

⑫ **EUROPEAN PATENT APPLICATION**

⑳ Application number: **81300137.7**

⑤① Int. Cl.³: **A 47 C 31/12**

㉔ Date of filing: **13.01.81**

㉓ Priority: **19.01.80 GB 8001840**

⑦① Applicant: **ASSOCIATED SURGICAL ENGINEERS (INTERNATIONAL) LIMITED**, 250 Wellington Road South, Stockport Cheshire SK2 6NW (GB)

④③ Date of publication of application: **29.07.81**
Bulletin 81/30

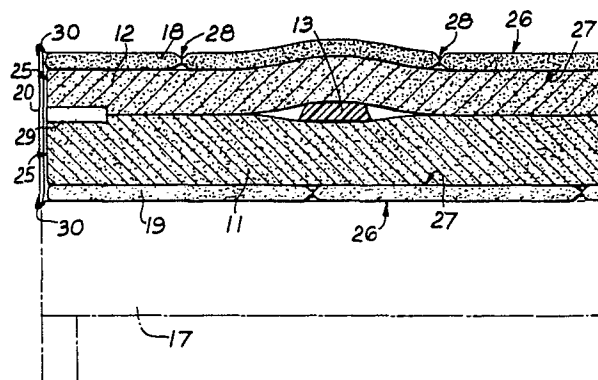
⑦② Inventor: **Neal, David Bruce**, 28 North Farm Road, Lancing West Sussex (GB)

⑧④ Designated Contracting States: **AT BE CH DE FR IT LI LU NL SE**

⑦④ Representative: **Daunton, Derek, Barlow, Gillett & Percival** 94, Market Street, Manchester M1 1PJ (GB)

⑤④ **Bed mattress.**

⑤⑦ A bed mattress comprising an outer cover enclosing a resilient anatomical-body-supporting structure (10) having a lower resilient supporting body 11 and a flexible resilient comfort layer (12), the outer cover consisting of top and bottom quilted layer (18, 19) interconnected by a side strip (20) of stretch fabric. The layer (12) is anchored to the body (11) along each transverse end thereof by means of respective adhesive strips (29) whereby inserts, such as inserts (13), can be introduced by a user of the mattress at desired locations between the body (11) and layer (12) to modify the geometry of the mattress to suit his or her comfort and for the relief of any spinal disorders and/or pain.



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**APPLICATION FOR LETTERS PATENT
UNDER THE EUROPEAN PATENT CONVENTION**

APPLICANT: ASSOCIATED SURGICAL ENGINEERS
 (INTERNATIONAL) LIMITED .

INVENTOR: NEAL, DAVID BRUCE

TITLE: BED MATTRESS

DESCRIPTION:

This invention concerns bed mattresses.

Back pain, like any other pain, is a symptom and physiological warning suffered by over a half the adult population of Britain (one in three of the total
5 population) at some time during their lives. Estimated production losses, due to back pain, amount to about three-hundred million pounds per annum, with an average of about 56,000 employees absent from work on every working day.

10 Anatomically, the back is a much under-appreciated and much overworked support system of great complexity. Its muscular systems are perfectly symmetrical but unfortunately the spine is not located in such a way that weight is distributed evenly about it. It does

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however control weight distribution and this it achieves by virtue of its flexibility, redeploying body weight as counterbalance and, where this alone is inadequate, transmitting neural messages to
5 appropriate muscle to bring additional force to bear in order to prevent the body falling over. It is small wonder that it can be easily overstressed leading to tension in, or lack of co-ordination of, the muscles which then manifests itself as pain.

10 Tense or unco-ordinated muscles in the back make it very difficult to sleep or rest thereby not only adding to the symptoms already present but also denying the muscles the necessary periods of relaxation, rest and recuperation which come naturally with
15 rest and sleep.

Back-pain sufferers are, from time to time advised to attempt to modify the support characteristics of their existing mattresses by insertion therebelow of a board or plank. Generally, however, ordinary bed
20 mattresses are 15 cms and upwards in thickness and will yield considerably. Therefore the insertion of a board or plank will only modify the support characteristics over a large area, in a very crude fashion and has relatively little effect on the particular root point
25 of the problem.

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Moreover, a very high proportion of beds in Britain are so-called "double" beds, intended for occupation by two persons, being for example one-and-a-half metres or more in width, with a mattress of
5 corresponding width. It will readily be understood that the use of a board or plank under the mattress of such a bed ostensibly to provide relief to a back-pain-suffering occupant of the bed can have the
10 repercussive effect of creating circumstances under which the other occupant begins to suffer pains as a result of inappropriate body support and distortion.

