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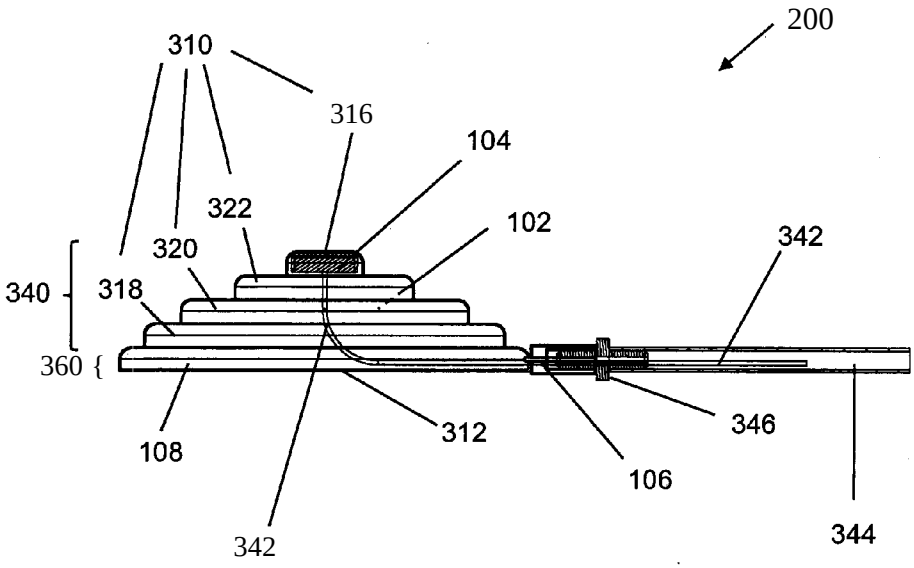
(54) Title: AIRBAG



(57) Abstract: According to one aspect, there is provided an airbag for applying a massage force, the airbag comprising: an inflatable chamber; an electro-mechanical device enclosed by the inflatable chamber, the electro-mechanical device configured in use to provide a massage force; and a port being in fluid communication with the inflatable chamber, the port configured in use to permit fluid flow into and out of the inflatable chamber.

Airbag

Technical field

[0001] Various embodiments relate to an airbag.

Background

[0002] Examples of medical conditions that a massage can alleviate include improving blood circulation, relieving stress and relaxing tense muscles.

[0003] To provide an effective massage, massage devices typically employ force applicators that apply forces to a body of a user. These force applicators knead, tap, roll or press against the body to generate the effect of a massage. Typically such force applicators are mechanical rollers. However, such mechanisms are also difficult to implement in smaller applications such as in footwear, for example.

[0004] In view of the limitations of the mechanical force applicators, several massage devices have turned to air bags as substitutes to the conventional roller force applicator. Air bags may be suitably scaled in size for use in applications such as in footwear.

Summary

[0005] According to one aspect, there is provided an airbag for applying a massage force, the airbag comprising: an inflatable chamber; an electro-mechanical device enclosed by the inflatable chamber, the electro-mechanical device configured in use to provide a massage force; and a port being in fluid communication with the inflatable chamber, the port configured in use to permit fluid flow into and out of the inflatable chamber.

[0006] In the context of various embodiments, the term "airbag" may mean a structure having at least an expandable or inflatable portion, which when expanded or inflated, applies a compressive pressure against a surface (such as a body part) in contact with the airbag. The compressive pressure provides a massage force to the body part in contact with the airbag. The shape of the airbag depends on the extent to which the airbag is inflated. In the context of various embodiments, the airbag is used as a component in massage devices, such as massage chairs or handheld massaging devices.

[0007] In the context of various embodiments, the term "inflatable chamber" may mean a structure on the airbag, the structure expanding when fluid (such as a gas or a liquid) is introduced into the structure and generally returning to its original shape when the fluid exits from the structure. The airbag may have a plurality of such inflatable chambers or have only one inflatable chamber.

[0008] In the context of various embodiments, the term "electro-mechanical device" may mean a device that converts electricity supplied to the device into mechanical movement. Examples of such devices include any one or more of the following components: a vibration motor, a tapper or a roller. The sensation felt by a user from the massage delivered by the electro-mechanical device depends on the component used for the electro-mechanical device. By using any one or more of the following components: the vibration motor, the tapper or the roller, the sensation would be different from that of a feeling of compression brought about by the inflatable chamber of the airbag. Thus, the electro-mechanical device further enhances the massaging force already provided by the inflatable chamber of the airbag.

[0009] In the context of various embodiments, the term "enclosed" may mean that the electro-mechanical device is disposed completely within the inflatable chamber of the airbag and surrounded by the walls of the inflatable chamber, so that the massage force provided by the electro-mechanical device is delivered through a respective wall of the inflatable chamber. Thus, in addition to providing a means to house the electro¬mechanical device, the walls of the inflatable chamber serve to cushion the intensity of the massage force delivered by the electro-mechanical device, thereby providing a more soothed massage effect. With such an arrangement, additional padding may not be required to soften the force provided by the electro-mechanical device. Considering that airbags are used as components in a massage device, such as a massage chair where the airbags may be located in a seat cushion, use of airbags according to various embodiments may not require padding between the airbags and the seat cushion cover. Alternatively, the padding thickness may be reduced compared to the padding thickness required for an arrangement where an electro-mechanical device is provided on the exterior surface of an airbag.

