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(54) **Inflatable patient supports**

(57) An inflatable patient support has an array of inflatable tubes made of flexible material and divided into a plurality of groups which are supplied with air by first air supply means to cause cyclic inflation and deflation of the groups of said array of inflatable bodies in sequence, thereby providing periodic pressure variation to a patient on the support. A flexible ventilation air guide member (10) is provided on the array of tubes and has at its upper side a plurality of outlet apertures (6) for release of ventilation air upwardly to the patient on the support. Second air supply means supply air continuously to the flexible ventilation air guide member for release as the ventilation air. The ventilation air is thus independent of the pressure cycling air supply, and can be for example heated.

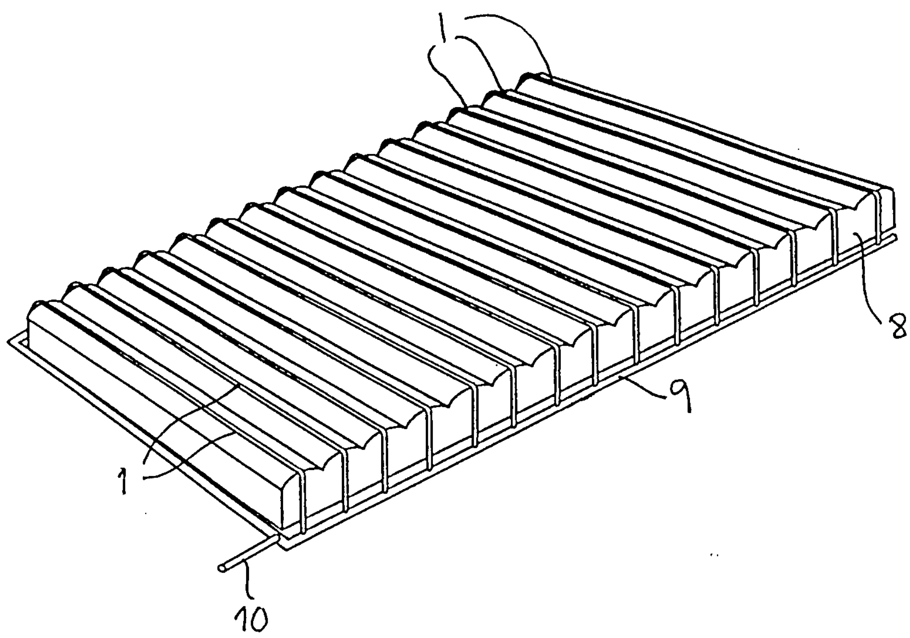

FIG. 3

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Description

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This invention relates to inflatable supports for patients, particularly human patients, for example mattresses for beds and cushions for chair seats, e.g. wheelchair seats. The invention also relates to a method of operation of such supports.

2. Description of the Prior Art

[0002] For patients suffering from bedsores (decubitus), risk of bedsores or burns, mattresses which provide pressure relief have long been known and many have been placed on the market and put in use. A first type of such mattresses is exemplified by the Pegasus Airwave (registered trade mark) mattress, made by the assignees of the applicant, which has a double-layer array of cells in the form of tubes which are divided into groups which are sequentially inflated and deflated in a predetermined cycle (see GB-A-1595417). The tubes are of air-impermeable material, and are deflated by venting to atmosphere. Alternatively, in accordance with our recently published patent application GB-A-2312835, the tubes are deflated by connection to a suction pump or pumps. This latter form of mattress has recently been placed on the market as the Pegasus Renaissance. As described in GB-A-2312835, the use of suction to achieve a pressure below zero (i.e. below ambient atmospheric pressure) in the tubes during the deflation part of the cycle is believed to result in improved clinical effects, due to the rapid removal of all pressure on the skin. It is an advantage of the Pegasus Renaissance mattress that it permits the use of an overlay or cover between the array of tubes and the patient, which has merits in hygiene and infection control, as well as appearance and comfort. A particular form of cover, which minimizes risk of interface pressure retention, is described in patent application EP-A-827705 of Pegasus.

[0003] A cushion for a wheelchair operating on similar principles is disclosed in W094/07396 and an active calf support in WO96/19175.

[0004] There have also been many proposals to enhance flow of air around the patient, since this can provide clinical benefits and help healing. Particularly, in the case of burn wounds, a large amount of liquid is produced at the wound site, and its removal by evaporation into air is beneficial. To achieve air supply to the patient's skin, the low air loss mattress concept has been well developed. A low air loss mattress has porous inflatable cells, so that when the cells are filled with air under pressure, there is continuous loss of air towards the patient. Low air loss from the cells has been combined with the cyclical inflation and deflation of the cells which provide the air loss.

[0005] Some problems arise however with the known low air loss systems. For example, if the cell providing low air loss is cycled through an inflation and deflation cycle, air flow from the cell would be most beneficial during the deflation part of the cycle, because when the cell is deflated the interface pressure between the patient and the cell may be lowest, or even close to zero. However, there is least airflow from the cell in the deflation part of the cycle. Secondly, hygiene control can be difficult, if liquid from the patient tends to pass through the apertures of the air loss cells. Liquid-impermeable material such as Goretex (registered trade mark) which is nevertheless air-permeable has been used to try to avoid this, but nevertheless risks of cross-infection on re-use of the mattress and also of build-up of cellular growth on or in the mattress remain.

[0006] WO97/42919 describes a cooling jacket or overlay for a patient who is to be subjected to cooling to achieve mild hypothermia as a clinical treatment. The lower side of the jacket may have apertures to provide a cooling air flowing over the patient. It is stated that this jacket may be used in conjunction with an inflatable mattress, preferably one of the low-air-loss type or alternatively one designed to provide pulsation therapy by cyclically varying pressures to the mattress.

SUMMARY OF THE INVENTION

[0007] It is an object of the present invention to provide a mattress, or other inflatable patient support, which provides good pressure relief, due to the cycling of the inflatable cells and further provides beneficial air flow around the patient while permitting good hygiene practice.

[0008] In a first aspect, the invention provides

an array of inflatable bodies made of flexible material and divided into a plurality of groups,
first air supply means including control means for causing cyclic inflation and deflation of said groups of said array of inflatable bodies in sequence, thereby providing periodic pressure variation to a patient on the support,
at least one flexible ventilation air guide member provided on said array having at its upper side a plurality of outlet apertures for release of ventilation air upwardly to a patient on the support,
second air supply means for supplying air to said flexible ventilation air guide member for release therefrom through said apertures as said ventilation air.

