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(54) Alternating pressure pad for wheel chairs and mattresses

(57) An inflatable pressure pad is provided which is particularly intended for use as a seat cushion for relieving interface pressure and preventing development of pressure sores. The pad comprises first and second outer cells (3,4) and an intermediate cell (2) therebetween; said intermediate cell comprising a longitudinal portion (22) and a plurality of transversely extending portions (24) connected pneumatically to said longitudinal portion, said outer cells each comprising a longitudinal tube (33,44) connected pneumatically to a plurality of transversely extending fingers (36,46), wherein at least some of said fingers are capable of extending between adjacent transversely extending portions of the intermediate cell.

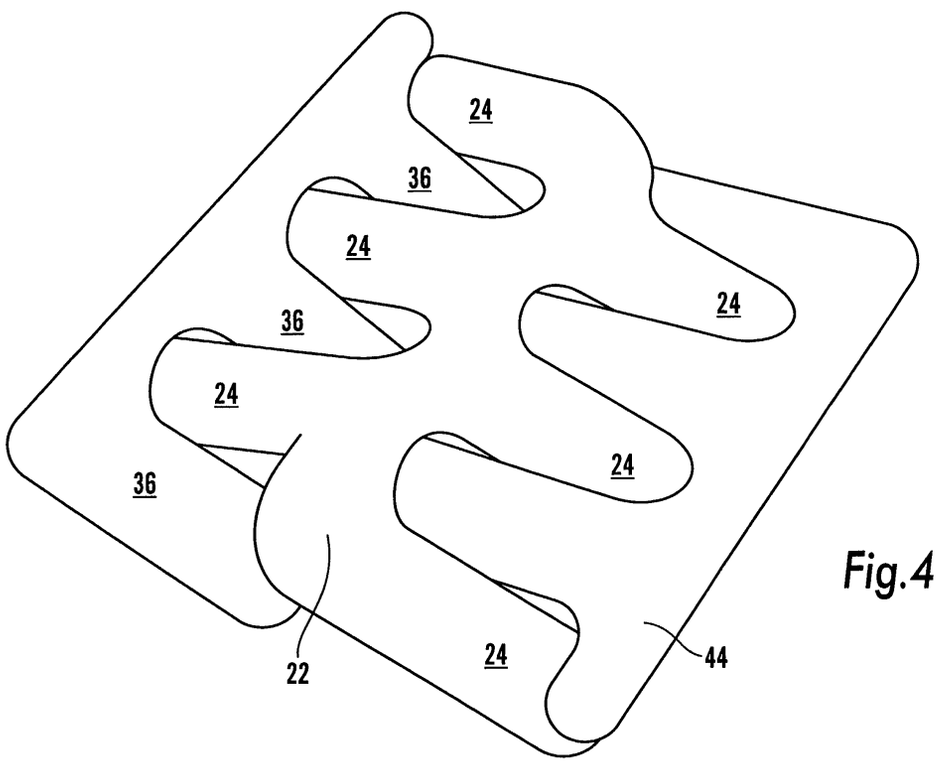

Fig.4

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Description

[0001] This invention relates to an alternating pressure pad for use by sedentary patients, e.g. bed-ridden patients. Such pads may take various forms including chairs, wheel chairs, mattresses and beds. For simplicity the invention will be described with reference to use in a standard chair or wheel chair.

[0002] Alternating pressure mattresses or pads are commonly used as an aid in prevention and treatment of pressure sores. These pads may, for example, have two separate air cells (or sets of cells) that alternately inflate and deflate. The variation in interface pressure between the patients skin and the mattress encourages blood circulation which tends to reduce the incidence of pressure sores.

[0003] Three products currently being used have different cell arrangements and although reasonably effective, patient comfort and security would benefit from improvement. In one design, longitudinal cylindrical cells are normally used in 2 sets of 2 cells. If the pad is used as a chair cushion, the patient is supported on cells 1 and 3 during the first half cycle end on cells 2 and 4 in the second half. When the cells 2 and 4 inflate the patient tends to tip to one side. When cells 1 and 3 inflate the patient is tipped to the other side. A second design has transverse cylindrical cells which are normally used as a nine alternate cell arrangement (1 set of 4 cells and 1 set of 5 cells). In a chair cushion it is essential that the patient is properly supported at the front edge of the pad to prevent the patient sliding forward. The transverse cell arrangement periodically deflates the front cell and allows the patient to gradually slide forward.

