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(71) Applicant and  
(72) Inventor: BAUM, Aaron, Wolf [US/US]; 960 Natoma Street #3, San Francisco, CA 94103 (US).

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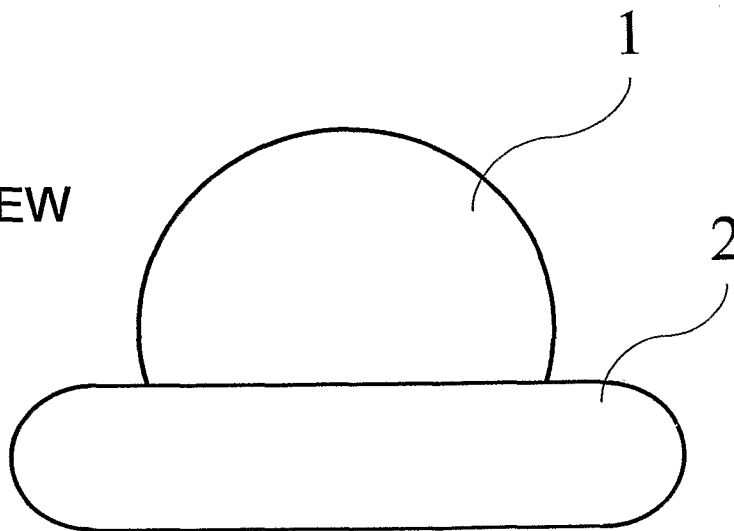
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(54) Title: HUMAN-BEARING INFLATABLE DEVICE

SIDE VIEW



(57) Abstract: An inflatable device serving in one or more roles as furniture and /or equipment for exercise, recreation, and /or therapeutic equipment, or in some combination of these functions is disclosed. The device consists of an inflatable base (2) with one or more cavities or holes, with rounded inflatable spheroid(s) (1) in said cavities or holes. The device may optionally include a system of straps (3 and 4) or a form-fitting covering around the base, which may serve to correct an asymmetry in said base. The device may include a weighted base (11). The device may also include means for generating lights, sound, and/or video (6, 7, 8, 9, 10, 12, and/or 13) responsive to the actions of users on or around the device.

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**TITLE OF INVENTION:**

**HUMAN-BEARING INFLATABLE DEVICE**

**CROSS-REFERENCE TO RELATED APPLICATIONS**

Not applicable.

**STATEMENT REGARDING FEDERALLY SPONSORED R & D**

Not applicable.

**REFERENCE TO SEQUENCE LISTING, A TABLE, OR A COMPUTER PROGRAM  
LISTING COMPACT DISK APPENDIX**

Not applicable.

**BACKGROUND OF THE INVENTION**

The present invention relates to human-bearing inflatables and more particularly pertains to multi-function inflatables serving in one or more roles as furniture or as exercise/recreation/therapy equipment.

Human-bearing inflatables are used as furniture as well as

exercise, recreational, and therapy devices. However, few devices of the prior art are significantly multi-function, and none combine the benefits of low cost, robustness, and multi-functionality. Simple, rounded shapes with minimal seams and seals offer the highest robustness and lowest manufacturing costs, but generally lack multifunctionality. For example, large rubber and PVC balls ("Swiss balls", "Pilates balls", etc.) are widely used for exercise and therapy, but their tendency to roll makes them unsafe for inexperienced users and limits their usefulness as furniture. Ball chairs and ball supports, which hold a ball in a shallow plastic or metal ring, require non-inflatable and costly additional components and do not support intensive recreational-exercise activities. Inner tubes, which, like balls, are also a low-cost and robust shape, are limited by their shape to a few recreational uses, even with added handles, tow points, etc. (E.g. US patent #5,476,404.) Furthermore, mass-produced inner tubes are often unattractively asymmetrical when inflated outside of tires.

#### **BRIEF SUMMARY OF THE INVENTION**

In accordance with the present invention, an inflatable device comprises an inflated spheroid and an inflated base sized so as to fit together to form a stable form suitable for seating, recreation and/or

exercise. These can consist of mass-produced molded components (i.e. an exercise ball and a mass-produced inner tube), providing a high degree of robustness at low cost.

The device may include one or more additional options. It may include a system of straps or a form-fitting covering for correcting some asymmetry in the base form. It may include equipment for controlling and-or generating sound, lights and-or video responsive to the actions of person(s) on or around the device. It may also incorporate a weighted bottom to prevent excessive movement during use.