[0009] The first and second air supply means may be fed with air from a common source of pressurised air under control of respective independent control means, e.g. independent pressure and flow rate control, but preferably are fed by respective separate sources of pressurised air, e.g. compressors, with respective control means.

[0010] The second air supply means preferably includes temperature control means, preferably heating means, for controlling the temperature of the ventilation air. This temperature control may include feedback by means of a sensor of the temperature of the air supplied to or emitted from the ventilation air guide member. This sensor may sense the temperature of air adjacent the patient. It should be noted that the pressure reduction on emission of the air through the outlet apertures will cause it to cool slightly.

[0011] The flexible air guide member may be a tube mounted on one of the inflatable bodies of the array or between an adjoining pair of the bodies of the array. In this case there is preferably a plurality of these tubes at spaced apart regions of the array.

[0012] Alternatively the flexible air guide member may be a flexible cover overlying the array of inflatable bodies with the outlet apertures on its side facing away from the array and having one or more air conduits within it for supply of air to the outlet apertures. These may be a plurality of air conduits formed by tubes in the cover sheet. Alternatively the cover may have within its thickness an air-permeable core layer laminated with air-impermeable layers on both sides, one of said air-impermeable layers having the outlet apertures through it for passage of air from the core layer to the exterior. The core layer thus constitutes a conduit. Preferably this cover is stretchable in two perpendicular directions.

[0013] Within the scope of the invention is the use of a porous material whose pores provide the apertures for outflow of ventilation air.

[0014] The inflatable bodies of the array providing support of the patient and periodic pressure variation may be made of air-impermeable sheet material, and may be for example elongate tubes. Preferably the control means for this cyclic inflation and deflation includes suction means for extraction of air from them for their deflation. The suction means may be arranged to establish a negative pressure (i.e. pressure below ambient atmospheric pressure) in the bodies during their pressure cycle. The array may be controlled in the manner described in GB-A-2312835, whose contents are incorporated herein by reference.

[0015] By contrast, the second air supply means is desirably arranged to provide in use a continuously positive air pressure in the flexible ventilation air guide member or members, so as to ensure continuous outflow of the ventilation air (except at any apertures which may be blocked by the weight of the patient). This positive air pressure should preferably be substantially constant.

[0016] In the case where a cover constitutes the flexible ventilation air guide member, the cover may be constructed in accordance with EP-A-827705, the contents of which are herein incorporated by reference, i.e. a cover in which a top sheet is attached to side sheets with the top sheet having a greater lay-flat length than the side sheets, due to assembly with the side sheets in a stretched state. This construction is compatible with the concepts of the cover sheets described here.

[0017] By providing separate air supply means for the inflation and deflation of the array of inflatable bodies on the one hand, and for the ventilation air which is supplied through the apertured flexible guide member on the other hand, there can be achieved accurate and optimised control of both functions. Continuous, or substantially continuous, flow of ventilation air from the apertured flexible guide member can be obtained, optionally with temperature control. It is not necessary to maintain a positive pressure in the inflatable bodies, so as to ensure air loss from them, as in conventional low air loss type mattresses. Therefore the pressure cycling within the inflatable bodies can be controlled to achieve the maximum beneficial effects due to pressure relief. Control of the ventilation air can be achieved independently of the control of the inflation and deflation, so that a continuous gentle flow of air from the mattress system around the patient's body can be achieved. At the same time, the lowest necessary air pressure to support the patient can be supplied to the inflatable bodies, to maintain the patient's support.

[0018] As mentioned, temperature control of the ventilation air is applicable, and can be easily selected and controlled. To achieve temperature control in a conventional low air loss mattress, all the air entering the mattress must be temperature controlled, but in the support of the present invention only the ventilation air need be temperature controlled. If cooling is desired, a cooling effect can be achieved due to the expansion of the air on emerging from the apertures of the flexible air guide member. For many medical applications, heating is beneficial, and easily achieved in the invention.

[0019] While in many cases it is appropriate to provide ventilation air to the whole area on which the patient is lying, in other cases it may be desirable to provide ventilation air only at a selected zone or zones, and this can be readily achieved in the support according to the invention without compromising the pressure relief function of the cycling of the inflatable bodies.

[0020] As mentioned above, it is desirable for several reasons to provide a liquid-impermeable cover between the patient and the inflatable bodies undergoing inflation and deflation. This is incompatible with the low air loss type of mattress, in which the air emerges directly from the inflatable bodies (cells). It is however readily applicable in the present invention, since the cover may itself constitute or contain the flexible ventilation air guide member or members and at the same time not permit passage of liquid through it from its upper to its lower side. This can be achieved with a thin, flexible and comfortable cover.

[0021] The air pressure in the apertured flexible ventilation guide member is generally low, so that if it is of tubular form it is easily compressed flat by the weight of a patient and therefore provides no discomfort. In one embodiment of the invention the apertured flexible guide member is a sheet having an air-permeable core layer, which also provides no discomfort.

[0022] The cover including the ventilation air apertures can be relatively inexpensive, and therefore is economic to discard after use by a single patient, thereby minimising infection risk, particularly cross-infection risk.

BRIEF INTRODUCTION OF THE DRAWINGS

[0023] Embodiments of the invention will now be described, by way of non-limitative example, with reference to the accompanying drawings.

[0024] Fig. 1 is a perspective view of a first form of flexible air guide member used in the present invention.

[0025] Fig. 2 is a transverse sectional view of the air guide member of Fig. 1.

[0026] Fig. 3 is a schematic general view of an inflatable patient support of the invention, incorporating air guide members as shown in Figs. 1 and 2.

[0027] Fig. 4 illustrates the effects of locating the air guide member of Fig. 1 at a particular point on the surface of the mattress of Fig. 3.

[0028] Fig. 5 is a general schematic view of another mattress embodying the invention.

[0029] Fig. 6 is a partial sectional view of the cover of the mattress of Fig. 5.

[0030] Fig. 7 is a general view of a cover of another mattress embodying the invention.

[0031] Fig. 8 is a partial cross-sectional view of the cover sheet of Fig. 7.

[0032] Fig. 9 is another partial cross-sectional view of the cover sheet of Fig. 7, showing the connection of an air inlet.

[0033] Fig. 10 is a view of a length of sheet used in the embodiment of the invention shown in Figs. 12-14.

[0034] Fig. 11 is a schematic cross-sectional view of the sheet of Fig. 10, with enlargement of the height direction.