[0004] In a further design, an H section cell arrangement incorporates a surrounding cell. When the two cells are alternately inflated, the patient experiences very noticeable changes during the cycle. Additionally the patient is not secure when the H section is inflated because the full width of the pad is not inflated.

[0005] It is one object of this invention to provide an alternating pressure pad with an improved cell arrangement that addresses the problems mentioned above.

[0006] According to one aspect of the present invention, there is provided an alternating pressure pad system which comprises first and second outer cells and an intermediate cell therebetween; said intermediate cell comprising a longitudinal tube and a plurality of transversely extending portions connected pneumatically to said longitudinal tube and a plurality of slots between said portions, and said outer cells each comprising a longitudinal tube connected pneumatically to a plurality of transversely extending fingers.

[0007] Preferably, the outer cells are flexibly connected to the intermediate cell so that on folding the outer cells inwardly, fingers of the outer cells can be inserted into slots of the intermediate cell, whereby fingers of the outer cells are interspersed with transversely extending portions of the intermediate cell.

[0008] In one aspect of the invention, the intermediate and outer cells are associated with an air pump and control apparatus for inflating and deflating the intermediate cell while alternating one or both outer cells.

[0009] Preferably the pump and control apparatus includes an indexing rotary valve.

[0010] In order that the invention may be well understood, it will now be described with reference to the accompanying drawings, in which:

Figure 1 is a plan view of the pad unfolded;

Figure 2 is a perspective view of the pad showing the intermediate cell inflated and the outer cells omitted;

Figure 3 is a perspective view of the pad showing outer cells inflated and the intermediate cell omitted;

Figure 4 is a perspective view of the pad folded, wherein the intermediate and outer cells are both inflated and

Figure 5 is a perspective view of the indexing rotary value.

Figure 5(a) is a plan view of a foam sheet for use with the pad.

[0011] Referring to Figure 1, the alternating pressure pad comprises an intermediate cell 2 and outer cells 3 and 4 made from an impermeable material, preferably comprising polyurethane. The cells 2, 3 and 4 each incorporate inflation tubes 6, 7 and 8. Tubes 6, 7 and 8 are associated with a pump and control apparatus so that cells 2, 3 and 4 may be inflated or deflated as described hereinafter. A suitable rotary control valve is shown in Figure 5. Any air pump of appropriate capacity may be employed, e.g. a diaphragm pump or an axial or centrifugal blower to provide a source of pressurised air.

[0012] Intermediate cell 2 comprises a longitudinal portion 22 and a plurality of transversely extending portions 24 connected pneumatically thereto by welding the edges of two suitably shaped sheets of flexible material. Between said portions 24 are associated gaps or slots 26.

[0013] Outer cells 3 and 4 are connected to intermediate cell by a web 10. The web 10 is made of a flexible plastic material such that cells 3 and 4 can fold over transversely extending portions 24 of the intermediate cell as shown in Figure 4.

[0014] Cells 3 and 4 both comprise longitudinal portions 33 and 44, connected pneumatically to a plurality of transversely extending fingers 36 and 46 respectively. Fingers 36 and 46 each have a closed end.

[0015] Figure 4 shows cells 2, 3 and 4 interlocking to

form the pad ready for use. This is performed by folding the outward cells inwardly from web 10 and inserting the ends of fingers 36 and 46 into slots 26 of the intermediate cell. In the case of the outermost fingers 36,46, they may extend beneath corresponding outermost portions 24 of the intermediate cell. These ends of fingers 36 and 46 are held in place by abutting the back portion of longitudinal portion 22 of the intermediate cell. The cells are now interspersed in a staggered arrangement as depicted in Figure 4.

[0016] As may be seen from Figure 4, longitudinal tubes 33 and 44 represent first and second sides of the pad with longitudinal tube 22 of the intermediate cell therebetween.