### **Objects and Advantages**

Accordingly, besides the objects and advantages of the human-bearing inflatable described in my above patent, several objects and advantages of the present invention are:

- (a) to form a human-bearing inflatable device capable of serving as furniture and/or equipment for exercise, recreation, and/or therapy;
- (b) to reduce the cost of manufacturing by employing mass-produced components;
- (c) to form a highly portable human-bearing inflatable device;

- (d) to form a highly robust human-bearing inflatable device;
- (e) to provide, optionally, a simple means for correcting any asymmetry in the base component;
- (f) to provide, optionally, a sound, lights, and/or video show responsive to users' movements; and
- (g) to incorporate, optionally, a weighted bottom to prevent excessive movement during use.

Still further objects and advantages will become apparent from a consideration of the ensuing description and drawings.

#### BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

In the drawings, drawings relating to the same embodiment have the same number but different alphabetic suffixes.

Fig 1A is a top view of the simplest embodiment of the invention.

Fig 1B is a side view of the embodiment shown in Fig 1A.

Fig 1C is a bottom view of the embodiment shown in Fig 1A.

Fig 1D is a sectional view of the embodiment shown in Fig 1A.

Fig 2A is a top view of an embodiment of the invention incorporating a means for correcting some asymmetry in the base component.

Fig 2B is a side view of the embodiment shown in Fig 2A.

Fig 2C is a bottom view of the embodiment shown in Fig 2A.

Fig 2D is a sectional view of the embodiment shown in Fig 2A.

Fig 3A is a top view of an embodiment of the invention incorporating a means for generating a sound, lights, and/or video show responsive to users' movements using sensors and DSP.

Fig 3B is a side view of the embodiment shown in Fig 3A.

Fig 3C is a bottom view of the embodiment shown in Fig 3A.

Fig 3D is a sectional view of the embodiment shown in Fig 3A.

Fig 3E is a detail view of the sectional view shown in Fig 3D.

Fig 3F is a schematic illustration of the functional relationships between the interactive components of this embodiment.

Fig 4A is a top view of an embodiment of the invention incorporating a means for generating a sound, lights, and/or video show responsive to users' movements using switches.

Fig 4B is a side view of the embodiment shown in Fig 4A.

Fig 4C is a bottom view of the embodiment shown in Fig 4A.

Fig 4D is a sectional view of the embodiment shown in Fig 4A.

Fig 4E is a detail view of the sectional view shown in Fig 4D.

Fig 4F is a schematic illustration of the functional relationships between the interactive components of this embodiment.

Fig 5A is a top view of an embodiment of the invention incorporating a means for weighting the bottom of the device to prevent excessive

movement.

Fig 5B is a side view of the embodiment shown in Fig 5A.

Fig 5C is a bottom view of the embodiment shown in Fig 5A.

Fig 5D is a sectional view of the embodiment shown in Fig 5A.

Although the drawings show a scale and suggest certain proportions between elements of the illustrated embodiments, the invention is intended to encompass a range of sizes and proportions appropriate for the multiple functions described and users of all sizes.

#### Reference Numerals in Drawings

- 1 inflatable spheroid
- 2 inflatable base
- 3 straps surrounding base
- 4 inside diameter-defining strap
- 5 straps crossing underside of device
- 6 light source
- 7 sound generator
- 8 video generator
- 9 analog to digital converter
- 10 sensor



11 weight

12 digital signal processor

13 switch

## DETAILED DESCRIPTION OF THE INVENTION

### Figs 1A–1D: Preferred Embodiment

Figs 1A–1D depict a preferred embodiment of the invention. In this embodiment, the device is composed of an inflatable spheroid 1 and an inflatable base 2 with a center hole, sized so that said spheroid sits securely in said hole. In a preferred embodiment, the spheroid is made of rubber or PVC, similar to any large exercise or “Pilates” ball. Alternatively, it may be made of any material forming a rounded shape that can support the weight of a person. In additional preferred embodiments, said spheroid is an ellipsoid, egg–shape, rounded–end cylinder, or another generally rounded shape fitting securely into the opening of base 2.

In a preferred embodiment, said base 2 comprises an inner tube, such as those used in car, truck, and tractor tires. In additional embodiments, said base comprises an inflatable form with one or more

cavities or holes in which one or more spheroid(s) of said type may sit securely. Said base can be made from rubber, PVC, neoprene, or other material appropriate for a human-bearing inflatable. In an additional embodiment, the spheroid and/or base incorporate handles.

