the bag, and control of the air pressure by the seat occupant enables adjustable control of the degree of support provided the lumbar region of the back. Pressure above ambient is induced by the load of a seat occupant's back against the bag and air is permitted to escape by way of a manually operated valve to select the desired degree of firmness. The bag is provided with excess volume in order to prevent damage to the seat occupant's back due to explosive expansion in case of rapid decompression of an aircraft cabin.

In such a conventional lumbar support, the portion of the seat back opposing the lumbar vertebra of a passenger may protrude unnaturally, particularly when the pneumatic bag or cushion is expanded. This may detract
5 from the appearance of the seat. Furthermore, since the passenger's back is supported at about two points, i.e. upper quarter of the back and the lumbar vertebra, the passenger is apt to feel fatigue or discomfort after relative long occupation of the seat.

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Therefore, it is an object of the present invention to provide a pneumatic lumbar support for a seat capable of forming an appropriately curved surface substantially along the lumbar vertebra to improve the
15 appearance of the seat and to comfortably support the passenger's back.

In order to accomplish the above and other objects, the lumbar support for a seat, according to the present invention, comprises a pneumatic cushion equipped
20 with a front-facing, flexible board-like member having sufficient rigidity to maintain a moderately curved support surface along the passenger's back and sufficient flexibility to be deformed by expansion and contraction of the pneumatic cushion. The board-like member is positioned
25 on the front side of the pneumatic cushion to oppose the passenger's back.

The invention will be understood more fully from the detailed description given herebelow and from the accompanying drawings of the preferred embodiment of the present invention, which, however, should not be taken as
5 limitative to the invention but are for explanation and elucidation only.

In the drawings:

Fig. 1 is a perspective view of a seat equipped
10 with the preferred embodiment of a pneumatic lumbar support according to the present invention;

Fig. 2 is a cross-sectional view of the seat of Fig. 1 showing seat back construction including the lumbar support;

15 Fig. 3 is a perspective view of a pneumatic cushion utilized in the preferred embodiment of the pneumatic lumbar support as viewed from the back side;

Fig. 4 is cross-sectional view of a modification of the seat construction of Fig. 2, in which the pneumatic
20 cushion is installed within a cushion pad;

Figs. 5 and 6 are perspective views showing modification of the pneumatic cushion of Fig. 3.

Referring now to the drawings, particularly to
25 Fig. 1, there is shown a seat adapted for use in an automotive vehicle. The seat generally comprises a seat back S and a seat cushion 5. The seat back S is connected

to the rear end of the seat cushion 5 by means of brackets 10 and 11. The seat back S is further provided with a head rest 12.

A pneumatic cushion 2 is provided in the seat back S at the position opposite the passenger's lumbar vertebra. The pneumatic cushion 2 has a port 2a to be connected to a pneumatic pump (not shown) to adjust the pneumatic pressure in a pneumatic chamber 2b in order to expand and contract the pneumatic cushion. The adjustment arrangement for adjusting the pneumatic pressure in the pneumatic cushion has been illustrated in U.S. Patent 3,326,601 to Vanderbilt et al. issued on June 20, 1967. The disclosure of U.S. Patent 3,326,601 is incorporated by reference.

As shown in Fig. 2, the seat back S generally comprises a seat back frame 13, a seat back support 14, cushion pads 1 and 3, and an outer decorative sheet 4. The seat support 14 is suspended in front of the seat back frame 13 with a plurality of coil springs 15. The pneumatic cushion 2 is interpositioned between the cushion pads 1 and 3 in the portion of the seat back S opposing the passenger's lumbar vertebra. The pneumatic cushion 2 is attached to a board-like member 6 which is sufficiently rigid to maintain a moderately curved surface conforming to the passenger's lumbar vertebra when the pneumatic cushion is expanded. The board-like member 6 is positioned in front of the pneumatic cushion 2 and is attached to the

back surface of the cushion pad 3.

As shown Fig. 3, the pneumatic cushion 2 is enclosed in an air-tight bag 2c of a flexible material such as synthetic resin sheet. The port 2a extends from the pneumatic chamber 2b for communication between the pneumatic chamber and the pneumatic pump (not shown). The board-like member 6 is bonded or attached to part of one surface of the pneumatic cushion 2. Preferably, the board-like member is formed from palm board which is made of fibers of the coconut palm embedded in latex. Furthermore, in the preferred construction, the board-like member 6 is bonded only to the portion of the pneumatic cushion 2 which experiences the greatest displacement so that the board-like member will not be deformed to match the contours of the entire surface of the pneumatic cushion.