[0017] Inflation tubes 6, 7 and 8 are connected to a pump and control apparatus. Preferably, the pump and control apparatus includes an indexing rotary valve as shown in Figure 5 and described in our co-pending GB Application No. 9927891.3 and PCT/GB99/03937. Referring to Figure 5 the valve member includes an aperture 12 for admission of pressurised air from a pump. The pump is not shown in the drawing, but would be connected to an air inlet 14 in one side of the body member. The planar surface 11 incorporates two diametrically opposed apertures 15 and 16, which are connected to outlet ports 18 and 19. Outlet port 18 is connected to inflation tubes 6 and 8 and outlet port 9 connected to inflation tube 7. By means of an actuator plate on the valve face, air is supplied to one or other or both sets of cells. There are various index point positions which represents a particular status with regard to cells 2, 3 and 4. These positions are shown below.

Index Point	Cell 2	Cells 3 and 4
1	Fill	Fill
2	Fill	Hold inflated
3	Fill	Exhaust
4	Fill	Hold deflated
5	Fill	Fill
6	Hold inflated	Fill
7	Exhaust	Fill
8	Hold deflated	Fill

[0018] The pad is used, e.g. as a wheelchair cushion with the portions 24,36 extending across the user's buttocks. It may now be seen that the cells inflate in a staggered arrangement. When cell 2 is inflated and cells 3 and 4 deflated, the user is supported by the transversely extending portions 24 and longitudinal cell 22 of the intermediate cell 2. When cells 3 and 4 are inflated and cell 2 deflated, the user is supported on the transversely extending fingers 36, 46 and longitudinal tubes 33, 44 of the outer cells 3 and 4. This ensures that the full width of the front and rear end of the pad are never totally deflated. This helps to prevent the user sliding forwards and backwards. Due to the fact that the shapes of the supporting area of the cell 2 are similar to cells 3 and 4, the user is more secure as there is no tendency to tip to one side.

[0019] As shown in Figure 1, each of the outer cells 3 and 4 carry long flexible straps 50 extending outwardly and also short flexible straps 51 extending inwardly. When the outer cells are folded inwardly into the position shown in Figure 4, the long straps 50 are passed through slots 53 in a sheet of closed cellular foam flexible or firm foamed plastics or rubber material (Figure 5a depicts a sheet of foam material in plain view). The long straps are then fastened to the short straps beneath the plastics foam. This provides a simple means of maintaining the pad in its folded position.

[0020] The pad is preferably made from a weldable sheet material such as polyurethane or a polyurethane-coated fabric, e.g. of woven nylon or polyester. It may be desirable to manufacture the pad from a breathable fabric, e.g. fabrics sold under the trade mark "Gortex".

[0021] The pad may be enclosed within a cover. The cover may be formed of a wear-resistant, moisture-impervious material, typically an easily cleaned plastics or composite material. The cover may be anchored to a chair or wheel chair by means of straps, Velcro, clips or the like.

[0022] The pad may be used in a variety of forms such as mattresses and beds, as well as chairs and wheelchairs.

Claims

1. An inflatable pressure pad comprising first and second outer cells and an intermediate cell therebetween; said intermediate cell comprising a longitudinal portion and a plurality of transversely extending portions connected pneumatically to said longitudinal portion, said outer cells each comprising a longitudinal tube connected pneumatically to a plurality of transversely extending fingers, wherein at least some of said fingers are capable of extending between adjacent transversely extending portions of the intermediate cell.

2. A pad as claimed in claim 1, wherein at least one of the fingers of the outer cells is aligned with a gap between adjacent transversely extending portions of the intermediate cell.

3. A pad as claimed in claim 2, wherein said outer cells are foldably connected to said intermediate cell so that on folding the outer cells inwardly, fingers of the outer cells can be inserted into corresponding gaps of the intermediate cell, whereby fingers of the outer cells are interspersed with transversely extending portions of the intermediate cell.

4. A pad as claimed in any one of the preceding claims, wherein said intermediate and outer cells are associated with an air pump and control apparatus for inflating and deflating the intermediate cell while alternately inflating and deflating said outer cells.

5. A pad as claimed in claim 4, wherein said pump and control apparatus includes an indexing rotary valve.

6. A pad as claimed in any one of the preceding claims, wherein said cells comprise a moisture vapour permeable material.