In accordance with the present invention, alternative embodiments may use proportions between the base form and the spheroid form different from those shown in the figures to optimize the device for a particular mode of use. The spheroid 1 and base 2 may be sized to seat individuals of a particular size on the base 2 with the spheroid 1 as a back rest. In this application, an ellipsoidal or cylindrical spheroid may be employed to provide a better back rest. Alternatively, the spheroid 1 and base 2 may be sized to seat individuals of a particular size on the spheroid 1 with the base 2 as a foot rest. For other uses, the optimal proportions will be apparent to anyone skilled in the art.

A pad may be placed around the device (or incorporated into the device) in any of the described embodiments to prevent injury in case a user falls off of the device.

**Figs 2A–2D: Additional Embodiment**

Figs 2A–2D depict an embodiment similar to that of Figs 1A and 1B, with the addition of a system of straps 3 and 4 surrounding the base 2. In a preferred embodiment, this system consists of a set of straps encircling the base in several places as shown in the figures. The base-surrounding straps 3 can be kept in their proper positions by fixing them to an additional strap 4 encircling the base's inner diameter. The straps 3 and 4 may consist of nylon, polypropylene, fabric, rubber, or any other material strong and flexible enough to surround the base while deflated, inflated, and under use. The pictures show four base-surrounding straps 3. In accordance with the invention, however, the system could include any number of such straps.

In a preferred embodiment, each base-surrounding strap 3 may include a buckle, snap, velcro, or other closure device to allow the system to be easily installed and removed. Said closure devices may allow the lengths of the straps to be changed individually. In an alternative embodiment, each of these straps 3 is sewn together around the base. In either case the base-surrounding straps 3 can correct for asymmetry in the base by constraining its expansion as it inflates. This system may serve additional or alternative purposes, such as to provide attachment points for a decorative or protective covering, handles, head rest(s), foot rest(s), sensors, switches, lights, speakers, etc. An example of such use

is shown in Figs 3A–3F and Figs 4A–4F.

As an alternative embodiment, the system around the base consists of a form-fitting covering, rather than, or in addition to straps. This covering may serve to correct asymmetry by constraining the expansion of the base as it is inflated; it may also provide attachment points for an additional decorative/protective covering as mentioned above. This form-fitting covering may consist of fabric, mesh, neoprene, rubber, or some combination of these or other materials capable of serving one or more of the above-mentioned purposes.

Additional embodiments include having a head rest on top of the spheroid, an injury-preventing pad extending around the edge of the base, handles attached to the straps, or some combination of these additional elements.

It will be evident to those skilled in the art that the above-described straps, covering(s), handles, etc. may be employed on any of the following embodiments as well.

**Figs 3A–3F: Additional Embodiment**

Figs 3A–3F illustrate an embodiment of the present invention incorporating components to generate some combination of sound, lights, and/or video responsive to user(s) actions on and/or around the device. Components 6, 7, 8, 9, 10, and 12 are attached to additional straps 5 which run across the bottom of the device and are anchored to the base itself or to the straps/covering. Fig 3F shows the functional relationship of these components.

As shown in Fig 3E, one or more sensor elements 10 can be positioned between a strap 5 and spheroid 1 to detect and/or measure users' activity on spheroid 1. The sensor 10 may be a pressure sensor such as piezoresistors, or a quantum-tunneling composite (such as those available from Peratech Ltd.). It may incorporate voltage sources and/or voltage dividers to generate a signal measurable by analog to digital converter 9. Such pressure sensors may also be placed under various parts of the device (such as under the base 2, or off-center under spheroid 1) to sense the weight and movement of users on various parts of the device. In further additional embodiments, other types of sensors may be placed on or around the device to sense user activity in those areas. These may be accelerometers, proximity sensors (electromagnetic-, IR-, or ultrasound-based), photosensors, piezoelectric

sensors, microphones, temperature gauges, or other type(s) which can detect or measure the activity of users on or around the device.

