Title: LIFTING SEAT APPARATUS FOR USE IN A BATH

Abstract: A lifting seat apparatus for raising and lowering a person in a bath which comprises a seat element (1) and a brackrest or lumbar support element (2) which are formed as an integral inflatable structure. This structure comprises two inflatable portions connected together by a joint which is flexible when the structure is deflated but becomes semi-rigid when the structure is inflated. The structure is supported by a stack of inflatable bags (3) which are inflated and deflated to raise and lower the structure.
before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.
LIFTING SEAT APPARATUS FOR USE IN A BATH

This invention relates to a lifting seat apparatus for raising and lowering a person, particularly a disabled or elderly person, in a bath and which also assists the person to get into and out of the bath.

Lifting seat apparatus of a kind comprising a seat and backrest structure and lifting means to raise the lower the structure relative to a base are known from our prior patent specification No. GB 2014446.

In such apparatus the seat and backrest structure comprises a rigid metal frame to give strength and rigidity to the structure, which frame gives rise to problems of weight and manufacturing cost. The apparatus may also be used for several disabled persons and thus it may have to be carried from one place to another, in which event the weight and size of the structure can be a hindrance.

With the object of providing an apparatus which is lighter in weight we proposed in our prior patent specification No. GB 2317335 a lifting seat apparatus for use in a bath comprising a seat and backrest structure in the form of a L-shaped plastics moulding integrally incorporating an obverse seat and backrest web of L-shape, upstanding guide means on a base and slidably guiding the seat and backrest structure, and lifting means to raise the structure relative to the base, the apparatus being characterised in that the moulding is hollow and also integrally incorporates a seat and backrest web support structure of L-shape.

The object of the present invention is to provide an improved form of lifting seat apparatus.

According to the invention there is provided a lifting seat apparatus for use in a bath which comprises a seat element and a backrest or lumbar support element, and means for raising and lowering the seat element, characterised in that the two elements are formed as an integral inflatable structure.
An inflatable structure forming only a seat element would be prone to instability, especially in a partially inflated state. The provision of a backrest or lumbar support formed by such a structure improves the stability of the apparatus as it lifts and lowers a person sitting on the seat element.

The two elements formed by the integral inflatable structure preferably comprise two inflatable portions respectively. Preferably these two portions of the structure are connected together by a joint which is formed to be flexible when the structure is deflated and semi-rigid or substantially rigid when the structure is inflated thereby to provide the structure with optimum stability when needed.

In one arrangement embodying the invention the means for raising and lowering the seat element may comprise a further inflatable structure which supports the said integral inflatable structure, and operating means operable to cause this further structure to be inflated and deflated thereby to cause the integral inflatable structure as a whole to move up and down. In this case the integral inflatable structure forming the seat element and the backrest or lumbar support element may remain inflated when the apparatus is in use, being deflated only when the apparatus is stowed away, but preferably this structure is arranged to be inflated and deflated together with the said further structure so that in use the resultant up and down movement of the upper surface of the seat element also acts to raise and lower a person sitting on the apparatus.

The further structure may comprise one or more inflatable bags. Where there are two or more such bags they are preferably arranged in a stack and preferably they are connected together so that air (or other gas) can flow between them whereby they can be inflated and deflated together.

As the upper surface of the seat element moves up and down on inflation and deflation of the integral inflatable structure, there
may be no need for a further inflatable structure, inflation and deflation of the integral inflatable structure alone being relied upon, in use, to raise the lower a person sitting on the seat element.

Seen from another aspect, therefore, the present invention provides a lifting seat apparatus for use in a bath which comprises a seat element and a backrest or lumbar support element, characterised in that the two elements are formed as an integral inflatable structure and operating means are provided for inflating and deflating the said structure to cause the upper surface of the seat element (and with it the backrest or lumbar support element) to move up and down, whereby a person sitting on the seat element can be lifted and lowered. If the apparatus is required to lift and lower a person a greater distance then the inflatable seat element is designed for, a further inflatable structure may be provided as described above.