[0035] Fig. 12 is a perspective view of another inflatable patient support embodying the invention using the sheet of Figs. 10 and 11.

[0036] Fig. 13 is an enlarged cross-sectional view on the line 13-13 of Fig. 12.

[0037] Fig. 14 is an enlarged view of the ringed portion of Fig. 13.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0038] Figs. 1 and 2 show a flexible air guide member 1 in the form of a ventilation air distribution strip, which is mounted in use on the top of a conventional pressure relief mattress having air-impermeable inflatable cells in an array, such as the Pegasus Airwave or the Pegasus Renaissance mattresses which are described above. These mattresses have a double layer array of transverse tubes, which in each case are divided into three groups, these groups being sequentially cycled through pre-determined pressure cycles. Their construction and control is described in for example GB-A-1595417 and GB-A-2312835.

[0039] The ventilation air distribution strip 1 of Figs. 1 and 2 has two layers 2 of air-impermeable sheet material, for example heat-sealable polyurethane sheet, which are sealed together along four seal lines 3 shown in Fig. 2, so as to provide a central tube 4 and two lateral flaps 5. The central tube 4 has a row of spaced apart small apertures 6 along one side, and is connected at its ends sealingly to pipes 7 by which the ventilation air is passed into the central tube 4.

[0040] To form an inflatable support according to the present invention, at least one but preferably many of these ventilation air strips 1 of Figs. 1 and 2 are held in position on top of the mattress, for example as shown in Fig. 3. Fig. 3 shows a mattress of the Pegasus Renaissance type, in which the air-impermeable tubes, which provide the support of the patient and periodic pressure relief due to their pressure cycling, are enclosed within a cover 8 which at its upper surface tends to conform to the shape of the top surface of the array of cells, as described in EP-A-827795. The air strips 1 are held in position on top of this cover by being connected to a rigid or semi-rigid air distribution manifold in the form of a tube 9 which extends along both sides of the mattress and along one end, and to which the inlet pipes 7 of the strips 1 are connected. A branch pipe 10 connects the manifold 9 to a compressor (not shown) which supplies air at a controlled constant pressure continuously into the manifold 9. This air passes into the strips 1 and out of the apertures 6 to effect continuous supply of ventilation air at the upper side of the inflatable support. The inflated tubes 4 of the strips 1 are small, and contain air at low pressure, so that they are easily flattened by the weight of the patient on the mattress, where the patient contacts them, so that the patient cannot detect their presence, and they provide no discomfort.

[0041] The air supplied may be temperature-controlled, preferably by heating it by suitable heating means to a pre-determined desired temperature above ambient air temperature. A temperature sensor may be provided in the air flow, with feedback control to obtain the desired temperature. Alternatively, the air temperature adjacent the patient may be sensed, and the temperature of the ventilation air controlled in dependence on this sensed temperature.

[0042] The air strips 1 may be maintained in position by the rigidity of the manifold 9, or alternatively may be fixed e.g. by heat-sealing to the cover 8. In either case, the construction is easy to manufacture, and is sufficiently cheap to allow it to be used in a "single use" mode, being disposed of for example after use by one patient. Since the cover 8 does not allow liquid to pass through it to its underside, this removes the need for carrying out complex and costly disinfection procedures on the more expensive array of inflatable tubes within the cover.

[0043] The number and location of the strips 1 can be selected as required, and adapted to the particular needs of a patient or treatment.

[0044] Fig. 3 shows the strips 1 at the locations of the peaks of the undulating top surface of the cover 8, which conforms to the undulating top surface of the array of tubes within the cover 8. The strips 1 are therefore located on the highest points of the inflatable tubes of the array, but of course during cycling of the array, each of these peaks will periodically disappear, particularly if the tube is subjected to suction, as described in GB-A-2132835, in which case the cover 8 tends to be pulled downwardly away from the patient. It is at this time that the flow of ventilation air is particularly beneficial, because it is directed into the space provided between the cover 8 and the patient's skin. On the other hand, the strips 1 on top of an inflated tube may be pressing against the patient, in which case air flow from at least some of their apertures 6 will not take place. Nevertheless, a good ventilation effect can be obtained overall.

[0045] Alternatively, the strips 1 may be located not at the peaks of the undulations of the top surface of the cover 8, but part way down the sides of these undulations, as schematically shown in Fig. 4. Fig. 4 shows a portion of the cover 8 having one strip 1 mounted between the positions of the peaks of two tubes A,B of the array of tubes inside the cover 8. Fig. 4 shows how at time A with cell A inflated and cell B deflated, a strip 1 emits air from its apertures 6 obliquely upwardly into a space created under the patient. Later in the inflation/deflation cycle of the array of tubes, the tube B will be inflated and the tube A deflated, in which case as shown at time B in Fig. 4, the same strip 1 emits air obliquely upwardly into a space created between the patient and the cell A. In this way, it may be possible to obtain almost continuous emission of air from each strip 1. Compared with the case of Fig. 3 where the strips 1 are at the peaks of the undulations, fewer strips 1 may therefore be required. However, there is also the possibility that the patient's skin may block the apertures 6 at both time A and time B shown in Fig. 4.

[0046] In the embodiment shown in Figs. 5 and 6, the flexible air guide member providing the ventilation air passages to the apertures is a continuous sheet 10, formed of material which is stretchable in two directions, overlying the cover 8. In Fig. 5, this sheet 10 is shown as covering part of the mattress only, but it may alternatively cover the whole of the mattress. Within the cover 8 is the array of cyclically inflatable tubes, as described above. The sheet 10 contains a row of air passages, formed by additional sheet strips 11 sealingly secured along their edges to the sheet 10 so as to provide tubular passages (see Fig. 6). At the location of these tubular passages the sheet 10 has rows of apertures 6 for the emission of ventilation air towards the patient. As a whole, the sheet 10 is liquid-impermeable and air-impermeable. The passages in the sheet 10 are connected at the edges of the sheet to an air manifold 12, which may be built into the sheet, which is in turn connected by a pipe 13 to the compressor for the ventilation air, which is supplied in the manner described above.

[0047] This sheet 10 can be provided on the mattress in the manner of the normal bed sheet, and can provide an efficient and uniform flow of ventilation air towards the patient. The lines of the apertures 6 in the sheet 10 can be located at the peaks of the undulations of the cover 8 caused by the array of inflatable tubes in the cover 8, or in the troughs between the peaks, with similar effects as described above with reference to Fig. 4.