[0010] In the context of various embodiments, the term "port" may mean a means through which fluid is permitted to flow into and out of the inflatable chamber. The port may be a valve or an opening which is provided on the inflatable chamber itself or provided on a separate portion of the airbag and connected to the inflatable

for example, a channel or pipe. In an embodiment, the port may be the only path through which fluid may flow into and out of the inflatable chamber.

[0011] In various embodiments, the electro-mechanical device may be secured to a wall of the inflatable chamber. This has the advantage of fixing the location of the electro-mechanical device, allowing the electro-mechanical device to be placed on the wall of the inflatable chamber which is closest to the body part which the air bag massages.

[0012] In various embodiments, the wall of the inflatable chamber includes a recess and the electro-mechanical device is at least partly secured within the recess. The recess provides for a defined or specific area, along the wall of the inflatable chamber, for securing the electro-mechanical device.

[0013] In various embodiments, the wall of the inflatable chamber may include a corrugated portion, wherein the recess may form part of the corrugated portion. The corrugated portion may include a plurality of ridges and grooves. The ridges and grooves may be formed by folding the wall of the inflatable chamber. This may result in folds on the wall which when seen from a cross-section view exhibit a raised portion, followed by a lowered portion. This corrugated portion allows for the inflatable chamber to have a larger surface area when inflated, as opposed to an inflatable chamber with planar (i.e. not corrugated) walls.

[0014] In various embodiments, the corrugated portion may include a plurality of ridges and grooves arranged to form concentric rings, wherein the recess may form at least part of a central ring of the concentric rings.

[0015] In various embodiments, the electro-mechanical device may be fused to the wall of the inflatable chamber. For example, when two layers of separate material are fused together to form the inflatable chamber (with each layer forming a wall of the inflatable chamber), fusing of the electro-mechanical device may also be performed simultaneously, thereby simplifying securing of the electro-mechanical device to the inflatable chamber. However, in some other embodiments, the electro-mechanical device may additionally or alternatively be secured to the wall of the inflatable chamber via an adhesive.

[0016] In various embodiments, a wire may be coupled to the electro-mechanical device, the wire extending out of the inflatable chamber. By connecting the wire to control circuitry, a means is provided to externally control activation of the electro-mechanical device. In an embodiment, the wire may extend out of the inflatable

portion, such as, for example, through a wall of the inflatable chamber and/or adjacent to the port. Since the portion of the airbag that is in the vicinity of the port is already adapted to accommodate the port, it simplifies manufacture of the airbag to also have the wire extend out of the inflatable chamber from the same portion of the airbag. Otherwise, another portion of the airbag would have to be specifically adapted to allow the wire to extend out of the inflatable chamber. In an embodiment, a portion of the airbag is specifically adapted by being reinforced.

[0017] In various embodiments, a first portion of the wire inside the inflatable chamber may be secured to the inflatable chamber. The first portion of the wire may be secured to the inflatable chamber at a position that is opposite to the electro-mechanical device. In other embodiments, the first portion of the wire may not be secured to the inflatable chamber, but may be allowed to hang slack inside the inflatable chamber.

[0018] In various embodiments where the first portion of the wire inside the inflatable chamber is secured to the inflatable chamber, the first portion of the wire may be fused to the inflatable chamber. However, in some other embodiments, the first portion of the wire may additionally or alternatively be secured to the wall of the inflatable chamber via an adhesive.

[0019] In various embodiments, a second portion of the wire inside the inflatable chamber may have a coiled segment.

[0020] In various embodiments, the electro-mechanical device may be any one or more of the following devices: a vibration motor, a tapper or a roller. Examples of a vibration motor include a coin motor. Use of such a vibration motor, in various embodiments, has the advantage that the electro-mechanical device is compact. Further, there is even distribution of the vibration across the wall of the inflatable chamber, so that the body part being massaged experiences a uniform massage sensation at a specified location.

[0021] In various embodiments, at least a portion of the periphery of the inflatable chamber is reinforced. The reinforced section may enhance the structural integrity of the airbag, since the inflatable chamber changes during operation from between an unexpanded size to an expanded size, so that reinforcement increases the durability of the airbag.

[0022] In various embodiments, the inflatable chamber may include a first layer and a second layer connected to each other about their respective perimeters, wherein the

between the first layer and the second layer is reinforcement may be reinforced through a reinforcement structure disposed at at least a portion of the inflatable chamber. In one embodiment, after the first layer and the second layer are connected together, a further fabrication step is used to create the reinforcement structure. In another embodiment, no further fabrication step is required as follows. Each of the first layer and the second layer is provided with material excess to the material designated to form a respective wall of the inflatable chamber created when the first layer and the second layer are connected to each other. The excess material, located around the respective perimeter of each of the first and second layers, join together to create the reinforcement structure when the first layer and the second layer are connected to each other. In an embodiment, reinforcement may be provided by the joint between the first and second layer.

Brief Description Of The Drawings

[0023] In the drawings, like reference characters generally refer to the same parts throughout the different views. The drawings are not necessarily to scale, emphasis instead generally being placed upon illustrating the principles of the invention. In the following description, various embodiments of the invention are described with reference to the following drawings, in which:

[0024] Figure **1** is a block diagram showing an airbag according to one embodiment.