7. A pad substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

8. A chair or wheelchair which is fitted with a pad as claimed in any one of the preceding claims as a seat cushion.

9. A bed which is fitted with a pad as claimed in any one of claims 1 to 7 as a mattress.

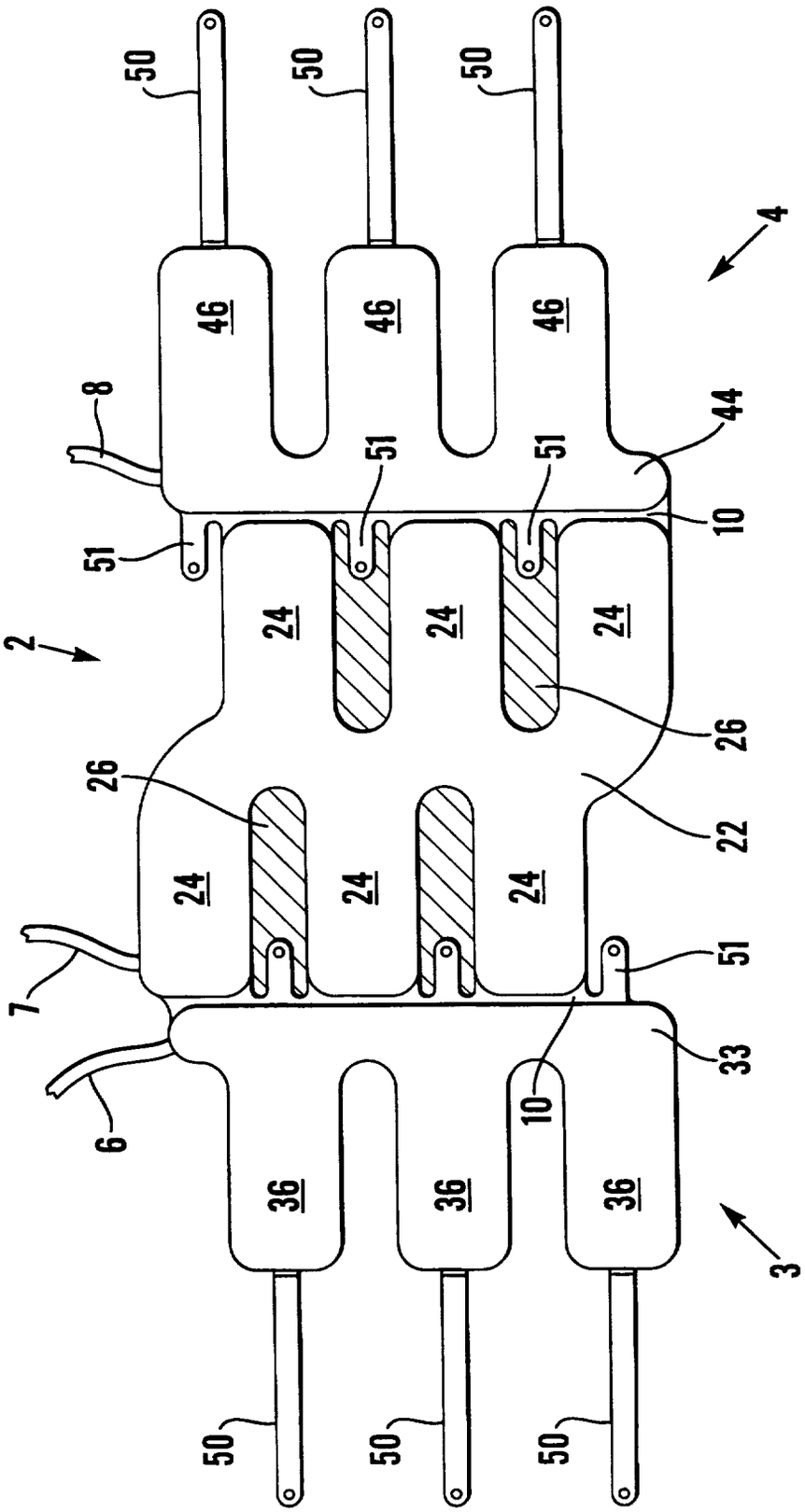
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Fig. 1