In the above-mentioned construction, the pneumatic cushion 2 is pumped up by the pneumatic pump to deform the portion of the lumbar as illustrated in broken lines in Fig. 2. Since the board-like member 6 is bonded only to a point B in Fig. 2, it is free to retain its original shape even though the pneumatic cushion surface may be more drastically curved. Deformation of the pneumatic cushion 2 causes the board-like member 6 and the cushion 1 to also deform slightly so that the board-like member 6 will form a gently curved surface as shown in broken lines in Fig. 2. The moderately curved surface of the board-like member 6 imparted to the seat back will more

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comfortably fit the passenger's back than the pneumatic cushion 2.

Although the invention has been illustrated in detail with the specific embodiment, the invention should
5 not be limited to the foregoing embodiment but understood as including any possible modification.

For example, the board-like member 6 need not always be a palm board, but rather can be made from any material which will form a moderate curve when the
10 pneumatic cushion 2 is pumped up. For example, the board member can be a hard-slab urethane board, chipped urethane board, coarse blanket and so on. Furthermore, the pneumatic cushion can be integrally installed in the cushion pad 1 as shown in Fig. 4. Also, the pneumatic
15 cushion can be made in various different forms, as shown in Figs. 5 and 6 for example. In Fig. 5, the pneumatic cushion 7 has enlarged portions 7a at either horizontal end and thus a surface curved laterally. This will also cause the board-like member 6 to curve laterally and thereby to
20 conform more closely to the shape of the passenger's back. In Fig. 6, the pneumatic chamber in the pneumatic cushion 8 is partitioned into a plurality of chamber sections 8a, 8b, 8c, 8d, 8e and 8f. The sections 8a and 8f are thicker than the other sections. On the other hand, the sections 8c and
25 8d are thinner than the sections 8b and 8e. Thus, similar to the pneumatic cushion of Fig. 5, the board-like member will be curved laterally.

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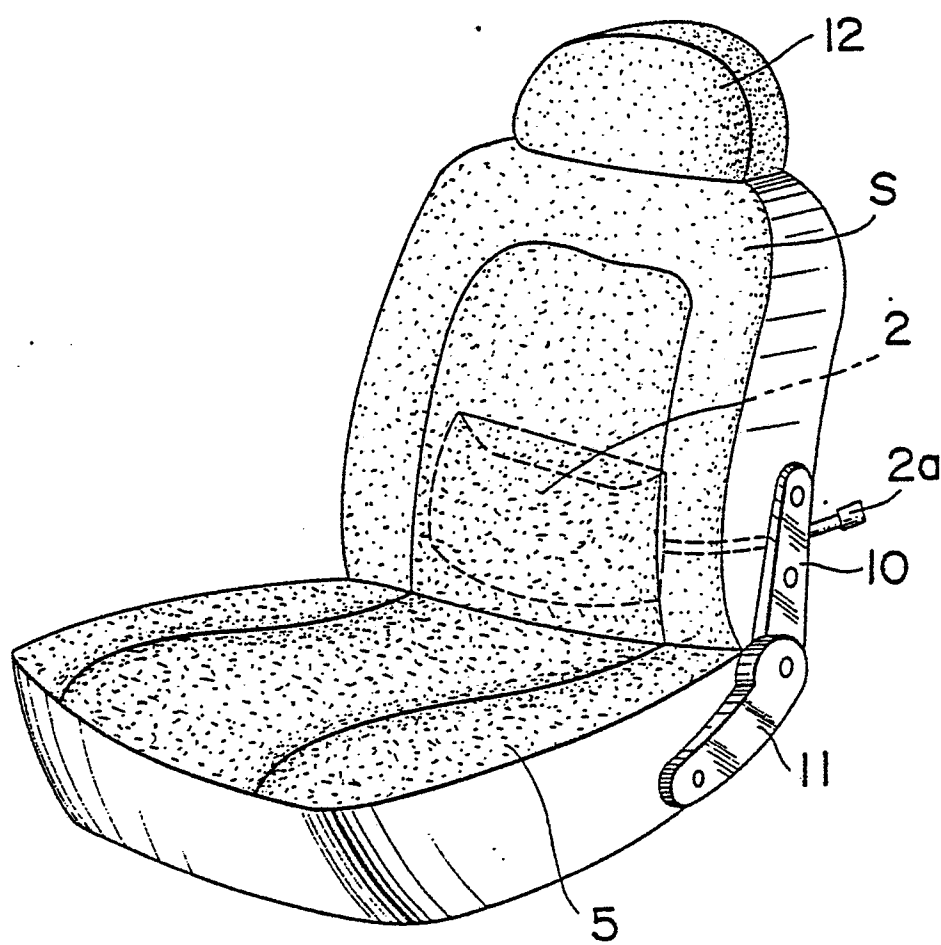
CLAIMS