[0025] Figures 2A to 2D show various views of an airbag in accordance with an embodiment.

[0026] Figure 3 shows a cross section view of an airbag in accordance with an embodiment.

[0027] Figure 4 shows an exploded view of an airbag in accordance with an embodiment.

Detailed Description

[0028] While various embodiments have been particularly shown and described with reference to specific embodiments, it should be understood by those skilled in the art that various changes in form and detail may be made therein without departing from the spirit and scope as defined by the appended claims. The scope is thus indicated by the appended claims and all changes which come within the meaning and range of

of the claims are therefore intended to be embraced. It will be appreciated that common numerals, used in the relevant drawings, refer to components that serve a similar or the same purpose.

[0029] Figure 1 is a block diagram showing an airbag 100 according to one embodiment.

[0030] The airbag 100 has an inflatable chamber 102, an electro-mechanical device 104 enclosed (symbolised by its dashed outline) by the inflatable chamber 102 and a port 106.

[0031] The electro-mechanical device 104 is configured in use to provide a massage force. The port 106 is in fluid communication with the inflatable chamber 102, wherein the port 106 is configured in use to permit fluid flow into and out of the inflatable chamber 102. A connection (not shown) such as a tube or channel may be located between the port 106 and the inflatable chamber 102 for the fluid communication.

[0032] While a circular shape is shown, the airbag 100 may be fabricated in any other shape, such as polygonal, hemispherical, ellipsoid, triangular, trapezoidal, square, rectangular, octagonal, pentagonal, or a combination thereof.

[0033] In the embodiment shown in Figure 1, the airbag 100 has a border 108 around the perimeter of the inflatable chamber 102, the border 108 acting to reinforce the inflatable chamber 102. The port 106 is located at the border 108. However in another embodiment (not shown), the airbag does not have such a border, so that the perimeter of the inflatable chamber forms the perimeter of the airbag itself. In this other embodiment, the port may be located on the inflatable chamber.

[0034] When operated, the inflatable chamber 102 expands to apply a compressive pressure against a surface (such as a body part) in contact with the airbag 100. When the electro-mechanical device 104 is for example, a vibration motor, the electro-mechanical device 104 vibrates the body part. In this manner, the sensation of the massage force brought about by the airbag 100 is a combination of vibration and compression, thereby providing a more stimulating massage at that particular point of the body.. By placing the electro-mechanical device 104 inside the inflatable chamber 102, the electro-mechanical device 104 is placed further away from the body part and together with the walls of the inflatable chamber 102 acting as cushions, no or less additional cushioning may be required to soften the increased intensity of the massage delivered by both the electro-mechanical device 104 and the inflatable chamber 102.

[0035] Figures 2A to 2D show various views of an airbag 200 in accordance with an embodiment. Figure 2A is a perspective view, Figure 2B is a top view, while Figures 2C and 2D are side views of the airbag 200.

[0036] Similar to the airbag 100 of Figure 1, the airbag 200 has an inflatable chamber 102, an electro-mechanical device 104 (see Figure 3) enclosed by the inflatable chamber 102 and a port 106. The airbag 100 also has a border 108 around the perimeter of the inflatable chamber 102, the border 108 acting to reinforce the inflatable chamber 102. Since the functions of the components 102, 104, 106 and 108 have already been explained, the other features of the airbag 200 are described below, with reference to Figure 3.

[0037] Figure 3 shows a cross section view of the airbag 200 of Figure 2B taken along the line B-B of Figure 2B.

[0038] The inflatable chamber 102 has two walls 310 and 312, where the internal surface of each the walls 310 and 312 face each other. The wall 310 has a corrugated surface, while the wall 312 has a generally planar surface.

[0039] From the perspective of the inner surface of the wall 310, the wall 310 of the inflatable chamber 102 includes a recess 316 and the electro-mechanical device 104 is fully secured within the recess. Such a recess 316 provides for a defined or specific area, along the wall 310 of the inflatable chamber 102, to secure the electro-mechanical device 104. It is also possible for the electro-mechanical device 104 to be only at least partly secured within the recess 316. The electro-mechanical device 104 need not necessarily be secured to the recess 316, but simply secured to the wall 310 of the inflatable chamber 102, at any portion of the interior surface of the wall 310.

[0040] The wall 310 of the inflatable chamber 102 has a corrugated portion 318, 320 and 322, wherein the recess 316 forms part of the corrugated portion 318, 320 and 322. The corrugated portion 318, 320 and 322 is a stepped structure formed across the thickness of the wall 310, so that both the inner and outer surfaces of the wall 310 are not planar, but corrugated. The corrugated portion 318, 320 and 322 allows the top 340 of the inflatable chamber 102 to have a larger surface area than the bottom 360 of the inflatable chamber 102. The corrugated portion 318, 320 and 322 may be implemented using a plurality of ridges and grooves arranged to form concentric rings (see Figure 2B), wherein the recess 316 forms at least part of a central ring of the concentric rings.

