

(12) UK Patent Application (19) GB (11) 2 321 136 (13) A

(43) Date of A Publication 15.07.1998

(21) Application No 9725780.2

(22) Date of Filing 04.12.1997

(30) Priority Data

(31) 9625181 (32) 04.12.1996 (33) GB

(71) Applicant(s)

Hodgkinson & Corby Limited
(Incorporated in the United Kingdom)
Unit 1, Fairview Estate, Reading Road, HENLEY ON
THAMES, Oxfordshire, RG9 1HE, United Kingdom

(72) Inventor(s)

Dieter Smith

(74) Agent and/or Address for Service

J. A. Kemp & Co.
14 South Square, Gray's Inn, LONDON, WC1R 5LX,
United Kingdom

(51) INT CL⁶
H01H 3/14, G08B 21/00

(52) UK CL (Edition P)
H1N NUJD N448 N608 N616 N618 N707 N744
U1S S1213 S2189

(56) Documents Cited

GB 2128031 A GB 2083858 A GB 1454805 A
GB 1383337 A GB 0392936 A US 5120980 A
US 4172216 A

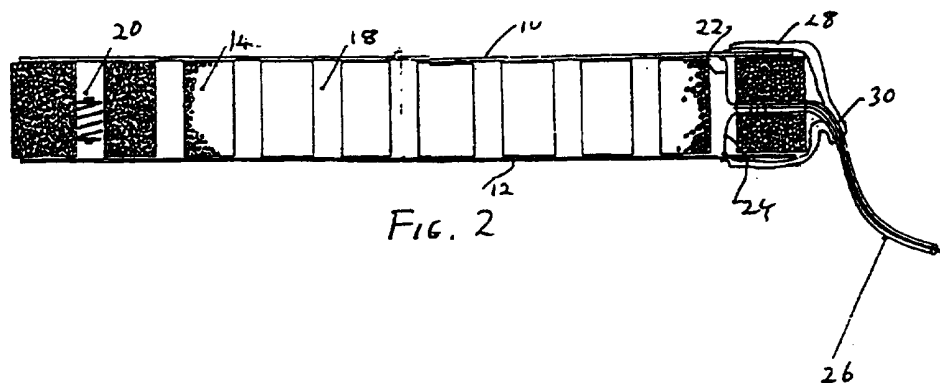
(58) Field of Search

UK CL (Edition P) H1N
INT CL⁶ G08B, H01H

(54) Abstract Title

Inflatable cellular support cushion or mattress detector

(57) A detector for an inflatable cellular cushion or mattress comprises upper and lower rigid elongate frame members 10,12 with interposed compressible plastics foam material 14. A switch for operating an alarm includes electrical conductors, eg compression springs 20, located in openings 18 in the foam material 14. The conductors 20 contact conductive zones formed on the lower and upper surfaces respectively of the frame members 10,12 when the frame members are pressed towards each other, thereby setting off an alarm when the correct degree of compression of the cushion or mattress has been achieved. The frame members 10,12 and the foam material 14 are completely surrounded by a flexible insulation 28. The height of the detector is between 22 and 30 mm and the width is between 10 and 20 mm to enable the detector to be positioned between two adjacent rows of inverted inflatable pockets of the cushion or mattress.