So-called "orthopaedic" mattresses have already been proposed as being appropriate to relieve back pains. However, conventional orthopaedic mattresses
15 are generally only designed to support a region where the average lumbar region is estimated to lie, and frequently make no allowance or adjustment for the nature, precise point of pain/injury or for the wide
20 range of physical variations in people, either as individuals or persons sharing the same bed.

An object of the present invention is to provide a construction of mattress which can be individually matched to the requirement and comfort of the person
or user who will rest upon it, and which can be
25 modified by the user, as may be desired, at any

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time and without outside assistance or guidance being essential.

With this object in view, the present invention provides a bed mattress comprising a resilient anatomical body-supporting structure characterised in
5 that said structure comprises a lower resilient supporting body overlaid by a comfort layer of flexible resilient material which is anchored to the supporting body only at localised areas whereby inserts
10 or modifiers may be introduced between said supporting body and said comfort layer, at desired locations, to modify the geometry and therefore the pressure return characteristics.

The comfort layer is conveniently anchored to the
15 supporting body along each transverse end thereof, for instance by means of respective adhesive strips. Each such strip may comprise a fabric or plastics band with an adhesive coating on both faces thereof.

Advantageously, the supporting body and the
20 comfort layer are enclosed by an outer cover, said outer cover comprising top and bottom quilted layers, between which are sandwiched the supporting body and the comfort layer, and a side strip which interconnects the quilted layers. To improve the
25 appearance of the mattress and ventilation of the

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surfaces thereof upon which a person will rest, each quilted layer may comprise, for example, a layer of resilient material such as a low density polyurethane foam, combed cotton, or fibre matting, of a
5 thickness of the order of 2.6 centimetres.

Preferably the side strip is a stretch fabric which can stretch in one direction only to permit a change in the geometry of the quilted layer without distortion thereof. The side strip may have at least
10 one opening along part of its length so that the cover may be pulled over the supporting body and the comfort layer and also to permit introduction of said inserts through said cover. Preferably the or each opening can be closed by means of a sliding clasp fastener.

15 For a low cost version of the mattress, in place of the outer cover with its quilted layers, a stretch cover may be used, which stretch cover is readily removable and rather in the style of a fitted sheet, preferably of a fabric having a nap or pile (e.g.
20 simulated lambswool).

The supporting body may be any suitable relatively-dense resilient foam, such as reconstituted polyurethane foam, for instance of a nominal density of the order of up to 130 kilogrammes per cubic metre.
25 Reconstituted polyurethane foam is, of course,

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polyurethane foam granules or crumbs bound with a suitable adhesive binder. Resilient polyurethane foam can, of course, be used for the supporting body which may, typically, be of the order of five to
5 fifteen centimetres thick.

The comfort layer may be, for example, of flexible polyurethane or foam rubber, conveniently less dense than the material of the supporting body, and of the order of two to twenty centimetres in thickness.

10 Advantageously, both the supporting body and the comfort layer may have a fabric cover to improve their appearance and to protect the layers from the ingress of, for instance, perspiration.

The inserts or modifiers may be in the form of
15 strip members, e.g. of selected foams, wood or extruded plastics material. Such inserts or modifiers are conveniently in the form of a set with all of the components of the set equal in length to the width of the mattress and of equal height, for instance of
20 the order of 2.5 centimetres. The set may comprise inserts or modifiers of a variety of widths, for instance in the range of 5 to 12 centimetres, heights, densities and hardnesses. Each insert or modifier may be chamfered along its longitudinal edge so that its
25 width at its upper surface is about one half (for

instance 0.5 to 0.75 times) that at its bottom surface.

The invention will be described further, by way of example, with reference to the accompanying drawing, in which:-

5 Fig. 1 is a perspective view illustrating a preferred embodiment of the mattress of the present invention the mattress being a single-bed size mattress in position on a divan base and forming a single bed;

10 Fig. 2 is a perspective view illustrating one of a plurality of inserts or modifiers provided with the mattress of Fig. 1;

Fig. 3 is a view on the line 3-3 of Fig. 1;

15 Fig. 4 is a longitudinal cross-section of a supporting body and a comfort layer, forming part of the mattress of Fig. 1, in position on a divan base;

20 Fig. 5 is a perspective view of two mattresses, identical to the mattress of Fig. 1, in position on a double-bed size divan base and forming a double bed; and

Fig. 6 is a similar view to Fig. 5 but illustrating a double-bed sized mattress, similar in construction to the mattress of Figs. 1 to 5.