There are several ways to secure the electro-mechanical device to the wall 310 of the inflatable chamber 102. For instance, the electro-mechanical device 104 may be fused to the wall 310 of the inflatable chamber 102, the fusing done simultaneously with the fabrication of the inflatable chamber 102. On the other hand, the electro-mechanical device 104 may additionally or alternatively be secured to the wall 310 of the inflatable chamber 102 via an adhesive. Securing the electro-mechanical device 104 to the wall 310 of the inflatable chamber 102 ensures proper alignment of the electro-mechanical device 104 with respect to the inflatable chamber 102.

[0042] A wire 342 is coupled to the electro-mechanical device 104. A portion of the wire 342 is enclosed within the inflatable chamber 102, while a remainder of the wire 342 may extend out of the inflatable chamber 102. The wire 342 provides a means to power the electro-mechanical device 104 and also externally control operation of the electro-mechanical device 104 using control circuitry. A further wire 242 (see Figure 2B) may also be coupled to the electro-mechanical device 104. A portion of the wire 242 may be enclosed within the inflatable chamber 102, while a remainder of the wire 242 may extend out of the inflatable chamber 102.

[0043] The wires 342 and 242 extend out of the inflatable chamber 102 adjacent to the port 106. However, it is also possible for the wires 342 and 242 to extend out of the inflatable chamber 102 through an opening provided in the walls 310 and 312 of the inflatable chamber 102 which is not adjacent to the port 106.

[0044] When fluid enters the inflatable chamber 102 and causes the inflatable chamber 102 to expand, the electro-mechanical device 104 will rise. The enclosed portion of the wire 342 is provided with sufficient slack so that the enclosed portion of the wire 342 will not limit movement of, and will correspondingly rise with the electro-mechanical device 104.

[0045] A portion of the wire 342 enclosed inside the inflatable chamber may be secured, for example by fusing and/or using an adhesive, to the wall 312 of the inflatable chamber 102, at a position that is opposite to the electro-mechanical device 104.

[0046] The top 340 of the inflatable chamber 102 may be formed from a first layer of material and the bottom 360 of the inflatable chamber 102 may be formed from a second layer of material. The first layer and the second layer are connected to each other about their respective perimeters, wherein the connection between the first layer

nd layer is reinforced to form the border 108. The a reinforcement structure, so that at least a portion of the periphery of the inflatable chamber 102 is reinforced. During fabrication of the inflatable chamber 102, material (of the first and the second layers) excess to that designated to form a respective wall of the inflatable chamber 102 can be used to create the border 108. This excess material may be located around the respective perimeter of each of the first and second layers.

[0047] A tubing 344 is connected to the port 106 via a connector 346. The tubing 344 allows fluid (such as a gas or a liquid) to enter and exit the inflatable chamber 102.

[0048] Figure 4 shows an exploded view of the airbag 200 shown in Figure 3. In the embodiment shown in Figure 4, the electro-mechanical device 104 is a vibration motor, such as a coin motor. However, it is possible to use other devices like a tapper or a roller.

[0049] Figure 4 shows that the wire 452 (compare wire 352 shown in Figure 3) coupled to the electro-mechanical device 104 may have a coiled segment 452c. When the inflatable chamber 102 expands from the introduction of fluid, the coiled segment 452c will extend to allow the electro-mechanical device 104 to rise.

[0050] The airbag (100, 200) shown in Figures 1 to 4 may be fabricated from material such as plastic. Elastic material, such as rubber, may also be used. In the embodiment where rubber is used, the wall 310 (see Figure 3) of the inflatable chamber 102 may not be corrugated, since the natural elastic nature of rubber may not require the wall 310 to have a larger surface area than the other wall 312 of the inflatable chamber 102.

1. An airbag for applying a massage force, the airbag comprising:

an inflatable chamber;

an electro-mechanical device enclosed by the inflatable chamber, the electro¬mechanical device configured in use to provide a massage force; and

a port being in fluid communication with the inflatable chamber, the port configured in use to permit fluid flow into and out of the inflatable chamber.

2. The airbag of claim 1, wherein the electro-mechanical device is secured to a wall of the inflatable chamber.

3. The airbag of claim 2, wherein the wall comprises a recess and the electro¬mechanical device is at least partly secured within the recess.

4. The airbag of claim 3, wherein the wall comprises a corrugated portion.

5. The airbag of claim 4, wherein the recess forms part of the corrugated portion.

6. The airbag of claim 5, wherein the corrugated portion comprises a plurality of ridges and grooves arranged to form concentric rings.

7. The airbag of claim 6, wherein the recess forms at least part of a central ring of the concentric rings.

8. The airbag of claims 2 to 7, wherein the electro-mechanical device is fused to the wall of the inflatable chamber.

9. The airbag of claims 2 to 8, wherein the electro-mechanical device is secured to the wall of the inflatable chamber via an adhesive.

10. The airbag of any one of the preceding claims, further comprising a wire coupled to the electro-mechanical device, the wire extending out of the inflatable chamber.

11. The airbag of claim 10, wherein the wire extends out of the inflatable chamber adjacent to the port.

12. The airbag of claim 10 or 11, wherein a first portion of the wire inside the inflatable chamber is secured to the inflatable chamber.

13. The airbag of claim 12, wherein the first portion of the wire is secured to the inflatable chamber at a position that is opposite to the electro-mechanical device.

14. The airbag of claim 12 or 13, wherein the first portion of the wire is fused to the inflatable chamber.

15. The airbag of claim 12 to 14, wherein the first portion of the wire is secured to the inflatable chamber by an adhesive.