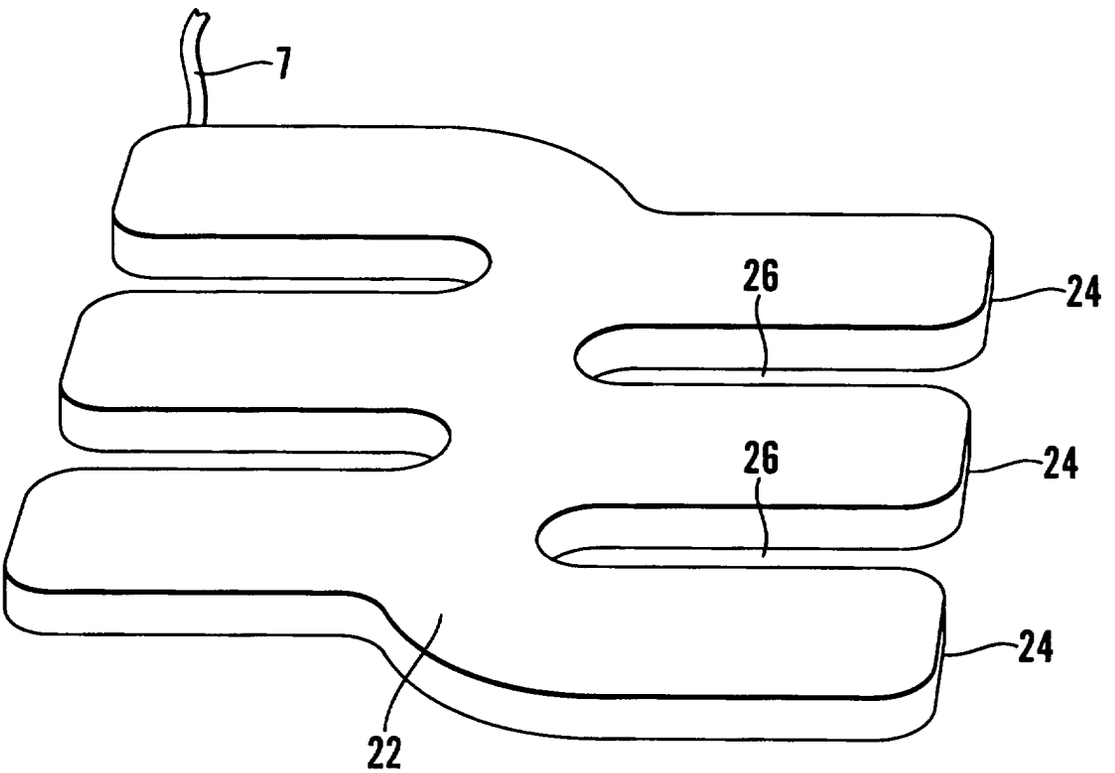

Fig.2