The preferred embodiment of the mattress of the present invention as illustrated in Figs. 1, 3, 4 and 5 is a rectangular single-bed size mattress, but of course it can be of any desired practical size or shape. The mattress comprises an anatomical-body-supporting structure, indicated generally by the reference numeral 10 (Fig. 4) of which the principal component is a lower resilient supporting body 11 which is made of reconstituted polyurethane foam having a nominal density of about 128 Kg per cubic metre, or any similar resilient polymeric material or rubber. The thickness of the body 11 is of the order of 10 cms, but of course the thickness can be chosen as desired.

Superimposed upon the supporting body 11 is an upper or comfort layer 12 whose shape in plan corresponds to that of the body 11. This layer 12, being about 5 cms in thickness in the illustrated case, is made of a flexible and resilient material, such as polyurethane, which is less dense than the body 11.

As is more clearly illustrated in Fig. 3, the supporting body 11 and the comfort layer 12 are enclosed by an outer cover, said outer cover comprising quilted layers 18 and 19 between which are sandwiched the supporting body 11 and the comfort

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layer 12. The quilted layers 18, 19 provide the two surfaces of the mattress on which a person may rest.

Interconnecting the two quilted layers 18, 19 is a side strip 20. The side strip 20 is made of a stretch fabric which can only stretch in the vertical direction to permit a change in the geometry of the quilted layers 18, 19 without corresponding distortion thereof. The side strip 20 is connected to respective quilted layers 18, 19 by a respective edging tape 30.

The quilted layers 18, 19 each comprise a resilient material, such as a low density polyurethane foam, combed cotton or fibre matting, having a thickness of approximately 2.5 centimetres, sandwiched between two fabric layers 26, 27. The fabric layers 26, 27 of respective quilted layers 18, 19 are drawn together at regular intervals so that the two surfaces of each quilted layer 18, 19 have depressions 28.

The outer cover not only improves the appearance of the mattress but also improves the ventilation of the surfaces on which a person may rest.

The side strip 20 has an opening to allow the outer cover to be easily pulled over the body 11

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and the layer 12 and to permit the passage of inserts or modifiers 13 through the cover. The opening is provided with a sliding clasp fastener 21.

The layer 12 is anchored to the body 11 in such a way as to provide localised areas of attachment between the body 11 and the layer 12 which permits the introduction, between the body 11 and the layer 12 of any desired practical number of the inserts or modifiers 13 of the type shown in Fig. 2. As illustrated in Fig. 3 this anchoring is achieved by the provision of two adhesive anchoring strips 29 (only one anchoring strip 29 being shown in Fig. 3), one along each end of the body 11 and layer 12. Each such strip 29 is a thin fabric band coated on each face with a pressure-sensitive adhesive, or applied adhesive, the strips 29 simply being positioned on the body 11 prior to putting the layer 12 in place so that adhesion then follows automatically. It is to be understood, however, that anchoring can be effected in any desired locations or by any means which will enable the inserts or modifiers 13, or equivalent members, to be introduced where required so as to extend the mattress, without significantly restricting the positions in which the said members are located.

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To improve the appearance of the body 11 and the layer 12, and to protect them for the ingress of, for example, perspiration, said body 11 and said layer 12 are each provided with a cover 25 made of any suitable
5 fabric.

Three of the inserts or modifiers 13 are shown, in outline, located in position of the mattress of Fig. 1, and it will readily be appreciated that it will be normal practice to supply the mattress with
10 sufficient thereof, to enable a user to select and position in the mattress any practical number and arrangement of the inserts 13 he or she may desire. The length of each said inserts 13 is such as to correspond approximately with the width of the
15 mattress 10. Each insert 13 may be made of the same material as either body 11 or layer 12 and may be coated with P.V.C. to improve their appearance. As illustrated particularly in Fig. 2 each insert 13 is chamfered along its longer edges as at 16 so that
20 its lower face 14 is wider than the opposite upper face 15. So far as thickness is concerned, the members of the set may, if desired, all be of the same thickness or of different thicknesses. Typical dimensions for the members of a set may, for instance,
25 be as follows.

<u>overall length</u>	<u>thickness</u>	<u>width at lower face</u>	<u>width at upper face</u>
approx.)	2.5 cms	5.0 cms	2.5 cms
equal)	2.5 cms	6.5 cms	4.0 cms
to the)			
mattress)			
width)	2.5 cms	11.5 cms	6.5 cms

It will thus be appreciated that the chamfering,
 5 if provided, may reduce the width of the upper face
 15 of the insert 13, such that the width of the lower
 face 14 of the insert 13 is of the order of 1.5 to 2
 times the width of the upper face 15, although alter-
 native appropriate shapes may be used.