[0048] Instead of providing a separate sheet 10 as an overlay on the cover 8, these two may be combined, i.e. the additional strips 11 may be provided on the material of the cover 8, and the apertures 6 formed in the cover 8 at the location of the strips. Even in that case, the cover 8 remains a relatively inexpensive item, suitable for "single use", to avoid hygiene and infection risks.

[0049] Figs. 7, 8 and 9 show a cover sheet 14, which can be used in the same manner as the sheet 10 of Fig. 5, as a flexible air guide member for supplying ventilation air to the patient. In this case, the air flow passage in the sheet 14 is provided integrally in the sheet in the form of a core 15 shown in Fig. 8 which is made of loose weave material, which allows a free passage of air in two perpendicular directions, with very little air resistance (unless the sheet is compressed). The core 15 is laminated over its two faces to sheets 16 of air-impermeable material, e.g. by means of adhesive. One of the face sheets 16 has rows of apertures 6 through which the ventilation air emerges. As Fig. 7 shows, the rows of apertures 6 may have different mutual spacings at different parts of the sheet 14.

[0050] Along one side of the sheet 14, or optionally along both sides, there is a manifold pipe 17 which is connected by branch pipes 18 to larger apertures in the upper face sheet 16, for flow of air into the core layer 15. To avoid risk of blocking, this aperture in the face sheet 16, to which the branch pipe 18 is attached may consist of a honeycomb of small voids.

[0051] Ventilation air is fed to the manifold 17 from a compressed air supply, optionally with temperature control, as described above. Since the core layer 15 is generally filled with air at slight pressure, the air can flow in all directions through this core 15. There is achieved a gentle outflow of air at all apertures 6 of the upper sheet 14 which are not directly blocked by the patients weight.

[0052] The pipes 7 of Fig. 1, and the manifold connections shown in Figs. 5 and 7, are preferably provided with self-sealing one way valves, so that they do not allow outflow of air if they are not connected, or become accidentally disconnected in use.

[0053] It is possible to combine the construction of the sheet 14 in Fig. 7 with the concept described in EP-A-

827705 so as to obtain a cover for the air inflatable mattress which provides ventilation air in a very effective manner, with flow of ventilation air into void spaces created adjacent the patient's skin, during the cycling of the tubes within the cover. The cover can be relatively inexpensive, and therefore suitable for single use. Figs. 10 to 14 illustrate this.

[0054] Figs. 10 and 11 show a composite sheet which is used in the embodiment of the inflatable support of the present invention shown in Figs. 12 to 14. The composite sheet 10 of Figs. 10 and 11 consists of three layers adhered together by suitable adhesive. There is an air permeable core layer 15, formed in this embodiment of knitted nylon, and on one side a continuous unapertured face sheet 16b of air-impermeable material. On the other side of the core layer 15 is a face sheet 16a, of the same material as the sheet 16b. In use this sheet 16a is uppermost. The sheet 16a has at its central region an array of laser-cut apertures of preferably 0.7 to 1.0mm diameter. As Fig. 10 shows these apertures 6 are in rows extending across the central region of the sheet 10. Between these apertures 6 and the two edges of the sheet are continuous, elongate gaps or slits 20 where the material of the sheet 16a has been removed e.g. by laser cutting. As described below, the gaps 20 are for inlet of air into the cover sheet 10, this air flowing laterally through the core 15 to emerge at the outlet apertures 6.

[0055] The face sheets 16a, 16b of the sheet 10 should preferably be made of waterproof material capable of withstanding repeated washes and wear and tear. A suitable example of such a material is a polyurethane-coated nylon material known as Dartex^{tm} (Penn Nyla, Nottingham, England). This material is stretchable, waterproof, hydrophilic and water permeable, and can withstand washing temperatures up to about 90°C. As Fig. 10 suggests, the composite cover sheet 10 may be produced as a continuous length which is cut to the desired length for assembly as described below.

[0056] Figs. 12 to 14 show an inflatable patient support mattress capable of cycling pressure relief of a patient on it, in which the sheet 10 of Figs. 10 and 11 forms an upper cover, with its apertures 6 at the location where the patient lies. Fig. 12 shows around the sides of the inflatable support an outer skirt 21 which is also formed of the Dartex material described above. Fig. 12 also shows schematically inlet pipe bundles 22, 23 entering at the underneath of the mattress.

[0057] As shown in Figs. 13 and 14, the interior of the mattress contains two layers of transverse air tubes 24, 25 which support the patient and are inflated and deflated in a predetermined cycle, as described in GB-A-1595417. One method of control in cycling of these tubes is described in GB-A-2312835. The tubes 24, 25 each extend the full width of the mattress, and are divided into groups for cyclical inflation and deflation. Fig. 13 also shows one of a pair of side formers which are inflated tubes 26 extending along the two sides of the mattress and provide stiffening of the side portions of the mattress.

[0058] The tubes 24, 25, 26 are enclosed within a water-impermeable, vapour-permeable, removable cover, the aim of which is to prevent soiling and contamination of the tubes by body fluids and other spillages. The cover is removable for replacement, for example before a new patient uses the mattress, and can be washed. The top part of the cover is formed by the composite cover sheet 10 of Figs. 10 and 11 which, at the side of the upper tubes 24, is joined to an upper side sheet 27 which extends all around the mattress. The upper side sheet 27 is joined to a bottom part 28 which has an open box shape and whose construction need not be described here. The side sheet 27 and the bottom 28 are connected by a zip fastener 29, and may both be made of the Dartex material described above. The outer skirt 21 hangs down and covers the zip fastener 29, to minimize risk that liquid reaches the zip fastener.

[0059] As Figs. 13 and 14 show, the edge portion of the cover sheet 10 along the sides of the mattress is looped back on itself to a connection point 30 to form a ventilation air distribution cavity 31. At the connection point 30, the two portions of the sheet 10 are stitched together, with the interposition of an air-impermeable barrier strip 32 which closes over the edge of sheet 10 to prevent the loss of air from the edge. The strip 32 may be a polyurethane film. The strip 32 is connected at its other edge by stitching at connection point 33 to the outer skirt 21 and the inner side sheet 27. Lengths of heat sealing tape 34 are applied to provide airtight and watertight sealing of the stitching at the connection points 30, 33.

[0060] The cover sheet 10 lying over the tubes 24, 25 has the undulating or ruched shape shown in Fig. 12, because it is connected to the skirt 21 and side sheet 27 while the latter are in a more stretched state in the longitudinal direction of the mattress than the sheet 10. On relaxation of the skirt 21 and side sheet 27 to their unstretched state, cover sheet 10 becomes undulating, i.e. has fullness. This technique is fully described in EP-A-827705.

