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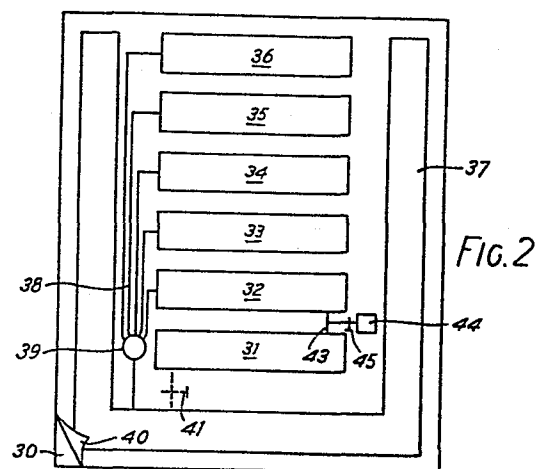
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54 **Body support system.**

57 A body support system in the form of a cushion arranged to provide varying degrees of support to different parts of the body comprises a plurality of resilient fluid-tight compartments (31 - 36) interconnected by a system of fluid conduits (38,43), and shut-off means (39) which can be engaged to isolate at least some of the compartments. In use, the shut-off means (39) is opened, the fluid-tight compartments (31 - 36) are inflated with a fluid medium, and the body is rested thereon to cause a varying distribution of fluid between the compartments, whereupon the shut-off means (39) is closed to retain the compartments (31 - 36) in varying degrees of inflation corresponding to the desired support required. The compartments (31 - 36) and the fluid conduits (38) may be defined between two superposed sheets of resilient fluid-tight material (30,40) to define a unitary panel structure. The panel may include an additional compartment (37) providing a fluid reservoir, and the assembly may be coupled to a fluid pump (44).



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BODY SUPPORT SYSTEM

The present invention relates to a body support system, in particular a back support for vehicle seats, though the invention may also be applied to other seats, 5 beds, wheelchairs and the like.

The use of a cushion to provide extra support for certain parts of the body is well known and it has been proposed to make such a cushion inflatable so that it can be set to the desired firmness and can be deflated 10 to take up less space when not in use. However, such a cushion would normally tend to be difficult to set in situ. Furthermore, it would not be adjustable in the sense that the cushion could not be set to provide varying degrees of support to different parts of the body as required. 15

It is an object of the present invention to provide a body support which can be adjusted in situ by the user to provide the required support in the required positions.

According to the present invention, a body support 20 comprises at least two resilient, fluid-tight compartments, a fluid conduit system connecting the compartments, shut-off means which can be engaged to isolate the compartments, and a fluid supply device arranged to admit fluid to the compartments, thereby forming inflated pads.

25 The invention is particularly adapted for use as a back support for a vehicle seat. It has been proposed to use a system of springs for back support but this

suffers the disadvantages that it is not adjustable and requires a considerable amount of space to accommodate a small range of movement. In another proposal, contoured steel bands are provided within the seat structure.

5. These bands follow what is believed to be the optimum curve for support, particularly of the lumbar region of the spine. However, this is of limited effectiveness due to the vast range of sizes and shapes of the occupants of the seats.

10. It is therefore an important object of the invention to provide an adjustable back support for a vehicle seat.

According to another aspect of the invention, a back support system for use in conjunction with a seat, particularly a vehicle seat comprises a lumbar support,

15. a thoracic support and a cervical support, each of the supports comprising at least one resilient, fluid-tight compartment, a fluid conduit system interconnecting the compartments, shut-off means which can be engaged to isolate the supports and a fluid supply device
20. arranged to admit fluid to the compartments, thereby forming inflated pads for supporting the lumbar, thoracic and cervical regions of the spine.

Conveniently, the working fluid is air and the supply device is preferably a simple hand-operated pump

25. with a relief valve. The shut-off means preferably comprise one or more valves operable on the conduits leading to the compartments. The compartments may be discrete components or may form part of a unitary construction. In the latter case, the construction may
30. comprise a backing sheet which may be relatively firm

and a front sheet attached to the backing sheet e.g. by welding or adhesive, in such a way as to define the various compartments and optionally the conduits.