GB 2 321 136 A

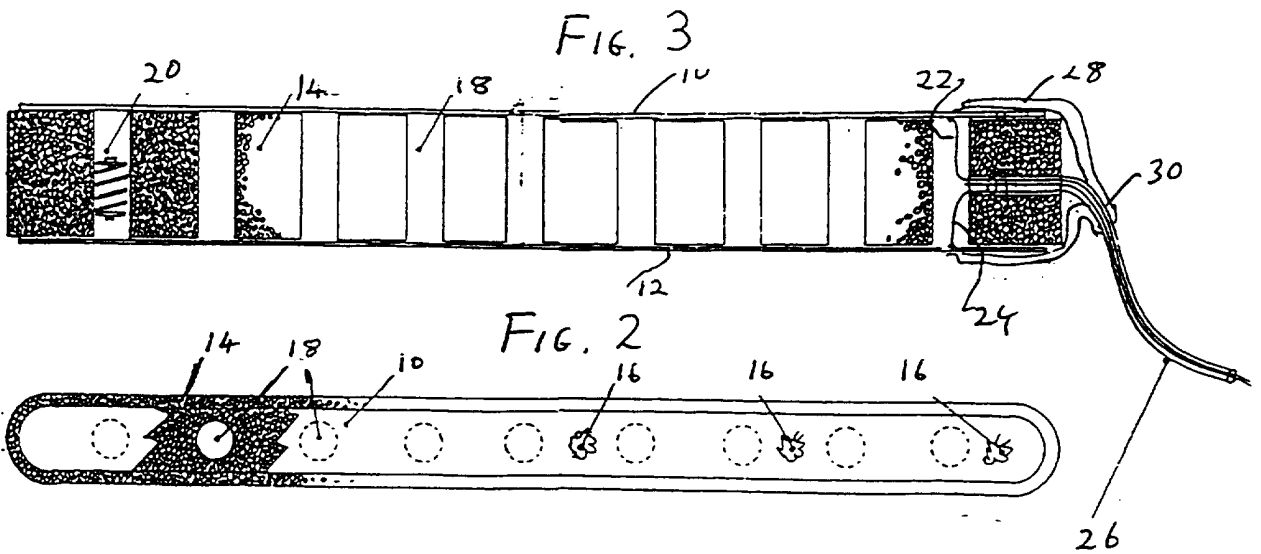
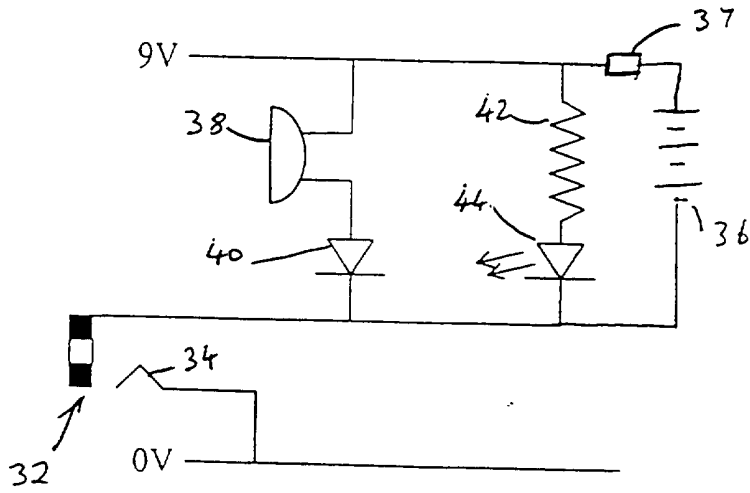
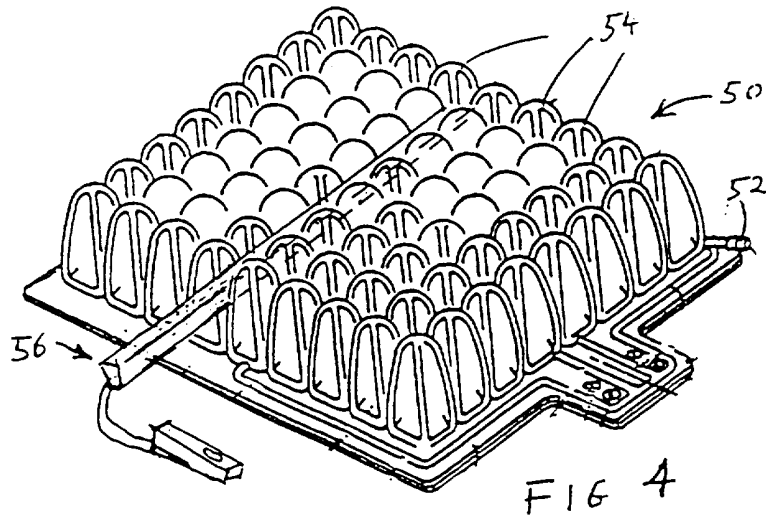


FIG. 1

INFLATABLE CELLULAR SUPPORT CUSHION OR MATTRESS DETECTOR

The present invention relates to a detector for use in an inflatable cellular support cushion or mattress.