[0061] It can be seen that the gap 20, at which the core layer 15 of the sheet 10 is exposed, is located at the distribution cavity 31. Figs. 13 and 14 show that an air supply tube pierces the sheet 10 at the cavity 31 and is glued in position with an airtight seal.

[0062] The air distribution cavity 31 formed by the looping back of the edge of the sheet 10 extends continuously around the mattress, i.e. extends at both sides and at the head and foot ends. Although not both shown in the drawings, two inlet tubes 35 are provided at opposite sides of the mattress, close to the foot end. These supply tubes are connected to an air supply pipe via a detachable connector at the exterior of the mattress. The air supply may be from a pump, possibly from the same pump as provides the inflation air for the tubes 24, 25, 26, alternatively from a separate supply source. The air supplied to the distribution cavity 31 is preferably heated. In use, it is preferably supplied continuously. The two supply tubes 35 may be in one pipe bundle 22, while air supply and return pipes for the tubes 24, 25, 26 are in the other pipe bundle 23.

[0063] Air entering the distribution cavity 31 passes through the gaps 20 into the core layer 15 of the sheet 10, and then emerges as ventilation air for the patient at the outlet apertures 6.

[0064] Because of its undulating or full shape, the cover sheet 10 tends to conform at any time to the shape of the top surface of the array of tubes 24. When the tubes 24 cycle between their inflated and deflated state, the sheet 10 tends to stay close to the tube surface, particularly if positive suction is applied to the tubes when they are deflated, as described in GB-A-2312835. In effect, due to "stiction" resulting from contact of the cover sheet 10 with the tubes, or due to air pressure effects, the cover sheet 10 tends to be pulled down with the upper surface of a tube 24, when the tube 24 deflates. Thus the cover sheet 10 is pulled away from the patient, allowing air to escape freely from the apertures 6 and ventilate the patient's skin. With the continuous cycling of the tubes 24, 25 through their predetermined sequences, all parts of the patient's skin lying on the mattress are given ventilation.

[0065] The continuous supply of air under pressure into the core layer of the cover sheet 10 tends to prevent ingress of any liquids thrqugh the apertures 6.

[0066] While the invention has been illustrated by these embodiments, it is not restricted to them. Modifications and variations are possible within the scope of the inventive concept herein described.

Claims

1. An inflatable patient support having

   an array of inflatable bodies (24,25) made of flexible material and divided into a plurality of groups,
   first air supply means including control means for causing cyclic inflation and deflation of said groups of said array of inflatable bodies in sequence, thereby providing periodic pressure variation to a patient on the support,

   characterised by:

   at least one flexible ventilation air guide member (1;10;14) provided on said array having at its upper side a plurality of outlet apertures (6) for release of ventilation air upwardly to a patient on the support, and
   second air supply means (7;9,10;12,13;17,18;31,35) for supplying air to said flexible ventilation air guide member for release therefrom through said apertures (6) as said ventilation air.

2. A patient support according to claim 1 wherein the first and second air supply means are fed by respective separate sources of pressurised air with respective control means.

3. A patient support according to claim 1 or 2 wherein the second air supply means includes temperature control means.

4. A patient support according to claim 3 wherein the temperature control means includes a sensor of the temperature of the air supplied to or emitted from the ventilation air guide member.

5. A patient support according to any one of claims 1 to 4 wherein the or each ventilation air guide member is a tube (1) mounted on one of the inflatable bodies of the array or between an adjoining pair of the bodies of the array.

6. A patient support according to any one of claims 1 to 4 wherein the ventilation air guide member is a flexible cover (10;14) overlying the array of inflatable bodies with the outlet apertures (6) on its side facing away from the array and having one or more air conduits (4;11;15) within it for supply of air to the outlet apertures.

7. A patient support according to claim 6 wherein the cover (14) has within its thickness an air-permeable core (15) layer laminated with air-impermeable layers (16) on both sides, one of said air-impermeable layers having the outlet apertures (6) through it for passage of air from the core layer to the exterior.

8. A patient support according to any one of claims 1 to 7 wherein said control means for cyclic inflation and deflation includes suction means for extraction of air from the inflatable bodies for their deflation.

9. A method of operating a patient support according to any one of claims 1 to 8, comprising sequentially inflating and deflating said groups of said inflatable bodies while continuously supplying said ventilation air to said ventilation air guide member for its release through said outlet apertures.