A fluid reservoir may be connected to the conduit system

5. and can preferably be isolated from the compartments by means of a valve. In a preferred embodiment, a single valve may be employed to interconnect/isolate the compartments and reservoir. However any valve system may be used with any number of valves provided that
10. it allows the compartments to be isolated and interconnected.

In the case of a vehicle seat back support, there are preferably two lumbar pads, two thoracic pads and two cervical pads. The reservoir may be a discrete

15. component and may therefore be located beneath the seat, or alternatively it may form part of an integral unitary construction. In the latter case the reservoir may constitute side supports, leg supports or a head support.

20. The invention may be carried into practice in various ways and some embodiments will now be described by way of example with reference to the accompanying drawings in which:-

- Figure 1 is a schematic diagram of a back support system in accordance with the invention;
- 25.

Figure 2 is a schematic diagram of a second embodiment of a support system, the system being a unitary construction;

- Figure 3 is a schematic detail to an enlarged scale of the valve used in the embodiment of Figure 2; and
- 30.

Figure 4 is a simplified section on the line IV - IV in Figure 3.

Referring firstly to Figure 1, the system comprises a pair of lumbar support pads 11, 12, a pair of thoracic support pads 13, 14, a pair of cervical support pads 15, 16 and a reservoir 17. Each pad 11 to 16 consists of an elongate resilient air-tight compartment made from a flexible plastics material. The reservoir 17 is of similar construction but is somewhat larger. The pads 11 to 16 and the reservoir 17 are interconnected by means of a conduit system 18.

The conduit system has a valve arrangement 19 which comprises a lumbar valve 21 and a combined thoracic and cervical valve 22. These valves 21 and 22 may be operated separately and are arranged to open and close the conduits leaving the pads 11 to 16. Thus, when the valves 21, 22 are open the reservoir 17 and the pads 11 to 16 are all connected by the conduit system 18 while when the valve 21 and 22 are closed, the reservoir 17 and the pads 11 to 16 are all isolated with the exception of the lumbar pads 11 and 12 which are permanently connected by a lumbar conduit 23.

In order to pump air into the system as a whole a hand pump 24 is connected to the lumbar conduit 23. The hand pump is provided with a relief valve 25.

In use, the pads 11 to 16 are attached to a vehicle seat by means of suitable straps, hooks or "Velcro" (Registered Trade Mark) etc., with the lumbar pads 11, 12 in the lumbar region of the user, the thoracic pads 13, 14 in the thoracic region, and the cervical pads 15, 16 in the cervical region. Conveniently, the

reservoir is placed beneath the seat. The lumbar valve 21 and the thoracic/cervical valve 22 are opened and the system is inflated by means of the pump 24.

- When the user feels that the pads 11 to 16 have
5. reached a sufficiently high pressure to offer the desired support, the user adjusts his body to the most comfortable position. The lumbar 21 and the thoracic/cervical valve 22 are then closed thus isolating the pads with the desired air pressure distribution.
 10. If, as is frequently the case, extra support is required in the lumbar region, then more air can be pumped into the lumbar pads 11 and 12 without affecting the remainder of the system as long as the thoracic/cervical valve is closed.
 15. If it is required to let some air out of the system, then it is simply necessary to open the relief valve 25 and optionally the lumbar valve 21 and thoracic/cervical valve 22. The presence of the reservoir allows more flexibility in changes in the volume of air in the various pads. Thus, if pressure is applied to
 20. all the pads 11 to 16, then the reservoir 17 can accept the air displaced, while if pressure is removed from the pads 11 to 16 then air can leave the reservoir 17 and enter the pads 11 to 16.

- It will be appreciated that in this system, once
25. the pads 11 to 16 have been set in the way described above, the support should remain constant until it is reset. Thus, the seat occupant can leave the seat and can return to it and the support will be the same as when he left it. Furthermore, apart from being able
 30. to increase or decrease the firmness of the support,

the pump 25 and the valves 21, 22 and 25 can be used to compensate for changes in temperature.

