

Aug. 10, 1965

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3,199,124

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Filed March 29, 1963

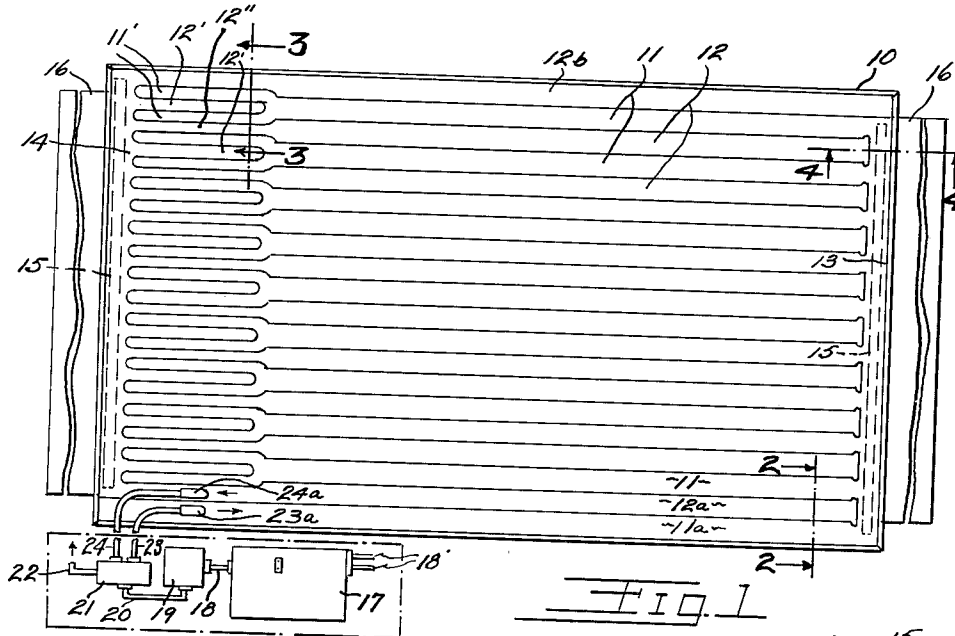


Fig. 1

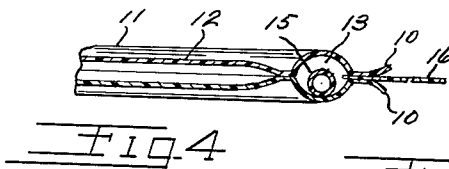


Fig. 4

Fig. 5

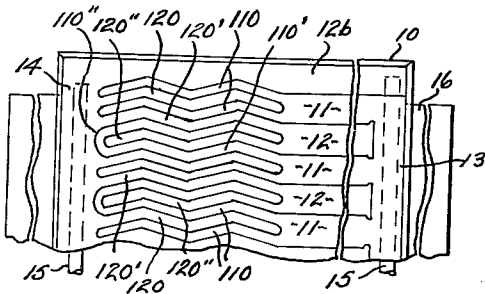


Fig. 5

Fig. 6

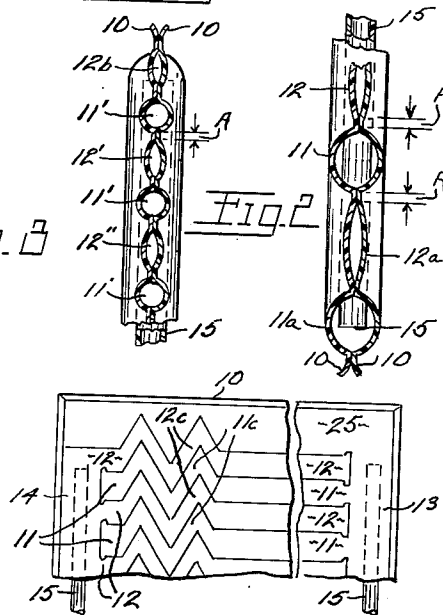
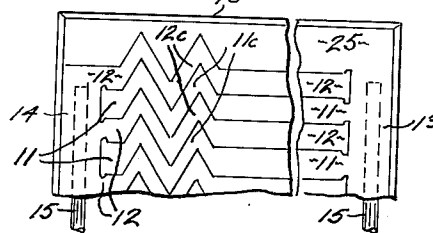


Fig. 2



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3,199,124

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Filed Mar. 29, 1963, Ser. No. 268,994
7 Claims. (Cl. 5—349)

This invention relates to improvements in a hollow mattress adapted to provide alternating pressure points so as to prevent or alleviate bed sores which might otherwise afflict a patient compelled to lie for long periods of time in bed.

An object of the present invention is to provide a novel alternating pressure point support for the heel portions of a patient's body.