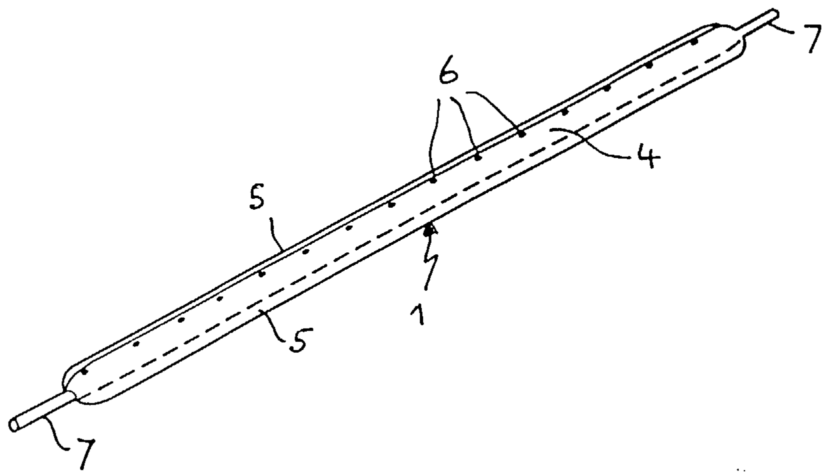

FIG. 1

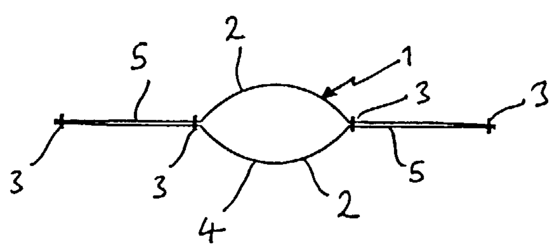

FIG. 2

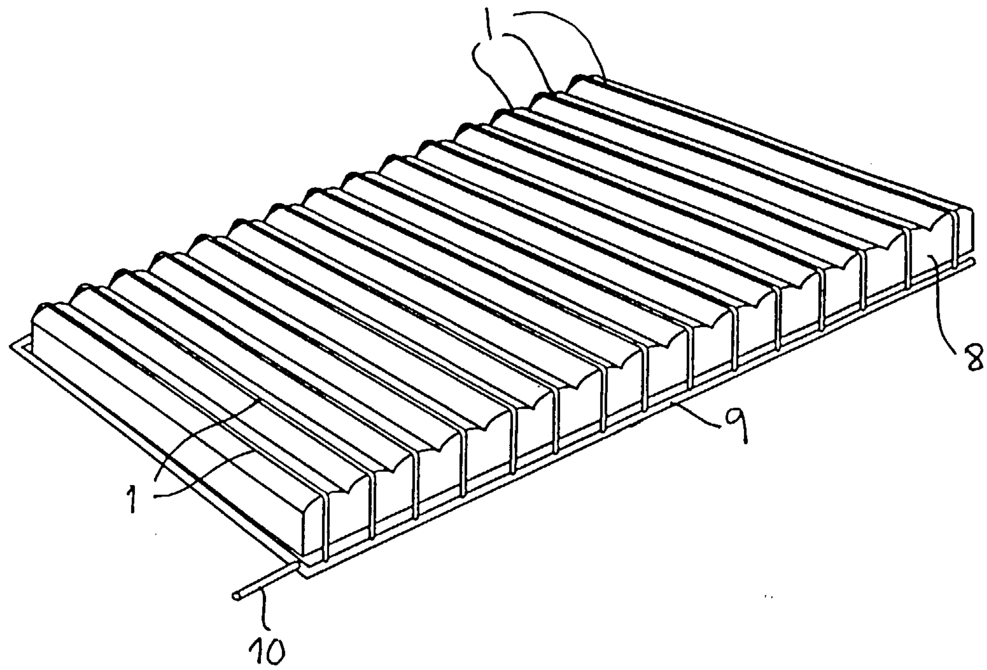

FIG. 3

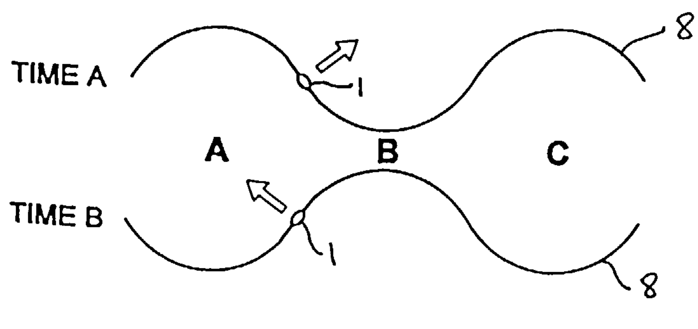

FIG. 4

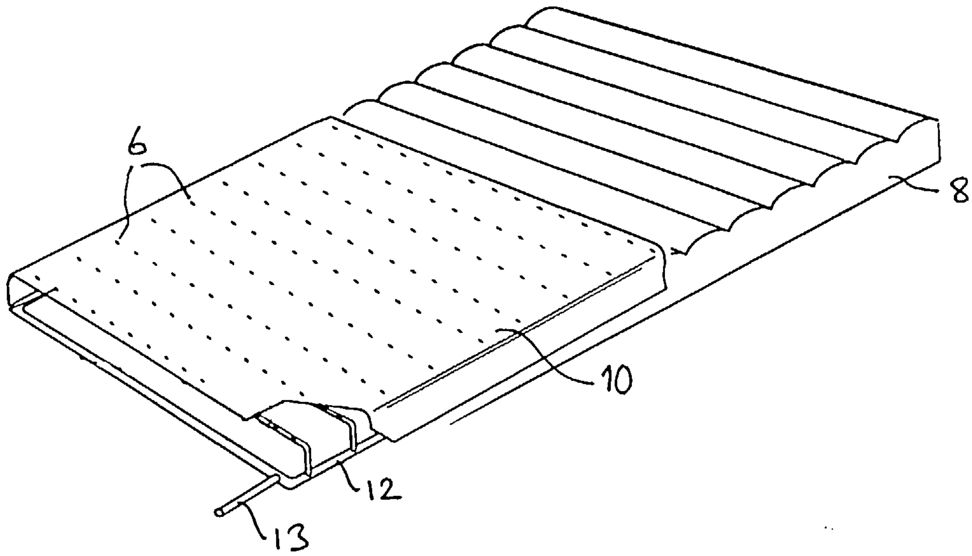

FIG. 5