5 Such cushions or mattresses are commonly used to support patients who are, for example, confined to wheelchairs, or who are required to sit or lie for an extended period, thereby preventing the patient from getting bedsores or other soreness.

10 A typical example of such a cushion is that shown in US Patent No. 5,163,196. In such a device of this general type, a large number of upstanding inverted pockets are provided and these are inflated, usually by a hand pump, to a particular pressure and the cushion or mattress is then ready
15 for use. However, it is of the utmost importance that the correct inflation should be achieved to suit the requirements of the particular patient whose weight and other physical characteristics will be different from those of another patient. Currently the only way is to guess at a correct value
20 for a particular patient and perhaps use the preset pressure for that particular patient. This is far from satisfactory.

It is now proposed, according to the present invention, to provide a detector for use in an inflatable cellular support cushion or mattress, having a plurality of
25 upstanding, inflatable, inverted pockets, arranged in parallel rows, said detector comprising upper and lower substantially parallel rigid elongate frame members, compressible plastic foam material positioned between said frame members, allowing said frame members to move resiliently towards and away from
30 one another, a plurality of openings formed in said foam material at longitudinally spaced locations along the length thereof, said openings each extending from the upper to the lower surface of said foam material, upper and lower electrical contact zones on the lower and upper surfaces of said upper and
35 lower rigid frame members respectively, said electrical contact zones being positioned at least at the location of said

openings, electrical conductors located in each of said openings, said electrical conductors having a vertical extent less than that of the thickness of said foam material, electrical alarm means being connected to the upper and lower
5 contact zones, whereby, when said rigid members are pressed together to be spaced apart by predetermined distance substantially equal to the vertical extent of said electrical conductors, contact is made and said alarm means is actuated, said frame members and said plastics foam material being
10 completely surrounded by a flexible insulation, the height of said detector being between 22 and 30 mm, and the width being between 10 and 20 mm, thereby enabling said detector to be positioned between two adjacent rows of said inverted inflatable pockets of the cushion or mattress.

15 The detector is placed between the pockets or cells of the cushion or mattress and the cushion or mattress is then inflated to a value which is clearly higher than that which is necessary for that particular patient. The cushion or mattress is then placed on the chair or bed and the detector according
20 to the invention is positioned between the cells or pockets.

The patient then sits or lies on the cushion or mattress and air is then let out slowly until the alarm is actuated. The passage into the interior of the cushion or mattress is immediately closed and the detector device removed.

25 By use of such a device, it is possible to obtain a pressure within the inflatable cushion or mattress which is exactly right for that patient to ensure that the cells or pockets do not collapse completely and to ensure that they are not inflated, on the other hand, to too high a value which can
30 subsequently produce discomfort.

35 GB-A-1454805, 2157496, 2045527, US-A-5473313 and 4242672 and EP-A-0191906 all show various forms of pressure switches and/or mats. However, none of the constructions illustrated in these documents would be satisfactory for the purpose for which the present invention is intended.

Considerable experimentation has had to be carried out to determine dimensions of the detector according to the invention, which will enable it to operate satisfactorily and reliably for the particular purpose for which it is intended.

5 These experiments have shown that the detector needs to be between 22 and 30 mm high, between 10 and 20 mm wide, and preferably between 300 and 350 mm long. One of the best constructions has been found to be 25 mm high, 15 mm wide, and 330 mm long.

10 Advantageously the frame members may be formed from rigid resin sheet material and the resin sheet material may be provided with a metallic coating on one of its faces to provide the contact zones.

The conductors are preferably in the form of metallic
15 compression springs.