The operating means may comprise control means for controlling the supply of air (or gas) under pressure to the inflatable parts of the apparatus and the venting of air from said parts, and these means may be connected to any one or more of the inflatable parts. Where the apparatus has a further inflatable structure comprising a stack of bags the control means may be connected to one of these bags but preferably, in both such an apparatus and an apparatus with an integral seat and backrest or lumbar support structure only, the control means are connected to the backrest or lumbar support element.

The or each bag of said further inflatable structure is preferably made of a flexible material and provided with one or more internal webs extending between the top and bottom walls of the bag, the web or webs acting to increase the stability of the bag as it is inflated and deflated.

Preferably, in a stack of bags, the lower bag has a rigid member secured to its underside and projecting laterally from the stack, the projecting part being connected by at least one flexible tie to the or an
upper bag of the stack. This arrangement further enhances the stability of
the structure when in use.

The apparatus may be provided with stabilisers in the form of
cushions or pads arranged to be secured to the sides of the seat element
or to the opposed side portions of a bath in which the apparatus is used.

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

FIGURE 1 is a perspective view of a preferred form of lifting seat
apparatus embodying the invention;

FIGURE 2 is a perspective view, partly cut away, of one of the inflatable
bags of the apparatus; and

FIGURES 3 and 4 show the apparatus in different positions of use in a
bath.

The drawings show a lifting seat apparatus for use in a bath which
comprises an inflatable structure having a seat element 1, a backrest
element 2 joined to the seat element and a stack of bags 3 supporting the
seat element so that inflation of the bags raises the seat element and with
it the backrest element, and deflation of the bags lowers the seat and
backrest elements.

The elements 1, 2 and 3 are all made from a fabric which is
suitably coated with a thermoplastics material to make it leak-proof so
that the elements can be inflated, and also tear-proof. The elements are
constructed in two parts, a first part comprising the seat and backrest
elements 1 and 2 and a second part comprising the stack of elements 3.
The seat and backrest elements are formed integrally with one another in
the shape of two generally rectangular portions joined by a waisted
portion. The elements are made by welding together, for example by
radio frequency welding, appropriately shaped pieces of the material.

The bags 3 are formed separately from one another and are
constructed as shown in FIGURE 2. Each bag is generally of rectangular shape and made by welding together the edges of two pieces of material. Inside the bag are located four generally L-shaped webs 4 which are welded along their upper and lower edges to the top and bottom walls respectively of the bag, the webs being arranged with their apexes facing inwardly towards one another.

The bags of each adjacent pair are connected together by two plastics grommets 5 in their respective top and bottom walls so that air can flow between the bags. The bags therefore form a unitary part (which as explained below can be used separately). The backrest element 2 is provided with a connector (not shown) for connection through a control unit (not shown) to a source of compressed air (or other gas). This source of compressed air is an electrically (mains or battery) operated compressor and the control unit is a hand-held unit incorporating valves which are operable to control the supply of compressed air to the backrest element and the venting of air from the element.

The upper bag 3 is detachably connected to the seat element 1 by similar grommets in their respective top and bottom walls so that air can flow between the seat and backrest elements 1,2 and the bags 3.

In use, the apparatus is placed in a bath as shown in FIGURES 3 and 4, the lower bag being provided with suction pads 6 for holding the apparatus in position in the bath. The inflatable structure is inflated by supplying compressed air to the backrest element, the air flowing firstly into the backrest and seat elements and thence into the stack of bags. With the seat element level with the top of the bath as shown in FIGURE 3, a person can sit on the inflatable structure and swing his or her legs over the side of the bath into the latter. Air is then released from the inflatable structure by the control unit so that it deflates thereby lowering the person into the bath as shown in FIGURE 4. The backrest element moves from the generally flat position shown in FIGURE 3 to a raised position as shown in FIGURE 4 and a quantity of air can be left in this
element so that it provides support and comfort for the person’s back.