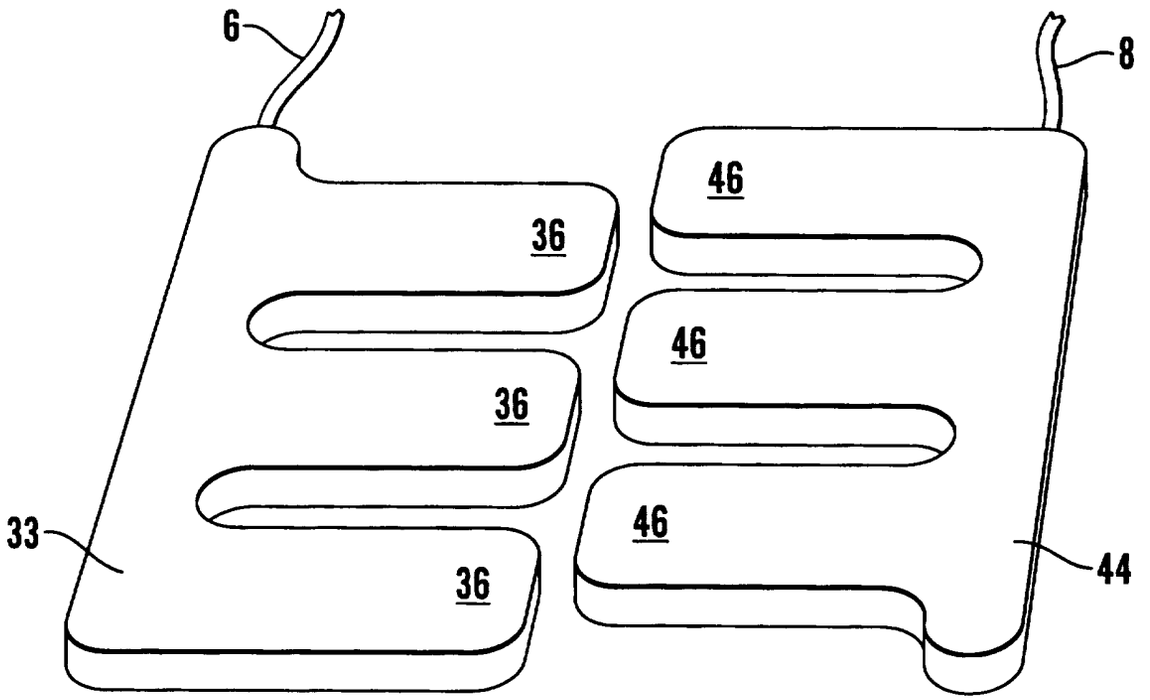

Fig.3

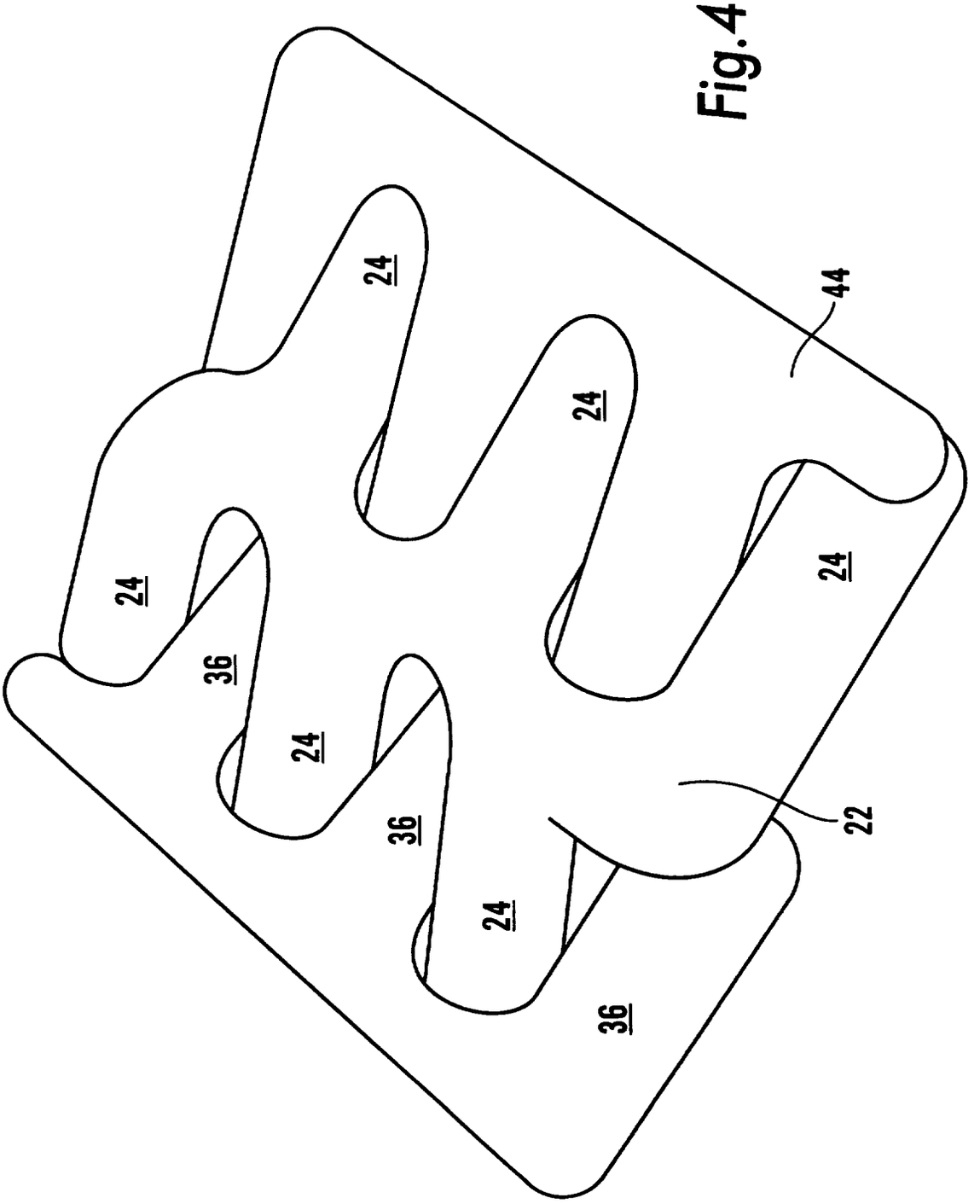