In order to ensure complete safety, the frame members and the support means are preferably completely surrounded by a flexible insulation such as a sheet rubber housing.

20 The alarm means may include a light and/or a buzzer and a venting tube may be provided to allow air to be expelled from the interior of the detector. This venting tube may also serve to carry the electrical wiring connections from the detector to the alarm system.

In order that the present invention may more readily
25 be understood, the following description is given, merely by way of example, reference being made to the accompanying drawings in which:-

Figure 1 is a plan view of one embodiment of detector according to the invention, partly in section;

30 Figure 2 is a longitudinal section of the detector of Figure 1;

Figure 3 is a circuit diagram for use with the detector; and

35 Figure 4 is a schematic view illustrating one form of inflatable cushion or mattress with the detector of the

invention positioned therein.

Referring first to Figures 1 and 2, the detector indicated therein is an elongate assembly, perhaps of the order of one third of a meter in length, and includes upper and lower substantially rigid frame members 10,12. These may be formed of a resin material of the type used to produce printed circuit boards. The lower surface of frame member 10 and the upper surface of frame member 12 are provided with metallic conducting faces, e.g. by tinning these faces.

The frame members 10,12 are adhered to a foam support 14, the reference numerals 16 indicating a number of different points for the application of adhesive. An alternative way of securing the frame to the foam is to spray the top and bottom surfaces of the foam with contact adhesive, and apply a conventional release sheet. The release sheet is immediately removed prior to assembly.

The foam material support 14 is provided with several openings 18 along its length. These openings are at equally spaced locations along the length and define on the metallic coating spaced contact zones on the frame members 10,12.

Positioned within some or all of the openings 18 are electrical conductors, here shown in the form of coil compression springs 20.

The metallic inner surfaces of the frame members 10,12 are connected to a pair of wires 22,24 which pass out of the detector through a vent tube 26.

The whole assembly is encased in a flexible insulating housing a portion only of which is shown at 28, this being provided with a tube 30 which is sealed to the exterior of the vent tube 26.

The wires 22,24 are electrically connected to a separate unit including the electric circuitry shown in Figure 3. The electric wires 22,24 may be connected into a conventional jack (not shown) which may be inserted into a socket 32. One terminal of the jack will contact the socket

32 and the other terminal the connector 34.

The circuit shown in Figure 3 includes a battery 36, which may produce a potential of 9 volts, for example. Adjacent the battery is a quick blow fuse 37. Connected across this 9 volt potential is a buzzer 38 with a diode 40, and in parallel therewith a resistor 42, and an LED 44.

It will be appreciated that when pressure is placed on the upper frame member 10, the support 14 will be compressed steadily, and when the predetermined load has been placed on the frame member 10 the conductor 20 will connect to the metallic surface on both the upper frame member 10 and the lower frame member 12, thereby acting as a switch which will actuate the alarm in the form of the buzzer 38 and the LED 44. This will tell either the patient or the carer that the pressure within the inflated cushion or mattress is correct.

Figure 4 illustrates a cushion 50 which is provided with an inflation tube 52, and itself comprises a plurality of upwardly extending pockets 54. The detector of the present invention, illustrated by the reference numeral 56 is inserted between lines of the pockets or cells 54. If desired more than one detector may be positioned in a cushion to give an accurate reading across the whole of a cushion.

When a patient sits on the cushion, the cushion will compress to an extent permitted by the degree of inflation. The patient or the carer releases air from the cushion until such time as the buzzer sounds and the LED lights up indicating that the correct pressure has been achieved.

As mentioned previously, the dimensions of the detector are important. The width has to be such as to enable the detector to be positioned between the two rows of pockets 54 without any significant contact therewith. However, the detector must be sufficiently wide to prevent it from falling over to one side or to the other. Thus, the upper frame member 10 must remain at the top and the lower frame member 12 at the bottom. A width of between 10 and 20 mm has been found

satisfactory and a preferred width is 15 mm.