10 Illustrated in Fig. 4 are the body 11 and the
 layer 12 disposed on a divan base 17. Between the
 body 11 and the layer 12 are a set of three inserts
 13 which are each of different dimensions from one
 another. The middle insert of the three is a combin-
 15 ation of two inserts of similar length one laid on
 top of the other. The lower face of the top insert
 corresponds in width to the width of the upper face
 of the bottom insert.

The mattress, that is the body 11, the layer 12
 20 and the outer cover, is shown in Figs. 1, 3, 5 and 6
 as being superimposed upon the divan base 17, to form
 a bed, but of course it can be used in conjunction
 with any suitable bed frame or box as is well known
 in the art. As illustrated in Fig. 5 in relation to

a double bed, the arrangement may be such that two single-size mattresses 22, 23 are disposed side-by-side on the base, frame or box 17 and, of course, either one or both of these mattresses 22, 23 may
5 be constructed in accordance with the invention. Where both these mattresses 22, 23 are constructed in accordance with the invention this provides for the possibility of a double bed suitable for two people suffering from conditions which call for
10 diametrically opposed approaches for their relief. For example, a person suffering from chronic acute ankylosing spondylosis sleeping with an intermittent low back pain sufferer. Therefore, inserts 13 are located in different dispositions.

15 As illustrated in Fig. 6 the usual approach to this problem would be with a double-sized mattress 24 according to the invention, but using modifiers or insert 13 of length equal only to half of the mattress width, so that each occupant may incorporate
20 them or not as desired.

In the illustrated embodiment of the mattress the resilient supporting body 11 serves to:-

1. eliminate or bridge any depressions or lumps present in the divan base, frame or box on which it
25 rests;

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2. provide a layer which combines the firmness required for support with the compressibility required for comfort;
3. impart rigidity and stability to the structure
5 and thence to the user;
4. provide a surface onto which the inserts 13 can key, thereby ensuring immobility of these inserts, preventing deviation from their useful positions as determined by the patient;
- 10 5. provide a non-unidirectional pressure return, in contrast to the unidirectional return pressure characteristic of a spring-interior mattress, even when the inserts 13 are not being used;
- 15 6. ensure that the mattress does not have the tendency to weaken or degenerate often exhibited by spring-interior mattresses, leading to characteristic dips or weak spots often to be found in the latter; and
- 20 7. accommodates, in the case of double-size bed, sleeping partners of greatly differing size and weight, without one of the partners having to try to sleep on a lateral slope with all the attendant distortive muscular tensions.

In contrast, the comfort layer 12 is:-

1. a soft layer giving a "feather-bed" feel which is psychologically desirable to persuade the user that he is comfortable;
- 5 2. a compressible layer which serves to soften the effect of and to straighten the curves created by the inserts 13;
3. a layer imparting an omnidirectional compressive force without imposing shear force to the
10 subject's skin, thus avoiding high pressures;
4. a layer which is deep enough for the natural elasticity of the layer to fill for instance, the curve of the user's lumbar region whilst affording good support thereto from the platform layer; and
- 15 5. a stratum which provides a high level of comfort when the inserts 13 are not in use.

It will readily be appreciated that the function of the inserts 13 is to alter the geometry of the mattress, to any desired practical degree and in any
20 exact positions as desired by the user. They may be inserted between the body 11 and the layer 12, or above the comfort layer 12, or below the body 11, depending upon the degree of alteration required,

thus enabling a very versatile range of therapeutic conditions to be achieved. The inserts 13 may be used in groups of two or more fitted on top of one another, if so desired. They may be made from the same material as the body 11 or from other qualities of flexible polyurethane foam. More-rigid inserts e.g. of wood or light metal, could be provided, in certain cases, and, alternatively, inflated inserts could be used.

10 For the relief and treatment of back pain, the user can select one or more appropriate inserts and position it or them to give himself or herself maximum comfort. The number and arrangement of the inserts 13 relies entirely upon the user's feelings of comfort.

15 It has been shown that the mattress of the invention is effective for the relief and treatment of back pain even though the user may not sleep on his or her back. The muscular sequence which provides the support for the lumbar region continues round the side and
20 there is no need to impose a sleeping position on the user. What is comfortable is right and the automatic response of the body will provide the controls.