The functional connections of the interactive components are illustrated in Fig 3F. The sensors' output attaches to the input of the analog to digital converters 9. The digital output of said converters is connected to the digital signal processor (DSP) 12, the output of which connects to some combination of light source(s) 6, sound generators 7, and/or video generators 8. The digital signal processor 12 consists of computer(s) and/or circuitry capable of translating digital sensor data into analog voltages and/or digital data to control the actuators 6-8. In a preferred embodiment, said DSP 12 consists of a digital computer with appropriate ports and programming. The output of DSP 12 is some combination of analog audio (e.g. mono, stereo, Dolby 5.1, etc.), analog video (e.g. composite, S-video, RGB, HD, VGA, etc.), other voltage output (e.g. control signals), digital audio (e.g. SPDIF, Firewire audio, digital Dolby surround, etc.), digital video (e.g. DV, DVI, etc.), and/or digital control signals (e.g. MIDI, RS-232, USB, Firewire, etc.).

The light sources 6 are some combination of light bulbs, rope lights, LEDs, electroluminescent material, or other light source (with any necessary power supply or control circuitry) whose output can be controlled by control signals (analog or digital) output by DSP 12.

Figures 3C and 3D show such a light source underneath the device; however, they may also be on or around the device.

In a preferred embodiment, the sound generator(s) 7 consist of one or more amplifiers connected to one or more speakers. In additional embodiments, said sound generators include audio synthesis capabilities controlled by the DSP 12 (e.g. by MIDI signals). Portions of sound generator 7 may be incorporated in the device (e.g. Fig 3C) while other portions (such as speakers) may be external to the device.

In a preferred embodiment, the video generator 8 comprises one or more computers programmed to create video output in response to control signals from DSP 12. Alternatively it may comprise a dedicated video synthesizer/generator operating in response to control signals from the DSP 12. In either case the video generator 8 may be connected (using an analog or digital signal) to one or more display devices such as a CRT, video projector, plasma screen display, LCD, etc. The DSP 12 may also feed video directly to such display device(s) without use of a video generator 8.

**Figs 4A–4F: Additional Preferred Embodiment**

Figs 4A–4F illustrate an embodiment of the present invention allowing for switches 13 to control the interactive components 6, 7, and/or 8, without requiring a DSP 12. Additional straps 5 across the bottom of the device provide anchor points for components 6, 7, 8, and 13.

Fig 4F shows the functional relationship of these components. In this embodiment, user(s) actions actuate switches 13 which directly control the output of some combination of light sources 6, sound generators 7, and/or video generators 8. In a preferred embodiment, the switches 13 consist of mechanical switches or quantum tunneling composite switches. In this embodiment, the switches 13 vary in resistance according to user(s) actions, controlling the flow of current to components 6, 7, and/or 8. In an alternative embodiment, the switches 13 incorporate circuits, such as voltage dividers, to generate voltages which control components 6, 7, and/or 8. The switches 13 may include sensors such as piezoresistors, quantum-tunneling composites, accelerometers, proximity sensors (electromagnetic-, IR-, or ultrasound-based), photosensors, piezoelectric sensors, microphones, temperature gauges, or any other sensor which can control current flow or generate a voltage in response to the presence and/or activity of users.



**Figs 5A and 5B: Additional Preferred Embodiment**

In this embodiment, a weight 11 is incorporated into the device by attaching it to the system of straps 3 and 4. In a preferred embodiment, the weight 11 is a hollow container of plastic, fabric, rubber, or other appropriate material, filled with a dense material such as water, sand, or lead shot. Alternately it may consist of any shape fitting below the device weighing enough to substantially limit displacement of the device when used. The weight may also be incorporated into the spheroid 1 and/or the base 2, either as an additional fillable compartment in one or both inflatables or by placing a dense material in one or both inflatables. Weighting of the device as described may be incorporated into any of the previously described embodiments.

## Advantages

From the description above, a number of advantages of the described inflatable device become apparent:

(a) The device can be used as furniture and/or as equipment for exercise, recreation, and/or therapy.

(b) The device can be formed from inexpensive mass-produced components.

(c) The device can be highly compact and portable when deflated.

(d) The device can be robust enough for vigorous use.

(e) Asymmetry in inflated components can be easily corrected.

(f) The device can provide a sound, lights, and/or video show responsive to users' activity.

(g) The device can be weighted to prevent excessive displacement during use.