Fig.4

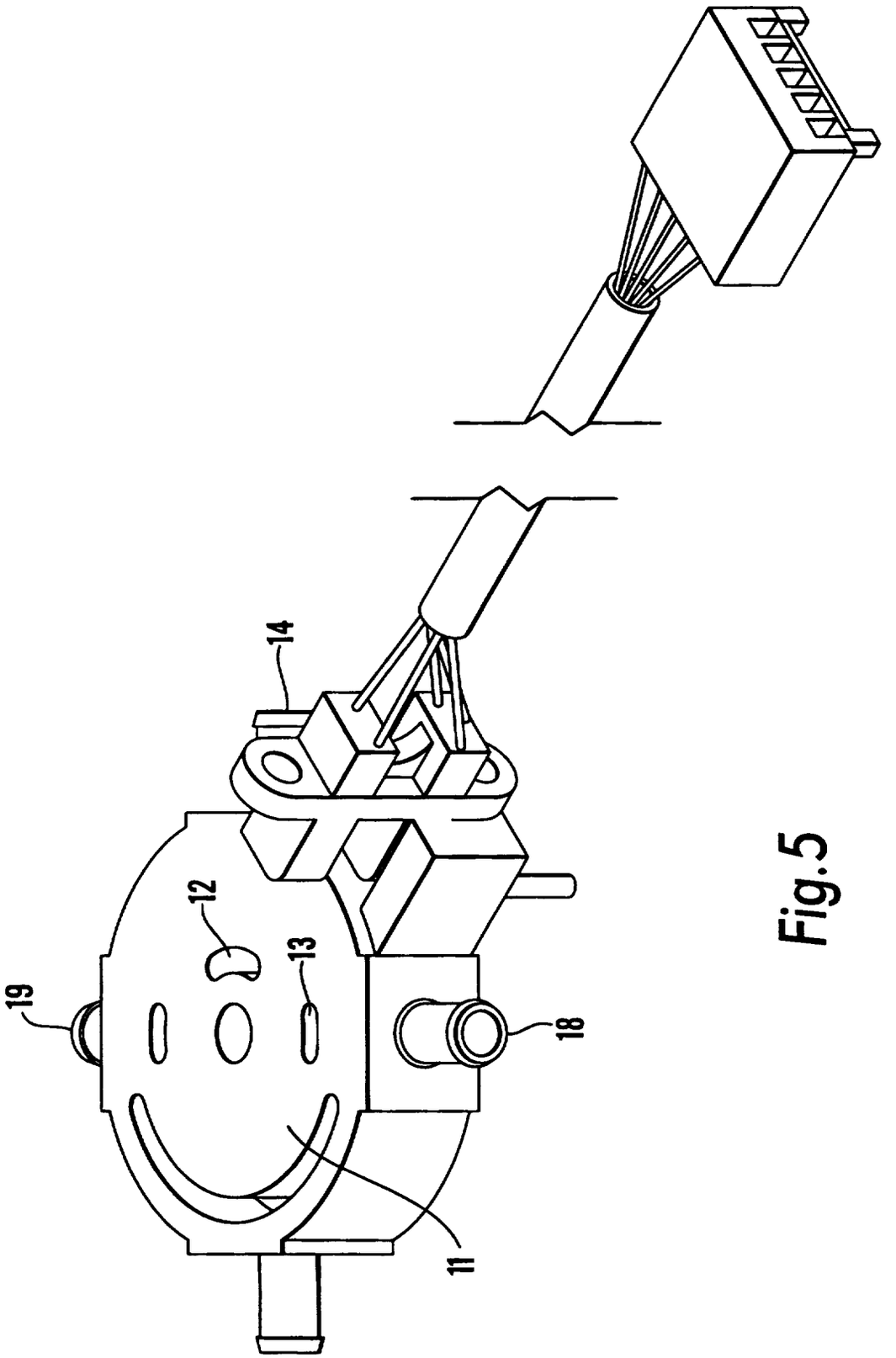