Other objects and advantages of the present invention will be apparent from the accompanying drawings and description and the essential features thereof will be set forth in the appended claims.

In the drawings—

FIG. 1 is a top plan view of a hollow mattress embodying the present invention with inflation and control apparatus therefor shown somewhat diagrammatically;

FIGS. 2, 3 and 4 are fragmental sectional views somewhat enlarged taken along similarly numbered lines of FIG. 1;

FIG. 5 is a plan view of a portion of a mattress taken in the same position as FIG. 1 and illustrating a modification; while

FIG. 6 is a plan view of a portion of a mattress similar to FIG. 5 and illustrating a further modification.

It is now well known that patients who lie for long periods of time on a flat mattress develop bed sores where pressure points occur between bony structures and the mattress. To alleviate this condition without requiring a great deal of nursing time for turning the patient manually, alternating pressure point mattresses are known wherein two sets of interdigitated cells are provided in the hollow mattress, alternating ones of which are inflated while those between are deflated and this cycle is regularly repeated between the two sets of cells so that alternately one set or the other is supporting the patient.

A difficulty with known alternating pressure point mattresses is that they fail to provide proper support for the heel portions of the patient but instead permit the heels to lie in general fixed pressure support with respect to the bed so that sores may develop on the heels. The present invention obviates this difficulty.

As illustrated in FIGS. 1 through 4 of the drawings, a pair of fluid tight flexible synthetic plastic sheets 10 are secured together in a substantially continuous seam or seal extending entirely around the rectangular periphery as seen in FIG. 1 by suitable application of heat and pressure in a well known manner. Two sets of parallel cells 11 and 12 are provided across the entire mattress alternating with the sets of one cell interdigitated between the cells of the other set. Along the lines indicated in full line in FIG. 1, the two sheets of synthetic plastic 10 are sealed together continuously along such lines as indicated at A in FIGS. 2 and 3 by suitable application of heat and pressure. This provides a structure wherein all of the cells 11 are closed at the left-hand end of FIG. 1 but are open to the passageway 13 at the right-hand end. At the same time, all of the cells of the set 12 are closed at the right-hand end of FIG. 1 and communicate at the left-hand end with the passageway 14. Preferably, hollow tubes 15 are inserted in the passageways 13 and 14 as shown in FIGS. 1 and 4 to make sure that these passageways do not collapse completely.

Preferably, means is provided for holding the hollow

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mattress of FIG. 1 in position on a bed, usually on top of an ordinary mattress. Shown here are two end flaps 16 which are secured to the main portion of the hollow mattress and serve to tuck under the head and foot of an ordinary mattress to retain the hollow mattress in place thereupon.

To provide more closely spaced pressure points to support the heels of a patient lying on the hollow mattress, each of the cells 11 is bifurcated as shown at 11' at the left-hand end of FIG. 1. In the pattern shown here, each of the narrow cells 11' is of a width approximately one-half of that of the broader portion of the cell 11. In one form of the invention, the cells 11 are approximately two inches wide while the cell portions 11' are approximately one inch wide. It will be noted that the cell portions 11' are in direct communication with the main portion of the cell 11 and are inflated and deflated therewith. Other narrower cell portions 12' and 12'' lying between the bifurcations 11' are in direct communication with the cells 12 and the passageway 14 associated therewith so that all of the cells 12, 12' and 12'' are inflated and deflated simultaneously. The cell portions 12' and 12'' are approximately the same width as the cell portions 11'.

Any conventional means may be utilized for alternately inflating and deflating the two sets of cells. Shown diagrammatically in FIG. 1 is an air compressor 17 adapted for operation electrically by power connected to the lines 18. The compressor supplies pressure fluid through conduit 18 to a pressure regulator 19 and then through a conduit 20 to a four-way valve 21 which besides the inlet 20 has an outlet to atmosphere at 22 and two other combined inlets and outlets at 23 and 24 leading to the mattress. Outlet 23 has a discharge elbow 23a lying in a passageway 11a extending along the margin of the mattress and communicating with the passage 13 and all of the cells 11. Outlet 24 has a discharge elbow 24a lying in a passageway 12a parallel to 11a and communicating with the cross passageway 14 and all of the passageways 12 through the narrower passageways provided by the cells 12'. It is obvious that the cells 12' are in direct communication with the passageway 14.

With the hollow mattress of FIG. 1 properly in position on a bed, the air compressor 17 is operated and the valve 21 is manipulated either manually or by means of a suitable timer to alternately inflate the cells 11 and those connected therewith while the cells 12 and those connected therewith are deflated, and then in a regular cycle this is reversed while the cells 12 are inflated and the cells 11 are deflated. In one embodiment of this invention, inflation of one set of cells takes place for two minutes, after which these are deflated in the next two minute period while the alternate set of cells is inflated. This results in the alternate inflation and deflation illustrated in FIGS. 2 and 3. Thus, the spacing between the cells 11' of one set as seen in FIGS. 1 and 3, or of the cells 12b, 12' 12'', in the other set, is so arranged that the pressure on the heel of an adult patient must necessarily be varied from point to point as the hollow mattress goes through its repeated cycle of inflation and deflation of the alternate sets of cells.