1. A pneumatic lumbar support for a vehicle seat,
comprising a cushion pad in a seat back of the vehicle
5 seat, a cover surrounding said cushion pad, a pneumatic
cushion expandable and contractable in response to
variation of the pneumatic pressure therein, said pneumatic
cushion being disposed inside said cushion pad or between
said cushion pad and said cover at a portion of the seat
10 back opposing the lumbar vertebra of the occupant,
c h a r a c t e r i z e d by a board-like member (6)
interpositioned at the front facing-side of said pneumatic
cushion (2,7,8) and being sufficiently rigid and flexible
to be deformed by said pneumatic cushion (2,7,8) when
15 expanded to form a surface with a larger radius of curvature
than said pneumatic cushion (2,7,8).
2. A pneumatic lumbar support as set forth in claim 1,
c h a r a c t e r i z e d in that said pneumatic cushion
(2) and said board-like member (6) are fixedly attached
20 at the position B of said pneumatic cushion (2) which
experiences the greatest displacement during variation
of the pneumatic pressure.
3. A pneumatic lumbar support as set forth in claim 1 or 2,
25 c h a r a c t e r i z e d in that said pneumatic cushion
(7,8) includes some lateral curvature such that said lumbar
supporting portion of the seat back S fits the occupant's
back.
- 30 4. A pneumatic lumbar support as set forth in claim 3,
c h a r a c t e r i z e d in that said pneumatic cushion
(8) has a plurality of pneumatic chambers (8a-8f) partitioned
from each other.
- 35 5. A pneumatic lumbar support as set forth in any of the

above claims, wherein said pneumatic cushion (2) is
interposed between said cushion pad 1 and said cover
3, c h a r a c t e r i z e d in that said board-
like member (6) is positioned between said pneumatic
5 cushion (2) and said cover (3).

6. A pneumatic lumbar support as set forth in any of the
above claims, c h a r a c t e r i z e d in that said
board-like member (6) is formed from a palmboard.