The embodiment shown in Figure 2 comprises a back support system having a unitary construction. Thus, the
5. various components are integrally formed but operate in a manner essentially similar to those of the embodiment of Figure 1.

The system comprises a backing sheet 30 and a front sheet 40 which is attached to the backing sheet 30 in
10. such a way as to define the various components. The front sheet 40 is made from a resilient air-tight material as is the backing sheet 30, although the backing sheet 30 may be relatively more rigid if desired. The two sheets 30, 40 are fixed together by means of an adhesive,
15. though they could equally well be welded together.

The components defined are a pair of lumbar support pads 31, 32, a pair of thoracic support pads 33, 34, a pair of cervical support pads 35, 36, a reservoir 37, and a conduit system 38. The pads 31 to 36 are elongate
20. resilient fluid-tight compartments while the reservoir 37 is a generally U-shaped resilient fluid-tight compartment which serves as two side supports and a leg support when in position on the seat.

The conduit system 38 is controlled by a valve
25. arrangement 39 which will be described in more detail with reference to Figure 3. The two lumbar support pads 31, 32 are interconnected by means of a lumbar conduit 43 to which a pump 44 is connected via a relief valve
45. Additionally, the lumbar pads 31, 32 may optionally
30. be connected to the reservoir by means of a lumbar valve 41.

Referring now to Figures 3 and 4, the valve arrangement 39 operates on five conduits 52 to 56 leading from the pads 32 to 26 respectively, and on a conduit 57 leading to the reservoir 17. The conduits 52 to 57 are interconnected by means of a conduit ring 58. The valve arrangement 39 comprises a upper clamping ring 61 and a lower clamping ring 62 which are arranged to clamp the conduits 52 to 57 in the position indicated by the broken lines 59 in Figure 3. The two clamping rings 61, 62 are connected together by means of a screw thread so that when one is rotated relative to the other the rings 61, 62 are either brought together or are moved apart. Washers 63 are positioned between the clamping rings 61, 62 to prevent any damage that might be caused to the sheets 30, 40 by rotation of the rings 61, 62.

It will be understood that when the rings 61, 62 are clamped together, the conduits 52 to 57 will be closed thereby isolating the pads 32 to 36 and the reservoir 37. Conversely, when the rings are moved apart, the pads 32 to 36 and the reservoir 37 are interconnected by means of the conduits 52 to 57 and the conduit ring 58. In order to connect the lumbar pads 31, 32 to the reservoir 37 independently of the pads 32 to 36 (as may be effected in the embodiment of Figure 1), the lumbar valve 41 may be included as shown in Figure 2.

Although Figures 3 and 4 show one preferred valve arrangement, any suitable valve arrangement may be employed provided that it operates in a similar fashion. Furthermore, although they are not shown as such,

the conduit system 38 may comprise a series of pipes located between the backing sheet 30 and the front sheet 40.

- 5 Finally, although the systems shown are systems which can be applied to existing structures such as vehicle seats, they may alternatively be formed integrally with such a structure.

5. A body support as claimed in Claim 4, characterised in that said fluid reservoir (37) is a flexible compartment arranged to provide an additional body support portion.

6. A body support as claimed in Claim 2 or any one
5 of Claims 3 - 5 as appended thereto, characterised in that said fluid supply device (24;44) is coupled directly to at least one compartment (11,12;31,32) of said lumbar support portion by valve means (25;45) independent of said shut-off means.

7. A body support as claimed in Claim 6 when appended
10 to Claim 4, characterised in that at least said one compartment (31) of said lumbar support portion is also coupled directly to said reservoir (37) by valve means (41) independent of said shut-off means (39).

8. A body support as claimed in any one of Claims
15 1 - 7, characterised in that it comprises a unitary panel structure provided by a pair of superposed sheets (30,40) of resilient fluid impermeable material joined by seams defining the boundaries of said compartments (31-37).

9. A body support as claimed in Claim 8, as appended
20 to Claim 2, characterised in that the respective lumbar (31,32), thoracic (33,34) and cervical (35,36) support portions are defined by a plurality of generally rectangular elongated compartments arranged laterally adjacent
25 one another with their longitudinal axes in mutually parallel relationship.