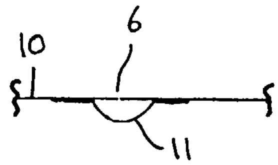

FIG. 6

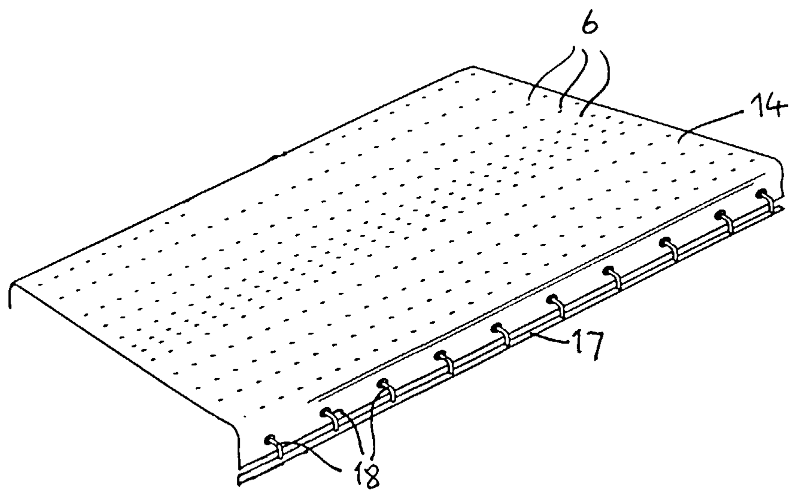

FIG. 7

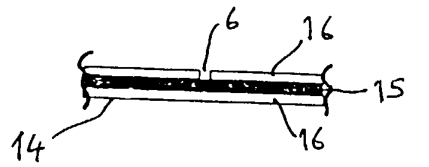

FIG. 8

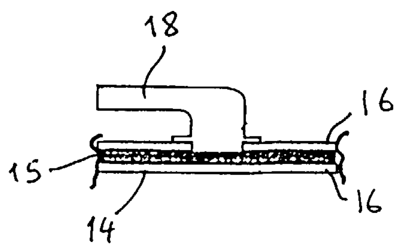

FIG. 9

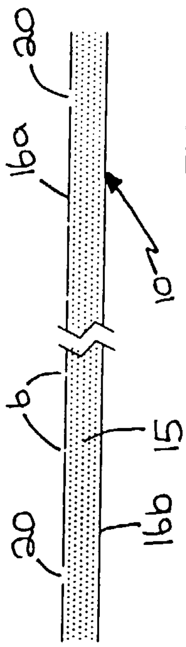

FIG. 11

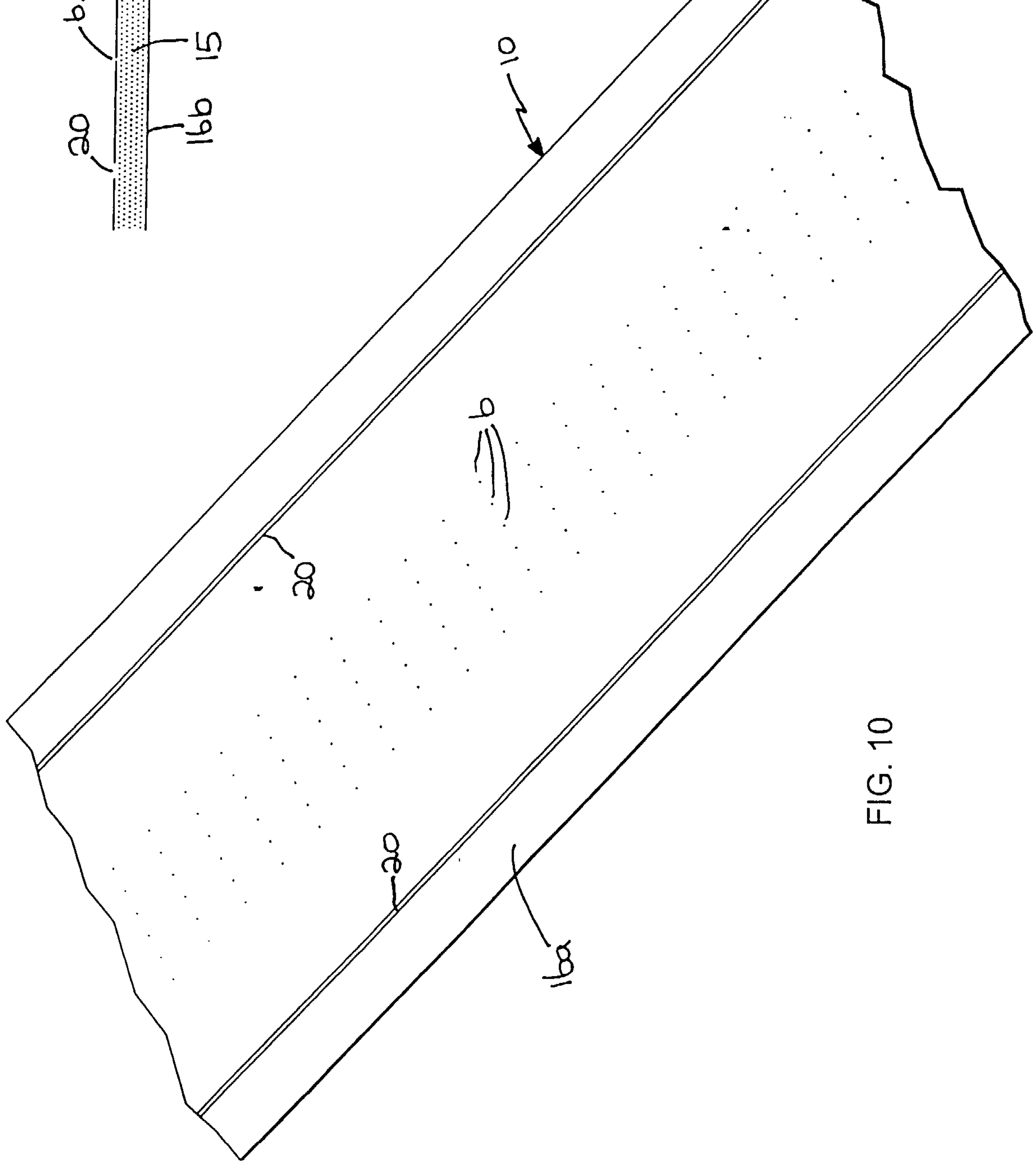