## Operation of Preferred Embodiment

In its most basic preferred embodiment (shown in Figs 1A and 1B), the device has multiple potential uses as furniture and as equipment for exercise, recreation, and/or therapy. One or more users may sit, and/or bounce on the base 2, using the spheroid 1 as a back rest. A user may sit on the spheroid 1, placing feet on the base 2 or on the ground. An additional, smaller form of the device can be used as a foot rest. Users can also lie on the spheroid 1 or the base 2, stand on the base 2, lean on the base 2, kneel on the base 2, or position themselves on the device in a variety of ways. In an embodiment including handles, users may grasp the handles while lying supine or prone on the spheroid 1 for an upper body stretch or workout.

For exercise, recreation, or therapy, users can bounce or stretch in any of the above positions, perform stretches over the spheroid 1, perform floor exercises with parts of their bodies on the device, or enjoy any number of other positions and activities. Most ball-based exercises can be performed on the device, with the added safety of the stability provided by the base 2. New exercises are also made possible, such as balancing on the stabilized spheroid 1. The spheroid 1 can also be removed from the base 2 to perform conventional ball exercises.

The addition of straps or a form-fitting covering on the base 2 (e.g. Figs 2A and 2B) allows for the correction of some asymmetry in the base 2, as well as providing attachment points for additional decorative/protective coverings or interactive components. The correction may be achieved by selective tightening of the straps 3 surrounding the base 2, or the straps/covering may be manufactured in a form that will enforce symmetry as the base 2 is inflated. A covering of the base 2 may protect from sharp objects, abrasion, sunlight, and/or excessive temperature.

In the interactive embodiments (e.g. Figs 3A-3F and 4A-4F), users may interact with the device in any of the above-described ways, with the device providing lights, sound, and/or video responsive to user(s) activity. In the DSP-based embodiment (i.e. Figs 3A-3F), sensors 10 detect and/or measure the presence, movement, and/or weight of users. The sensor signals are digitized by the A/D converters 9; this digital data is then used by the DSP 12 (which may include digital and/or analog outputs) to drive some combination of light sources 6, sound generators 7, and/or video generators 8. A multimedia show controlled by the user(s) is thus created. In a preferred embodiment, the sensors 10 are pressure sensors generating a waveform representing a user's bouncing on the device. In this preferred embodiment the DSP 12 converts the pressure data into music, flashing lights, and/or a video show (by driving

corresponding components 7, 6, and 8), with a rhythm matching that of the user's bouncing, encouraging further use.

In the switch-based embodiment (i.e. Figs 4A-4F), the presence, movement, and/or weight of users affects the output of switches 13. The switch output directly controls some combination of light sources 6, sound generators 7, and/or video generators 8. A multimedia show controlled by the user(s) is thus created. In a preferred embodiment, the rhythm of the generated show matches that of a user's activity.

In the additional embodiment incorporating a weight 11, the mass of the device is increased and its center of gravity lowered, reducing the device's movement during intensive use. In a preferred embodiment, the weight 11 is hollow, so that it may be shipped or transported empty.

### **Conclusion, Ramifications, and Scope**

Accordingly, the reader will see that the inflatable device of this invention can be used as furniture and as exercise / recreational / therapeutic equipment. It can be constructed from inexpensive components (i.e. exercise balls and inner tubes). Asymmetry in the base can be corrected easily, ensuring the device's attractive appearance. The

device can respond interactively to user(s) actions by generating lights, sound, and/or video responsive to their actions, enriching the experience of using the device and making it an audio-visual instrument. It can also be weighted to prevent excessive movement during intensive use.

Thus the scope of the invention should be determined by the appended claims and their legal equivalents, rather than by the examples given.

**CLAIMS:**

I claim:

1. An inflatable device serving in one or more roles as furniture, exercise device, amusement device, recreational device, and/or therapeutic device, comprising:
  - (a) an inflated form of substantially toroidal shape with a center cavity or hole; and
  - (b) an inflated form of substantially rounded shape, with a bottom portion fitting securely in said center cavity or hole, placed in said center cavity or hole.
2. The device of claim 1 wherein a plurality of straps or other covering surrounds said toroid.
3. The device of claim 1 wherein a plurality of straps or other covering surrounds said toroid, whereby some deviation in said inflated toroidal form from the ideal toroid shape is at least partially corrected.
4. The device of claim 2 wherein handles are affixed to said straps or other covering.