10. A body support as claimed in Claim 8 or 9, characterised in that said fluid conduit system (38) comprises flexible walled conduits defined by or located between
30 said superposed sheets (30,40) and that said shut-off means (39) comprises a clamping device having clamping

CLAIMS

1. A body support comprising at least two resilient, fluid-tight compartments (11-16;31-36) and a fluid supply device (24;44) arranged to admit fluid to the compartments, thereby forming inflated pads, characterised in that a fluid conduit system (18;38) connects the compartments in such a manner as to enable variation of the relative volumes of fluid contained in the inflated compartments in response to external pressure thereon, and that there is provided shut-off means (19;39) which can be engaged to isolate the compartments and thus retain the established distribution of fluid therebetween upon release of said external pressure.

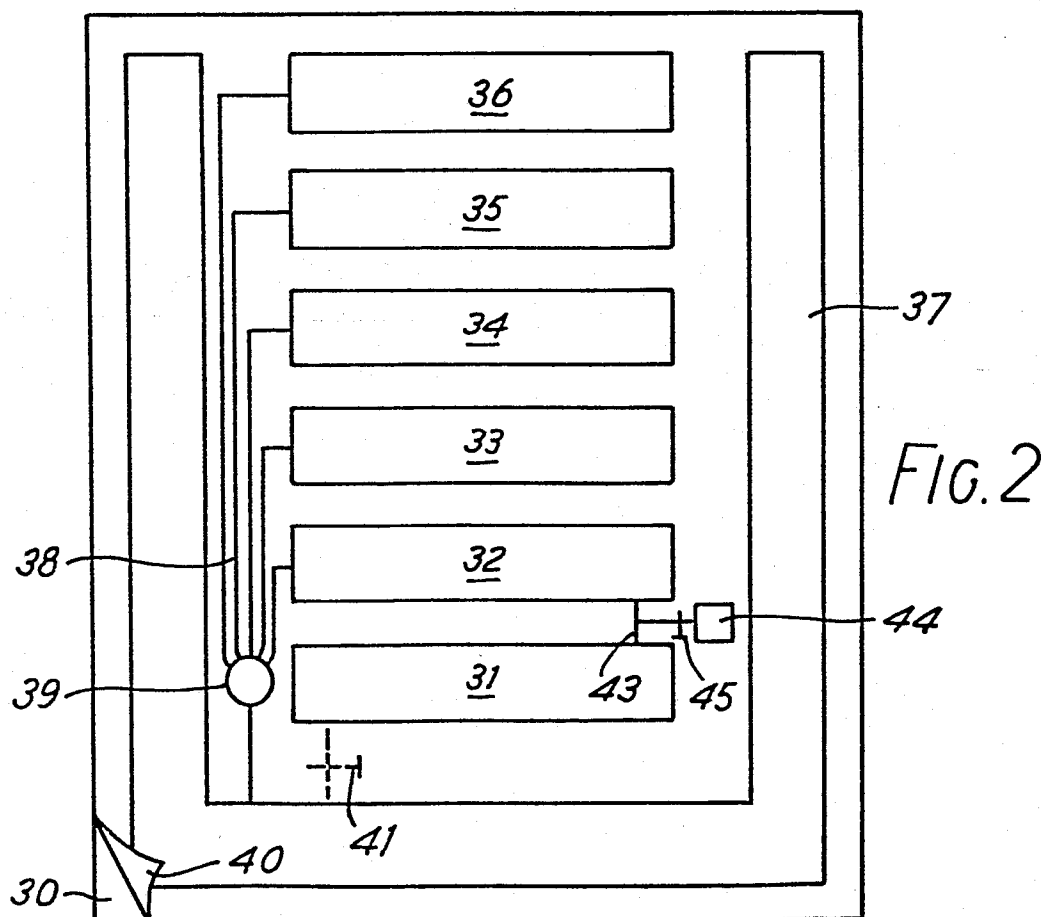
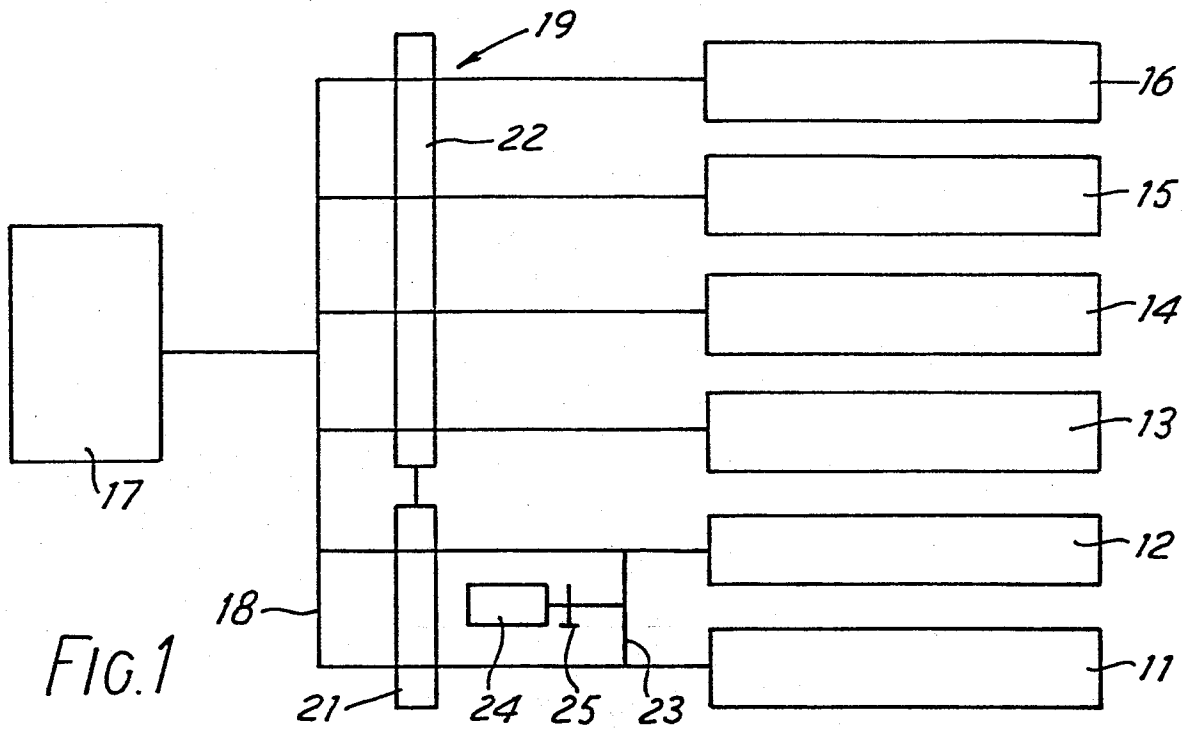
2. A body support as claimed in Claim 1, characterised in that it provides a back support system for use with or for incorporation in a seat, preferably a vehicle seat, and comprises a lumbar support portion (11,12;31,32), a thoracic support portion (13,14;33,34) and a cervical support portion (15,16;35,36) for supporting, respectively, the lumbar, thoracic and cervical regions of the spine, each said support portion comprising one or more of said compartments interconnected by said fluid conduit system (18;38).

3. A body support as claimed in Claim 1 or 2, characterised in that the fluid supply device (24;44) is arranged to admit air to said compartments (11-16;31-36) as the working fluid, and comprises a manual air pump provided with a pressure relief valve (25;45).

4. A body support as claimed in any one of Claims 1 - 3, characterised in that it includes a further fluid-tight compartment (17;37) forming a fluid reservoir connected to said conduit system (19;39).

portions (61,62) arranged on opposite faces of said panel structure to enable said conduits (52-57) to be pinched to a closed condition.

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DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	US-A-3 192 541 (MOORE) * Column 2, line 34 - column 3, line 17; column 3, lines 37-46; column 3, lines 51-68; figures *	1,2	A 47 C 27/10 A 47 C 7/46
A	-----	3,8,9,10	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)
			A 47 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 17-05-1984	Examiner VANDEVONDELE J.P.H.
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	