When the person has finished bathing the structure is inflated to raise the person to the position shown in FIGURE 3 so that he or she can then get out of the bath.

The joint between the backrest element and the seat element becomes flexible when the structure is deflated thereby allowing the backrest element to move to the raised position, and is semi-rigid when the structure is inflated to provide a stable support for a person getting on and off the apparatus.

As the structure is inflated the webs 4 act to stabilise the structure and in particular limit yaw. This action is further enhanced by the provision of a longitudinal rigid member 7 in the form of a slat which is secured to the underside of the lower bag 3 and has a projecting, upwardly inclined part 7a the outer end of which is attached by a flexible tie 8 to the middle bag 3.

The apparatus may be provided, particularly for use in wider baths, with two pads which can be attached by suction pads to the sides of the bath alongside the seat element as shown in dotted lines at 9 in FIGURE 3. These pads are positioned so that they contact opposite sides of the seat element when the latter is in the raised position and stabilise the apparatus. The pads comprise flexible bags each provided with a closure element or stopper which can be removed to allow air to be admitted to or expelled from the bag to vary its size.

The apparatus according to the invention which is illustrated in the drawings has the advantages that:-

The arrangement of the welded webs inside the bags is such as to promote optimum stability without recourse to rigid materials, and the limiting of yaw, as well as allowing the structure to be produced easily and relatively inexpensively by welding means.
The apparatus is broadly comprised of three sections. Each section has facets of design that enhance stability and restrict yaw:

1. The rigid member or slat 7 is tied to the top bag of the lower pneumatic section to curtail forward movement during inflation or deflation of the structure,

2. The stack of bags has specifically placed welded webs to restrict yaw and curtail instability during ascent and descent. The arrangement of webs controls the relative movement of the upper and lower walls of each bag whilst maintaining a substantially flat load bearing surface. There are two interconnecting grommets at the top to combine the function of fixing and the passage of air to the seat and backrest section. This arrangement also enables the two interconnecting pneumatic sections of the apparatus to be built separately before they are joined in this way.

3. The seat and backrest section is constructed to impart maximum increased stability to the user during ascent and descent, comprising:

   (a) the joint between the seat element and the backrest element is flexible at low pressure and semi-rigid at high pressure in the highest position, when optimum stability is most needed

   (b) the seat and backrest elements form an “L” shaped structure supporting the occupant and reacting on the back and sides of the bath, producing widely spaced contact points that assist the overall stability of the user: the back support contributes to the comfort, maintenance of central positioning and stability of the user when the apparatus is being operated

   (c) the seat element is of sufficient depth (circa 5”) so that it makes a rigid support as it expands to fill the width of the bath.

The section comprising the seat and backrest elements is detachable
from the stack of bags so that with the grommets of the upper bag closed, for example by stoppers, the stack can be used separately for raising and lowering a person, for example to assist him or her in getting on or off a chair or seat.
CLAIMS

1. A lifting seat apparatus for use in a bath which comprises a seat element and a backrest or lumbar support element, and means for raising and lowering the seat element, characterised in that the two elements are formed as an integral inflatable structure.

2. An apparatus as claimed in Claim 1 in which the two elements formed by the integral inflatable structure comprise two inflatable portions respectively.

3. An apparatus as claimed in Claim 2 in which the said two portions of the structure are connected together by a joint which is formed to be flexible when the structure is deflated and semi-rigid or substantially rigid when the structure is inflated.

4. An apparatus as claimed in Claim 1, 2 or 3 in which the means for raising and lowering the seat element comprises a further inflatable structure which supports the said integral inflatable structure, and operating means operable to cause this further structure to be inflated and deflated thereby to cause the integral inflatable structure as a whole to move up and down.

5. An apparatus as claimed in Claim 4 in which the integral inflatable structure forming the seat element and the backrest or lumbar support element is arranged to be inflated and deflated together with the said further structure.

6. An apparatus as claimed in Claim 4 or 5 in which the said further structure comprises two or more inflatable bags arranged in a stack and connected together so that air (or other gas) can flow between them whereby they can be inflated and deflated together.