FIG.1



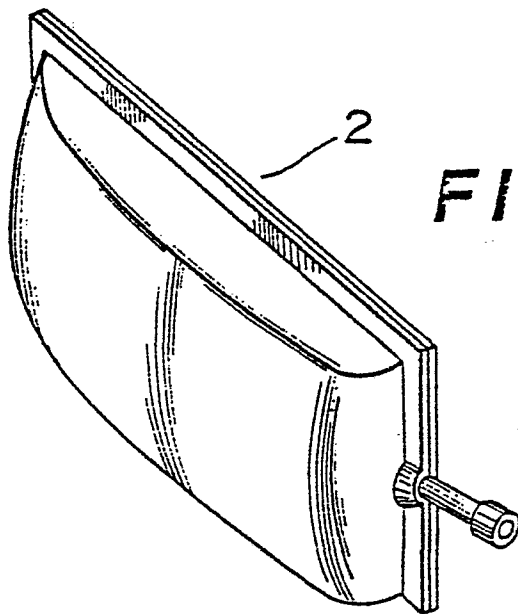


FIG. 3

FIG. 2

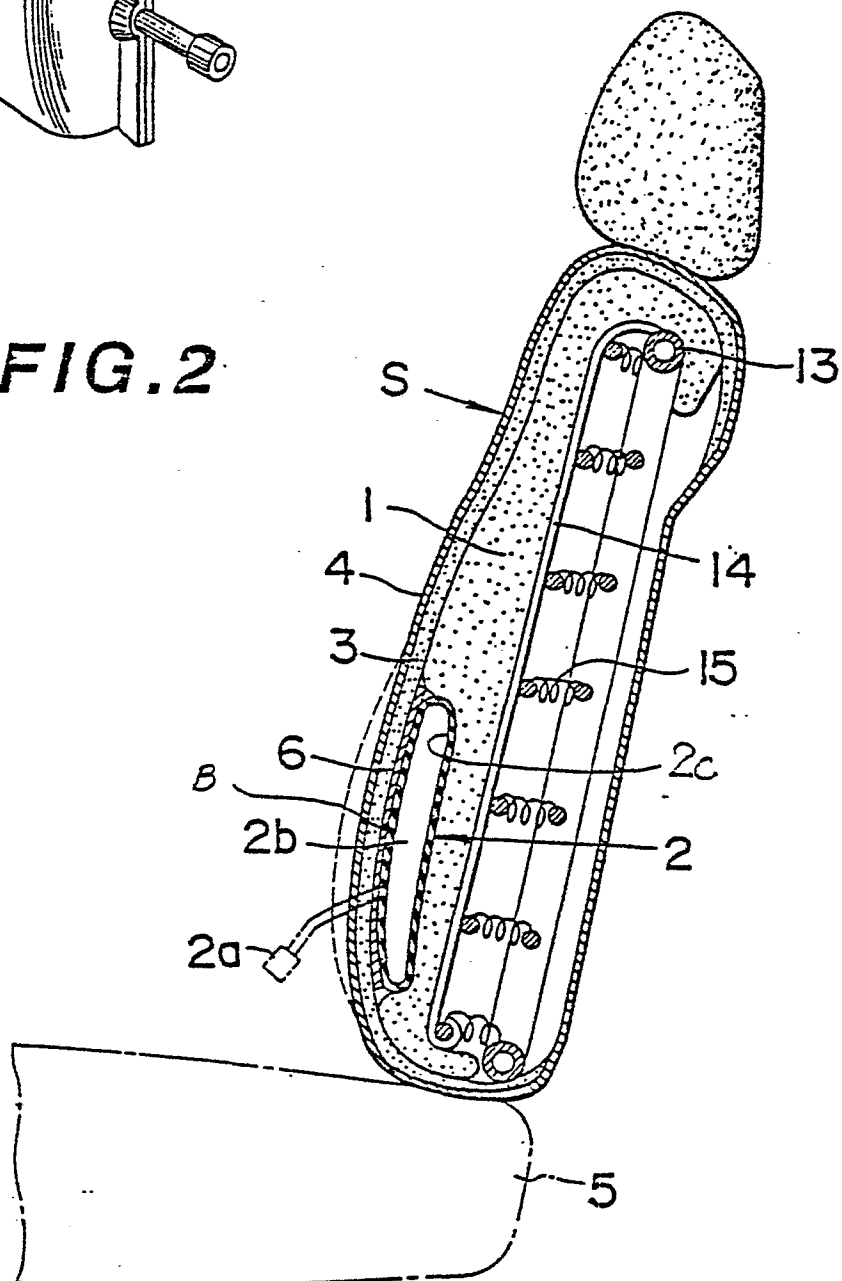


FIG.4

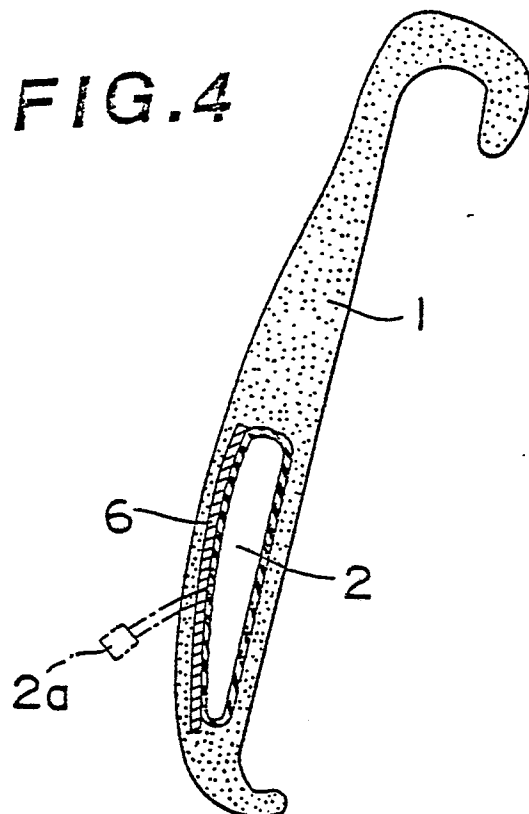


FIG.5

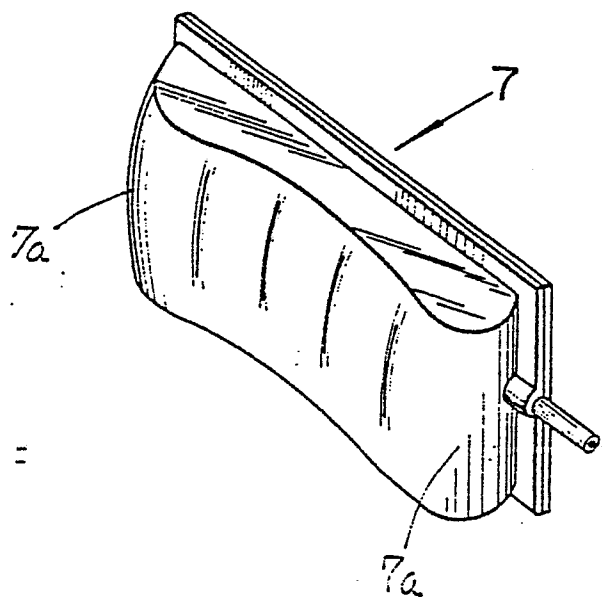


FIG.6