16. The airbag of claims 10 or 15, wherein a second portion of the wire inside the inflatable chamber has a coiled segment.

17. The airbag of any one of the preceding claims, wherein the electro-mechanical device is any one or more of the following devices: a vibration motor, a tapper or a roller.

18. The airbag of any one of the preceding claims, wherein at least a portion of the periphery of the inflatable chamber is reinforced.

19. The airbag of any one of the preceding claims, wherein the inflatable chamber comprises a first layer and a second layer connected to each other about their respective perimeters, wherein the connection between the first layer and the second layer is reinforced.

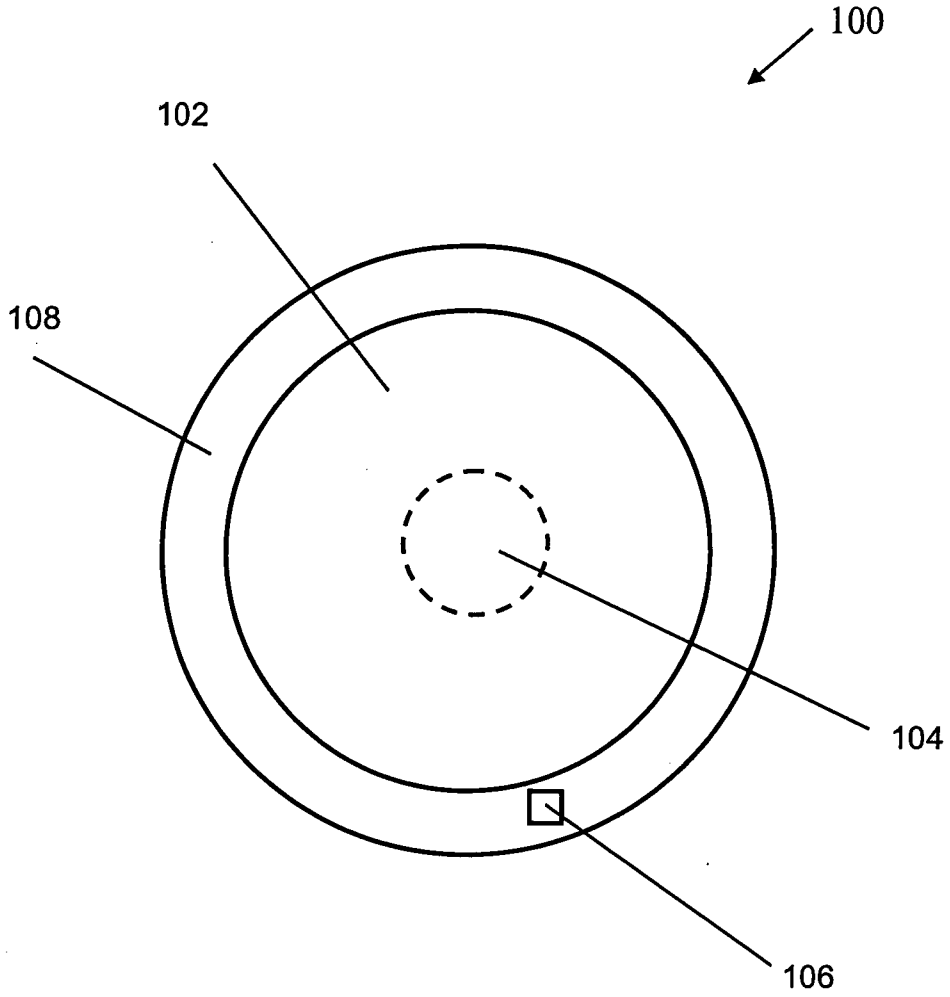


Figure 1

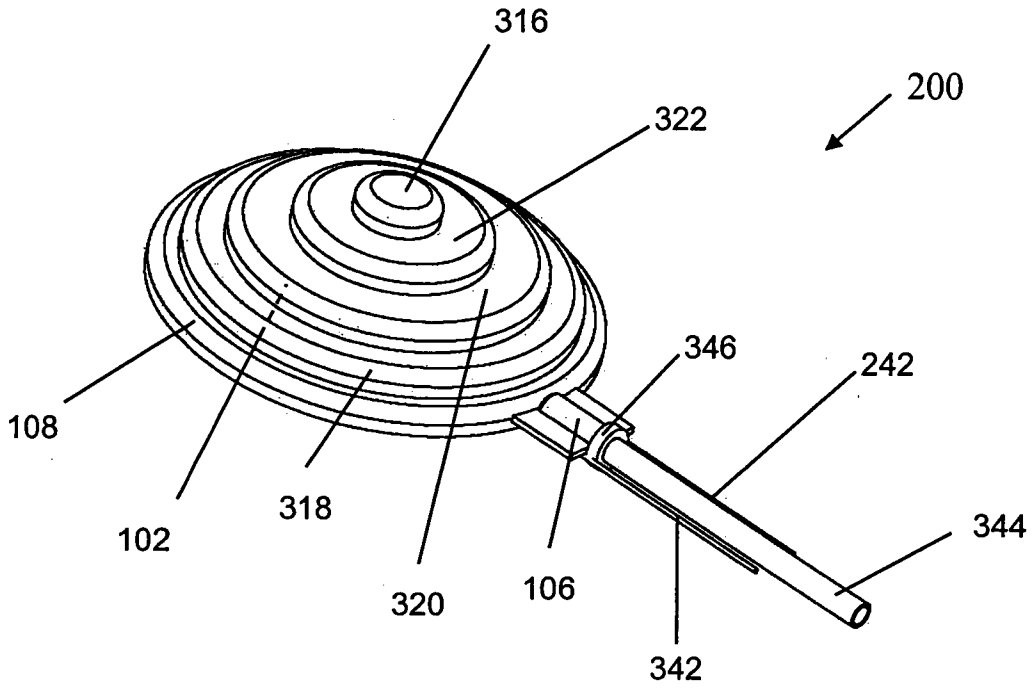


Figure 2A

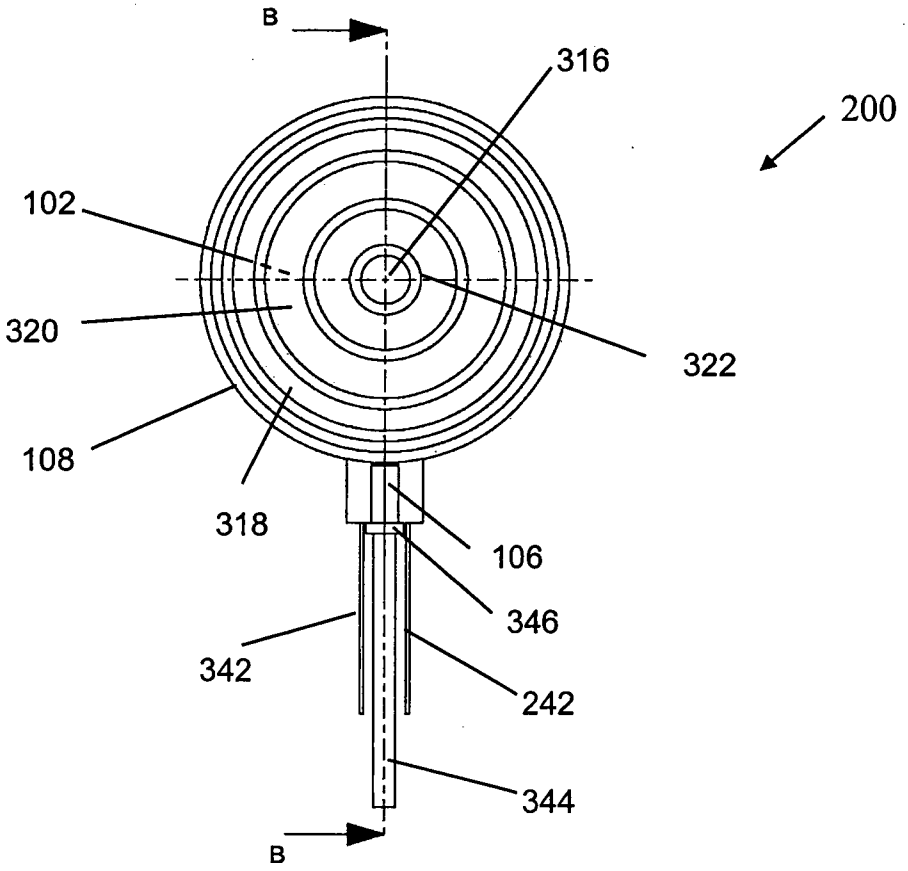


Figure 2B

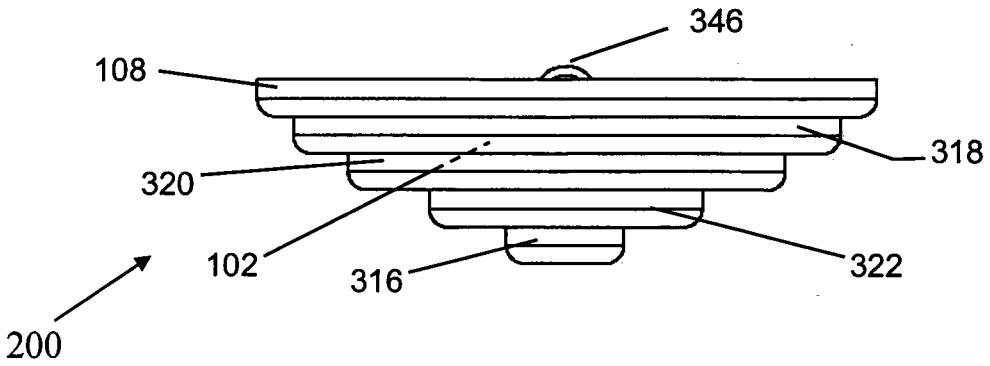