7. A lifting seat apparatus for use in a bath which comprises a seat element and a backrest or lumbar support element, characterised in that the two elements are formed as an integral inflatable structure and
operating means are provided for inflating and deflating the said structure to cause the upper surface of the seat element (and with it the backrest or lumbar support element) to move up and down whereby a person sitting on the seat element can be lifted and lowered.

8. An apparatus as claimed in Claim 4, 5, 6 or 7 in which the operating means comprise control means for controlling the supply of air (or gas) under pressure to the inflatable parts of the apparatus and the venting of air from said parts, these control means being connected to the backrest or lumbar support element.

9. An apparatus as claimed in Claim 4, 5 or 6 in which the or each bag of said further inflatable structure is made of a flexible material and provided with one or more internal webs extending between the top and bottom walls of the bag.

10. An apparatus as claimed in Claim 6 or Claim 8 or 9 when dependent on Claim 6 in which the lower bag of the stack has a rigid member secured to its underside and projecting laterally from the stack, the projecting part being connected by at least one flexible tie to the or an upper bag of the stack.

11. An apparatus as claimed in any one of the preceding claims which is provided with stabilisers in the form of cushions or pads arranged to be secured to the sides of the seat element or to the opposed side portions of a bath in which the apparatus is used.

12. A lifting seat apparatus substantially as herein described with reference to the accompanying drawings.
### A. Classification of Subject Matter

**IPC:** A61G7/10

According to International Patent Classification (IPC) or to both national classification and IPC

### B. Fields Searched

Minimum documentation searched (classification system followed by classification symbols)

**IPC:** A61G

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electrode data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

### C. Documents Considered to be Relevant

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<tr>
<td>Y</td>
<td>DE 38 40 213 A (LOECHLE RICHARD) 31 May 1990 (1990-05-31) the whole document</td>
<td>1,2,4,6,</td>
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<td>12</td>
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<tr>
<td>Y</td>
<td>DE 298 01 544 U (ROI UNTERNEHMENSBERATUNGSGESELL) 20 May 1998 (1998-05-20) the</td>
<td>1,2,4,6,</td>
</tr>
<tr>
<td></td>
<td>whole document</td>
<td>12</td>
</tr>
<tr>
<td>X</td>
<td>WO 00 09063 A (SILVER CROWN ASSOCIATES LIMITE; STEADMAN WILLIAM D (US)) 24</td>
<td>7-9,11,</td>
</tr>
<tr>
<td></td>
<td>February 2000 (2000-02-24) claims 47-52; figures</td>
<td>12</td>
</tr>
<tr>
<td>X</td>
<td>DE 30 29 572 A (BUTENHUTH HELLMUTH) 25 March 1982 (1982-03-25) page 4, line 11 -</td>
<td>7-9,12</td>
</tr>
<tr>
<td></td>
<td>line 24; figure 4</td>
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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  * "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
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  * "S" document member of the same patent family

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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>GB 1 582 332 A (TIDESLOCK LTD) 7 January 1981 (1981-01-07) the whole document</td>
<td>1,7</td>
</tr>
<tr>
<td>A</td>
<td>DE 581 796 C (SCHNEIDER) 13 July 1933 (1933-07-13) page 1, left-hand column, line 45 - right-hand column, line 52; figure 2</td>
<td>1,7</td>
</tr>
<tr>
<td>Patent document cited in search report</td>
<td>Publication date</td>
<td>Patent family member(s)</td>
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<tr>
<td>WO 9938471</td>
<td>05-08-1999</td>
<td>WO 9938471 A1</td>
</tr>
<tr>
<td>WO 0009063</td>
<td>24-02-2000</td>
<td>AU 5378399 A</td>
</tr>
<tr>
<td>GB 1582332</td>
<td>07-01-1981</td>
<td>NONE</td>
</tr>
<tr>
<td>DE 581796</td>
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<td>NONE</td>
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</table>