Fig.5

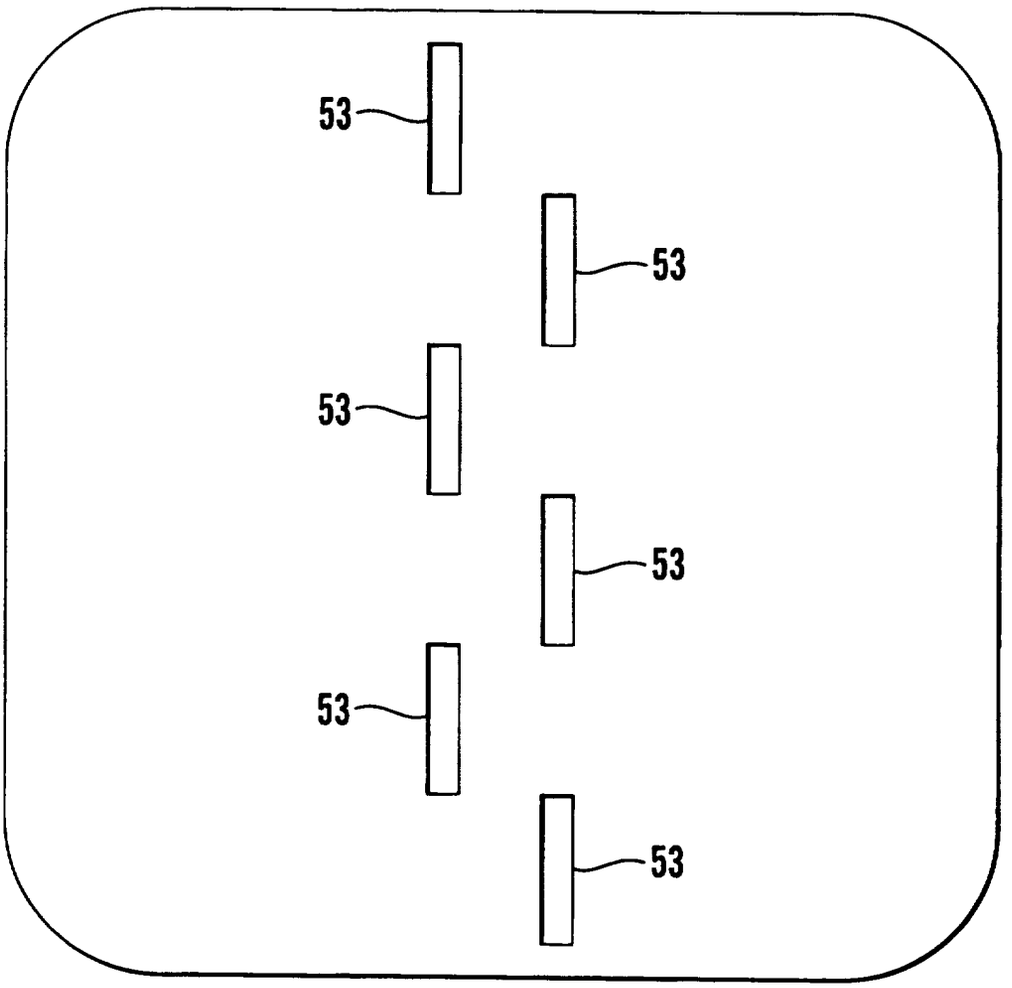

Fig.5A