FIG. 10

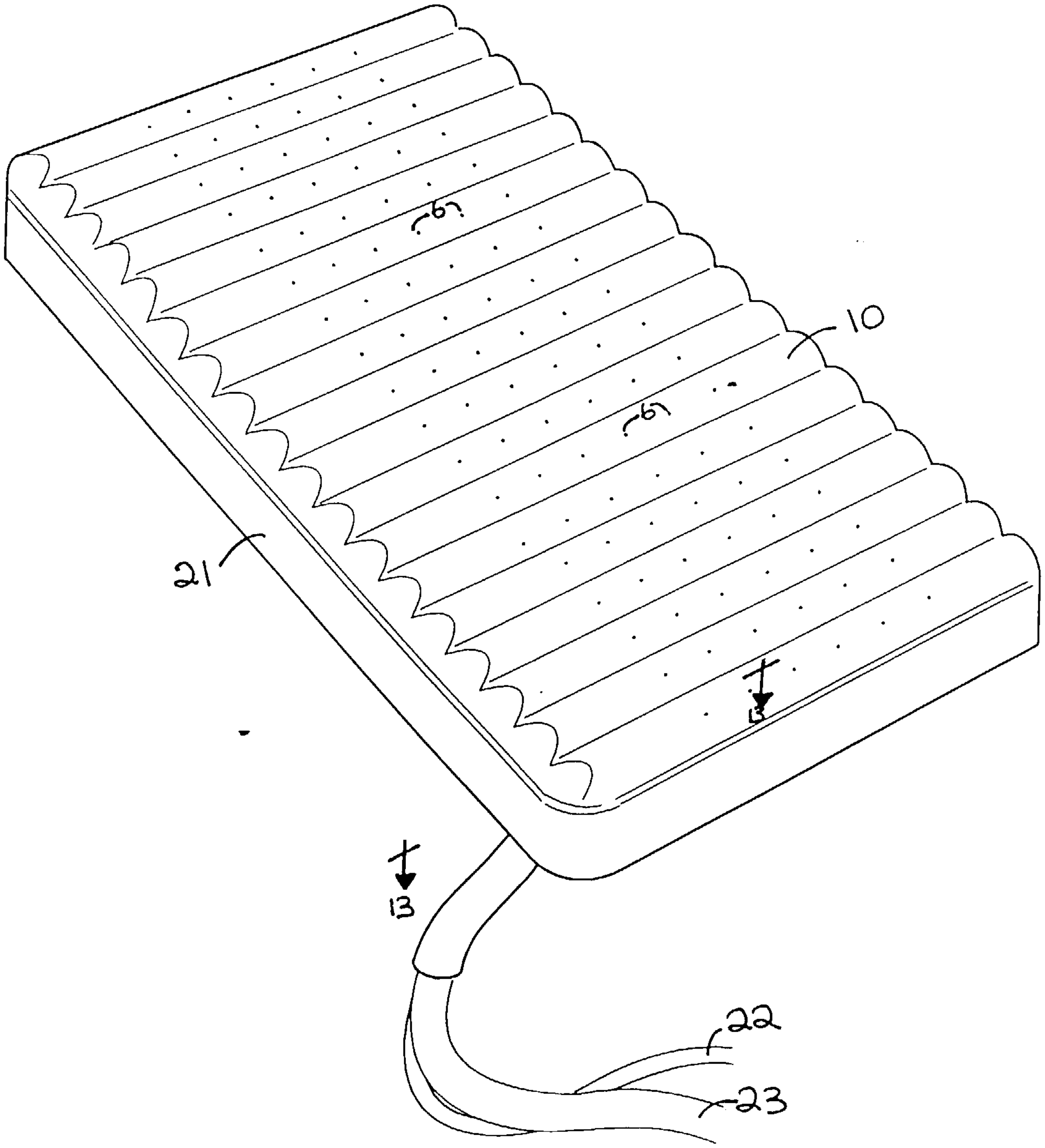

FIG. 12

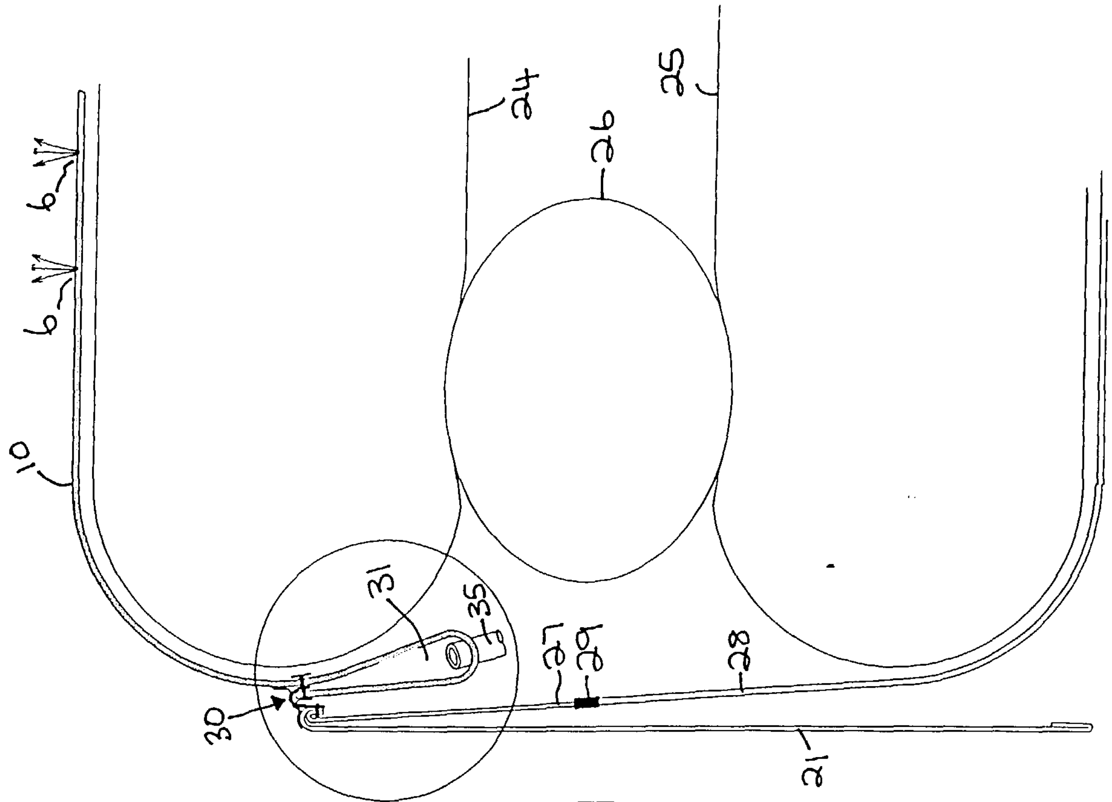
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FIG. 13

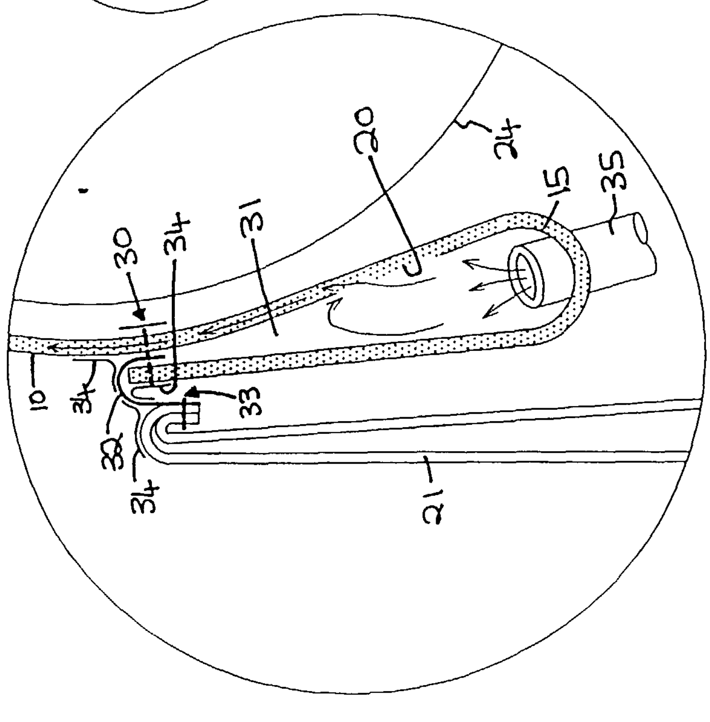
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FIG. 14