Figure 2C

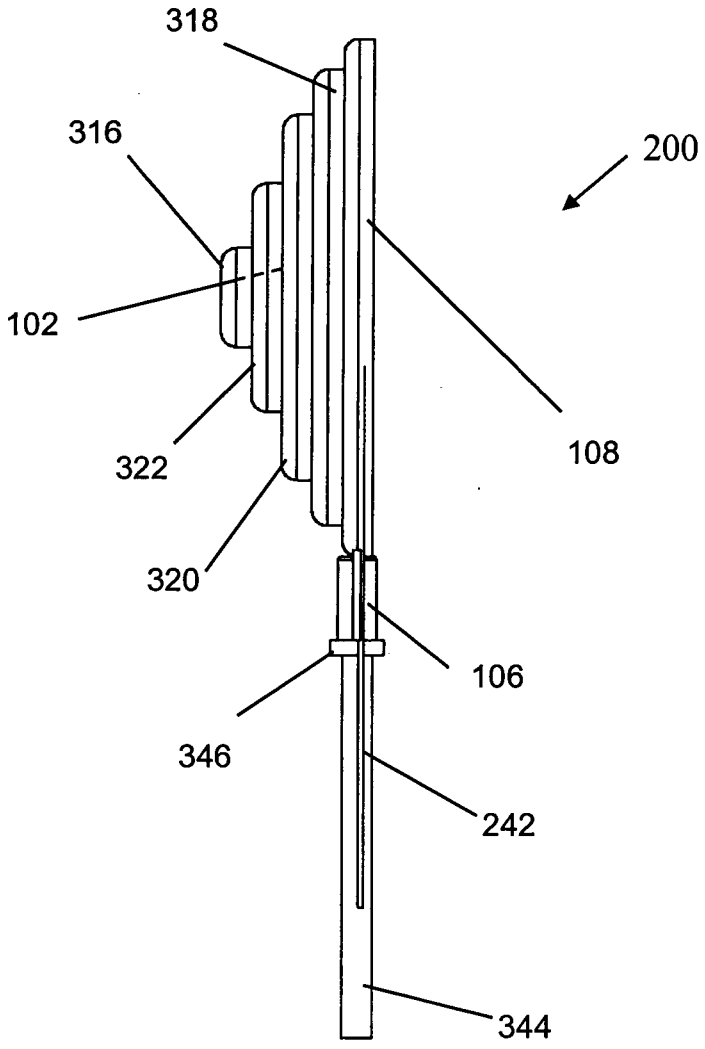


Figure 2D

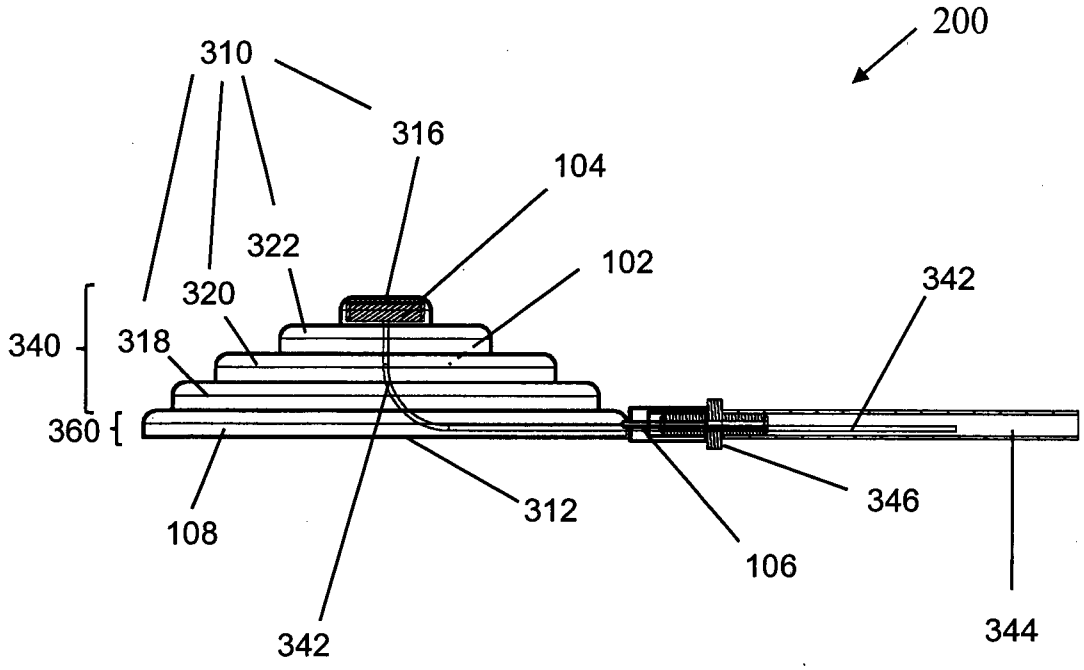

200
310
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Figure 3

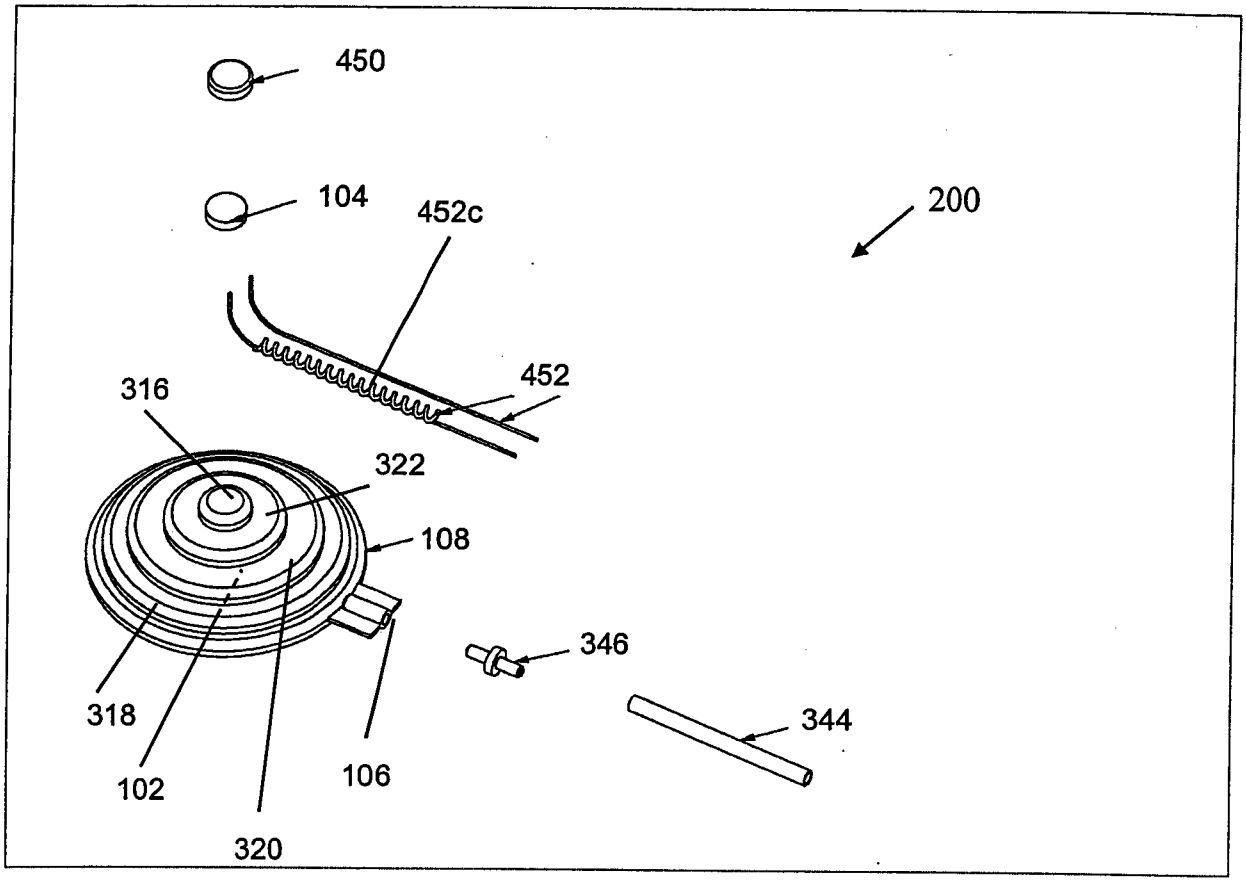

Figure 4

INTERNATIONAL SEARCH REPORT

International application No.
PCT/SG20 11/000454

A. CLASSIFICATION OF SUBJECT MATTER

Int. CI.

A61H 15/00 (2006.0 1) ***A61H 23/02*** (2006.0 1)

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)

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

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI: A61H/- & keywords [massag+; air+, inflat+; (electr+, motor+, tapp+, roll+, vibrat+) 6d (inside, inner, within, interior?)];
A61H15/- & keywords [(air) 3w (bag?, cushion+, bladder?, cell?, mat?); electr+, motor+, tapp+, roll+, vibrat+]

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	**CN 201 870915 U (TIANWEN HE) 22 June 201 1** **Abstract, Figure 1**	**1-4, 8-19**