5. The device of claim 1 incorporating means to control one or more light, sound, and/or video sources in a way responsive to users' actions on and/or around the device.
6. The device of claim 1 incorporating a weighted bottom.
7. An inflatable device serving in one or more roles as furniture, exercise device, amusement device, recreational device, and/or therapeutic device, comprising:
  - (a) an inflated form of substantially toroidal shape with a center cavity or hole; and
  - (b) an inflated form of substantially rounded shape, with a bottom portion fitting securely in said center cavity or hole, placed in said center cavity or hole; and
  - (c) a plurality of straps or other covering surrounding said toroid.
8. The device of claim 5 incorporating means to control one or more light, sound, and/or video sources in a way responsive to users' actions on and/or around the device.
9. The device of claim 5 wherein said straps or other covering serve to at least partially correct some deviation from the ideal toroid shape in said inflated toroidal form.



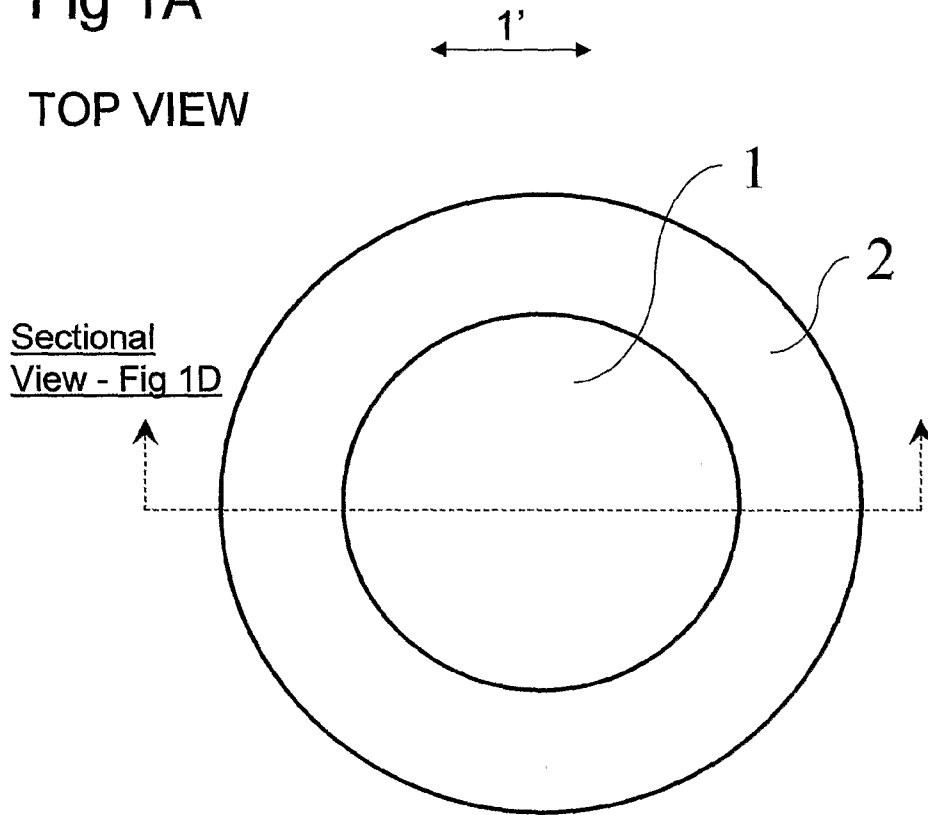
10. The device of claim 2 wherein handles are affixed to said straps or other covering.
11. The device of claim 5 incorporating a weighted bottom.
12. An inflatable device capable of bearing the weight of a human being, serving in one or more roles as furniture, exercise device, amusement device, recreational device, and/or therapeutic device, comprising:
  - (a) an inflated form with one or more cavities or holes; and
  - (b) one or more inflated forms of substantially rounded shape, each with a bottom portion fitting securely in one of said cavities or holes, placed in said cavities or holes.
13. The device of claim 12 wherein straps or other covering surrounds said toroid.
14. The device of claim 12 wherein a plurality of straps or other covering surrounds said toroid, whereby some deviation in said inflated toroidal form from the ideal toroid shape is at least partially corrected.
15. The device of claim 13 wherein handles are affixed to said straps or other covering.
16. The device of claim 12 incorporating means to control one or more

light, sound, and/or video sources in a way responsive to users' actions on and/or around the device.