5 Similarly the height needs to be between 22 and 30 mm and is preferably 25 mm to ensure that adequate compression of the cushion and of the detector is permitted for the patients comfort, before the detector indicates that the correct pressure of the cushion or mattress has been determined. It has been found that the length should preferably be between 300 and 350 mm and an advantageous length from a users point of view is 330 mm.

10 Again, the length of the springs is important. Tests have shown that this length should be between 15 and 20 mm, and 17 mm seems to give optimum results.

15 In the preferred structure according to the invention, the springs are made from 23SWG Phosphor bronze, the springs having an outside diameter of 7.5 mm, a height of 17 mm, and there are 10 coils, for each spring.

20 The actual structure of the foam is of some importance. Its principle function is to provide resilience for the detector, and also to provide insulation and support for the spring conductors. A suitable foam density has been found to be 60 gms per cc.

25 The tinned contact strips formed on the preferred structure of the rigid frame members are 325 mm long and 9 mm wide, one end being tapered for a 30 mm length down to 7 mm, and 2 mm diameter holes are drilled along the length at 10 mm centres from the tapered end, these facilitating soldering and providing strain relief on the cable.

CLAIMS

1. A detector for use in an inflatable cellular support cushion or mattress, having a plurality of upstanding, inflatable, inverted pockets, arranged in parallel rows, said detector comprising upper and lower substantially parallel rigid elongate frame members, compressible plastic foam material positioned between said frame members, allowing said frame members to move resiliently towards and away from one another, a plurality of openings formed in said foam material at longitudinally spaced locations along the length thereof, said openings each extending from the upper to the lower surface of said foam material, upper and lower electrical contact zones on the lower and upper surfaces of said upper and lower rigid frame members respectively, said electrical contact zones being positioned at least at the location of said openings, electrical conductors located in each of said openings, said electrical conductors having a vertical extent less than that of the thickness of said foam material, electrical alarm means being connected to the upper and lower contact zones, whereby, when said rigid members are pressed together to be spaced apart by predetermined distance substantially equal to the vertical extent of said electrical conductors, contact is made and said alarm means is actuated, said frame members and said plastics foam material being completely surrounded by a flexible insulation, the height of said detector being between 22 and 30 mm, and the width being between 10 and 20 mm, thereby enabling said detector to be positioned between two adjacent rows of said inverted inflatable pockets of the cushion or mattress.

2. A detector according to claim 1, wherein the height of said detector is 25 mm.

3. A detector according to claim 1 or 2, wherein the

width of said detector is 15 mm.

4. A detector according to claim 1, 2 or 3, wherein said the length of said detector is between 300 and 350 mm.

5

5. A detector according to any preceding claim, wherein said frame members are formed of rigid resin sheet material and wherein said resin sheet material is provided with a metallic coating on one of its faces to provide said contact zones.

10

6. A detector according to any preceding claim, wherein said conductors are in the form of metallic compression springs.

15

7. A detector according to any preceding claim, wherein said alarm means includes a light and/or a buzzer.

20

8. A detector according to any preceding claim, wherein a venting tube is provided to allow air to be expelled from the interior of said detector.

25

9. A detector according to claim 8, wherein said venting tube also serves to carry electrical wiring connections from the detector to said alarm system.



Application No: GB 9725780.2
Claims searched: 1-9

Examiner: Peter Corbett
Date of search: 8 May 1998

**Patents Act 1977
Search Report under Section 17**

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:
UK Cl (Ed.P): H1N
Int Cl (Ed.6): G08B; H01H
Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 2128031 A (MINNESOTA MINING) see Fig 5	1 at least
X	GB 2083858 A (BANHAM'S PATENT LOCKS) see Fig 2	1 at least
X	GB 1454805 (ESSEX INTERNATIONAL) see Fig 4	1 at least
X	GB 1383337 (FONTAINE) see Fig 3	1 at least
X	GB 0392936 (PEARSON & BAINTON) see Fig 2	1 at least
X	US 5120980 (FONTAINE) see Fig 1	1 at least
X	US 4172216 (O'SHEA) see Fig 2	1 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.