X	**CN 201 55821 8 U (ZHANG C) 25 August 2010** **Abstract, Figure 1**	**1-2, 8-19**
X	**CN 201906124 U (GUANGYUN HAN) 27 July 201 1** **Abstract, Figures 1-2**	**1-2, 8-19**
X	**CN 201239325 Y (GUOLIN ZENG) 20 May 2009** **Abstract, Figures 1-2**	**1-3, 8-19**

[X] **Further documents are listed in the continuation of Box C** [X] **See patent family annex**

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"Y" **document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art**

"&" **document member of the same patent family**

Date of the actual completion of the international search	Date of mailing of the international search report
10 February 2012	17 February 2012
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustralia.gov.au Facsimile No. +61 2 6283 7999	Authorized officer **Irina Talanina** AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No : +61 2 6283 2007

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 201768138 U (CHONGQING INCARE MED TECHNOLOGY CO LTD) 23 March 2011 Abstract, Figures 1-2	1-2, 8-19
X	CN 201 182735 Y (JI WANG) 2 1 January 2009 Abstract, Figures 1-2, 4	1-3, 8-19
A	US 2010/0063430 A1 (DEHLI) 11 March 2010 Abstract	1-19
A	US 7614168 B1 (ZUMMER et al.) 10 November 2009 Abstract, Figures 5B, 8B	1-19

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/SG201 1/000454

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Member					
CN	201 87091 5U	NONE					
CN	201558218U	NONE					
CN	201906124U	NONE					
CN	201239325	NONE					
CN	201768138U	NONE					
CN	201182735	NONE					
US	2010063430	CA	2524341	EP	1628552	US	2005004497
		US	7604606	US	8021313	WO	2004100571
US	7614168	NONE					

Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.

END OF ANNEX