In FIG. 5, I have shown a modification of the invention wherein the narrower cells at one end only of the hollow mattress are sinuous. I intend to use this term broadly to indicate any similar arrangement of the cells which is non-linear. Here the sheets of synthetic plastic material 10, cells 11, 12, 11a, 12a and 12b as well as the passageways 13 and 14 are like those already described and may be inflated and deflated in the same manner as described in connection with FIG. 1. The only difference in the embodiment of FIG. 5 is that the bifurcated cells 110, communicating with the main portion of cells 11, are of

3 zig-zag or sinuous form and, in the pattern shown, each of the cells 110 is approximately one-third the width of the main portion of the cell 11. In order to form a convenient and compact arrangement of the cells, it will be noted that each of the narrower cells 110' is bent back upon itself at 110'' so as to inflate an adjacent cell 110. Each of the cells 120 is inflated directly from the passageway 14 and each of the narrower cells 120' serves also to inflate one of the cells 12. The cells 120'' communicate directly with cells 12.

The operation of this second form of the invention is quite similar to that shown in FIG. 1. Alternately, the cells 11, 110, 110' are inflated through the communicating passageway 13 while the alternating cells 12, 120, 120' and 120'' are deflated through the passageway 14. At a suitable interval, such as the two minute interval mentioned above, this process is reversed so that the previously deflated cells are inflated and the previously inflated cells are deflated. Here again, as in the first described form of the invention, the pressure points provided by the sinuous cells are closer together than the width of the heel of an adult person so that the heel never rests on the same point for any length of time and bed sores on the heel are prevented. In one embodiment where the cells 12 are two inches wide, the cells 120, 120' and 120'' are about $\frac{5}{8}$ inch to $\frac{1}{16}$ inch wide.

It is advantageous to have both sets of cells extending lengthwise of the body to be supported because there is thus less chance of blocking, by cell pressure, one of the main arteries of the body.

In FIG. 6, I have shown a modification of the invention which in all respects is like that described in FIG. 5 with the following exceptions. Here the main body of the mattress, for supporting all but the feet and lower legs of the patient, is of alternate parallel linear cells 11 and 12 of a broader width, for instance, two inches in one form. At the foot end of the mattress, each of these cells is bent into a sinuous path by diverging from the linear cell along approximately 45° and successively reversing the 45° bends until the cell returns to the line from which it originally diverged. In so doing, the narrower cell portions 11c and 12c are formed, each of these being a continuation of and in communication with its associated wider cell and being approximately one-half the width of the wider cell. It should be understood that this mattress has a discharge end 23a discharging into a cell like 11a (not shown) which feeds the passageways 13

and 25. There is also a discharge end 24a which feeds the passageway 14 and all of the cells 12 separately from passages 13 and 25. The operation of this form is like those previously described.

What is claimed is:

1. A hollow mattress for supporting the body of a patient upon a bed and comprising flexible, fluid-tight sheet material divided into two sets of elongated generally parallel fluid cells extending lengthwise of the body to be supported thereon, one set of cells being adapted to be connected with a source of pressure-fluid for inflation to a body-supporting position while the other set of cells is connected to exhaust, in use the inflation and deflation of said two sets of cells alternating in a regular cycle, said cells at one end only of said mattress being formed with a lesser width cross-wise than the cell width at other parts of said mattress, and said narrower cell width at said one end being less than the width of an adult human heel.
2. A mattress as set forth in claim 1, wherein said narrower cell width is in the range of approximately $\frac{5}{8}$ inch to one inch.
3. A mattress as set forth in claim 1, wherein the wider cells of one of said sets are bifurcated lengthwise of said mattress at said one end to provide some of said narrower cells, and narrower cells lying between said bifurcations are in communication with the other of said sets of wider cells.
4. A mattress as set forth in claim 3 wherein said bifurcated cells are parallel to said wider cells and of a width approximately one-half the width of said wider cells.
5. A mattress as set forth in claim 3 wherein said bifurcated cells are sinuous.
6. A mattress as set forth in claim 5 wherein said bifurcated cells are of a width approximately one-third of the width of said wider cells.
7. A mattress as set forth in claim 1, wherein each of said narrower cells is a continuation of, and in communication with, an associated wider cell, each said narrower cell being formed by bending a linear wider cell into a sinuous path.

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