 In addition to back pain relief, the mattress of the invention is thought to be beneficial in the relief
25 and treatment of other complaints and injuries, such as:

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Ischaemic sores

By relocating pressure loads suffered by a user and by distributing them over a large area, the incidence of sores can be greatly diminished. Where this malady is already present in bed-bound patients
5 the mattress will assist the sores to recede spontaneously by relieving the pressure from affected areas by use of the modifiers.

Migraine or Tension Headaches

Some forms of migraine are very much related to
10 the build up of tension in the head and neck, which manifests itself as muscular tension, readily observed by characteristic rigidity in the splenius capitis, which forms the nape of the neck, and the trapezius muscles which join the neck to the shoulder joints.
15 Since the inserts 13 are effective in inducing muscular relaxation, insert 13 located in the mattress so as to be under the user's neck has been found to bring relief to many migraine sufferers.

Lower Limb Injuries

20 Since the inserts 13 can be positioned in any location within the mattress, they can also be used as supports for the relief and treatment of lower limb pains and injuries.

Bed Restraints/Snoring

The inserts 13 can, if desired, be placed longitudinally in the mattress, so located they will serve to restrain restless invalides, geriatrics and children, from falling out of bed. The inserts 13
5 can also be disposed so as to discourage a user from rolling over onto his or her back, thereby to prevent snoring.

The invention is not confined to the precise details of the foregoing example and variations may
10 be made thereto in addition to those already described. For instance, the mattress may be enclosed in a suitable covering or envelope, e.g. of textile fabric, and this may have openings (closed for
example by means of snap fasteners or sliding clasp
15 fasteners, not shown) permitting insertion and withdrawal of the inserts 13.

CLAIMS

1. A bed mattress comprising a resilient anatomical body-supporting structure (10) characterised in that said structure (10) comprises a lower resilient supporting body (11) overlaid by a comfort layer (12) of flexible resilient material which is anchored to the supporting body (11) only at localised areas, whereby inserts or modifiers (13) may be introduced between said supporting body (11) and said comfort layer (12), at desired locations, to modify the geometry and therefore the pressure return characteristics of the mattress.
2. A bed mattress as claimed in claim 1 wherein the comfort layer (12) is anchored to the supporting body (11) along each transverse end thereof by means of respective adhesive strips (29), each such strip (29) comprising a fabric or plastics band with an adhesive coating on both faces thereof.
3. A bed mattress as claimed in claim 1 or 2 wherein the supporting body (11) and the comfort layer (12) are enclosed by an outer cover, said outer cover comprising top and bottom quilted layers (18, 19) between which are sandwiched said supporting body (11) and said comfort layer (12).

4. A bed mattress as claimed in claim 3 wherein interconnecting the top and bottom quilted layers (18, 19) is a side strip (20) made of a stretch fabric which can stretch in one direction only.
- 5 5. A bed mattress as claimed in claim 4 wherein the side strip (20) has at least one opening along part of its length so that said outer cover may be pulled over the supporting body (11) and the comfort layer (12) and also to permit the passage of inserts (13)
10 through said outer cover, the opening being provided with a sliding clasp fastener (21).
6. A bed mattress as claimed in any preceding claim wherein the supporting body (11) is made of a relatively dense resilient foam, such as reconstituted
15 polyurethane foam of a nominal density of the order of up to 130 kilogrammes per cubic metre, and is between five to fifteen centimetres thick.
7. A bed mattress as claimed in any preceding claim wherein the comfort layer (12) is of flexible poly-
20 urethane or foam rubber which is less dense than the material of the supporting body (11) and is of the order of two to twenty centimetres in thickness.
8. A bed mattress as claimed in any preceding claim wherein both the supporting body (11) and comfort

layer (12) have a fabric cover (25) to improve their appearance and to protect the layers from the ingress of, for example, perspiration.

9. a bed mattress as claimed in any preceding claim
5 wherein the inserts or modifiers (13) are strip members, for example, for selected foam, wood or plastics.

10. A bed mattress as claimed in claim 9 wherein the inserts or modifiers (13) are in a set.

10 11. A bed mattress as claimed in claim 10 wherein all the components of the set are equal in length to the width of the mattress and of equal height for instance of the order of 2.5 centimetres.

12. A bed mattress as claimed in claim 10 wherein
15 the set comprises components of various widths, for instance in the range of 5 to 12 centimetres, and heights.

13. A bed mattress as claimed in any of claims 10 to 12 wherein each component is chamfered along its longitudinal edge (16) so that its width at its upper
20 surface (15) is about one half that at its bottom surface (14).

14. A bed mattress substantially as hereinbefore described with reference to and as illustrated in
25 the accompanying drawings.