17. The device of claim 12 incorporating a weighted bottom.

Fig 1A

TOP VIEW



Sectional  
View - Fig 1D

Fig 1B

SIDE VIEW

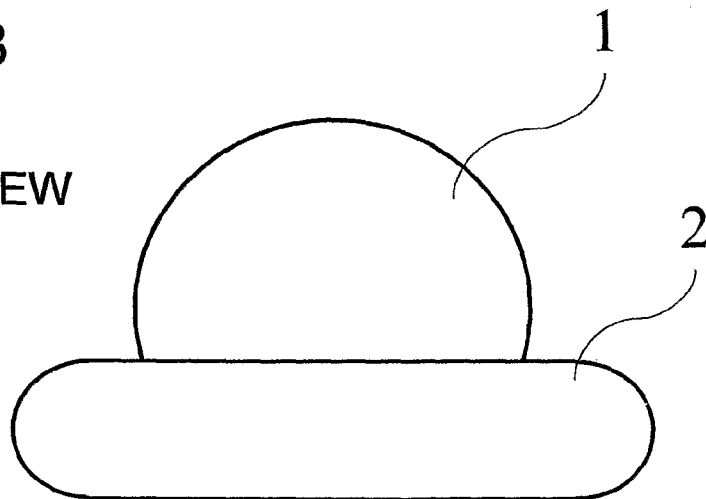


Fig 1C

BOTTOM VIEW

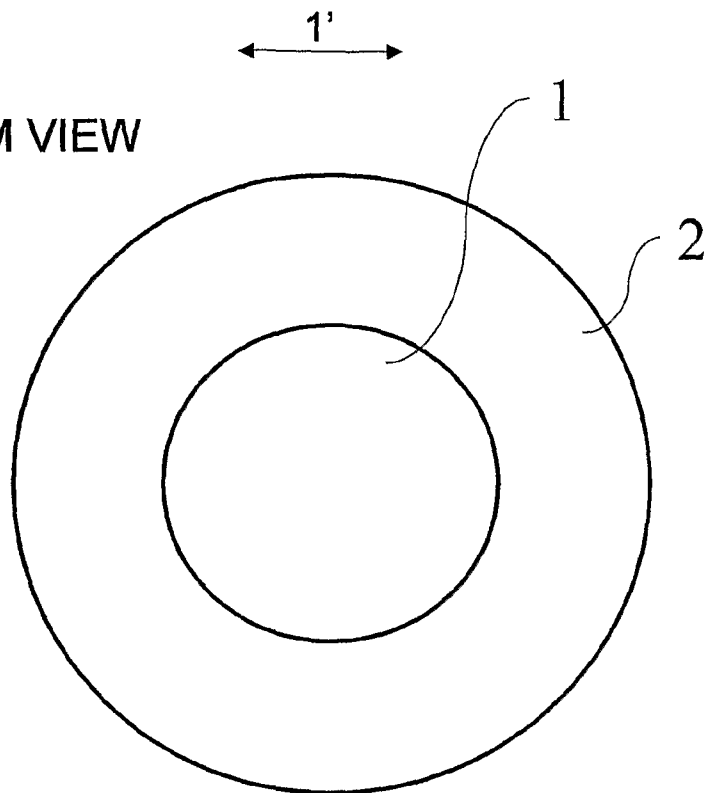


Fig 1D

SECTIONAL VIEW

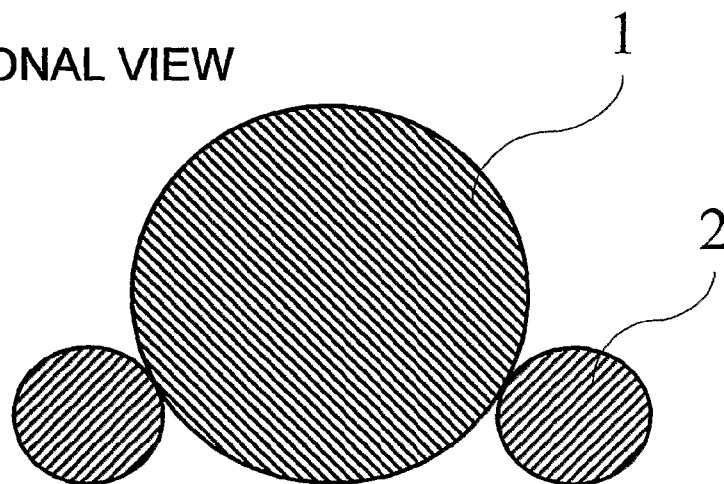


Fig 2A

TOP VIEW

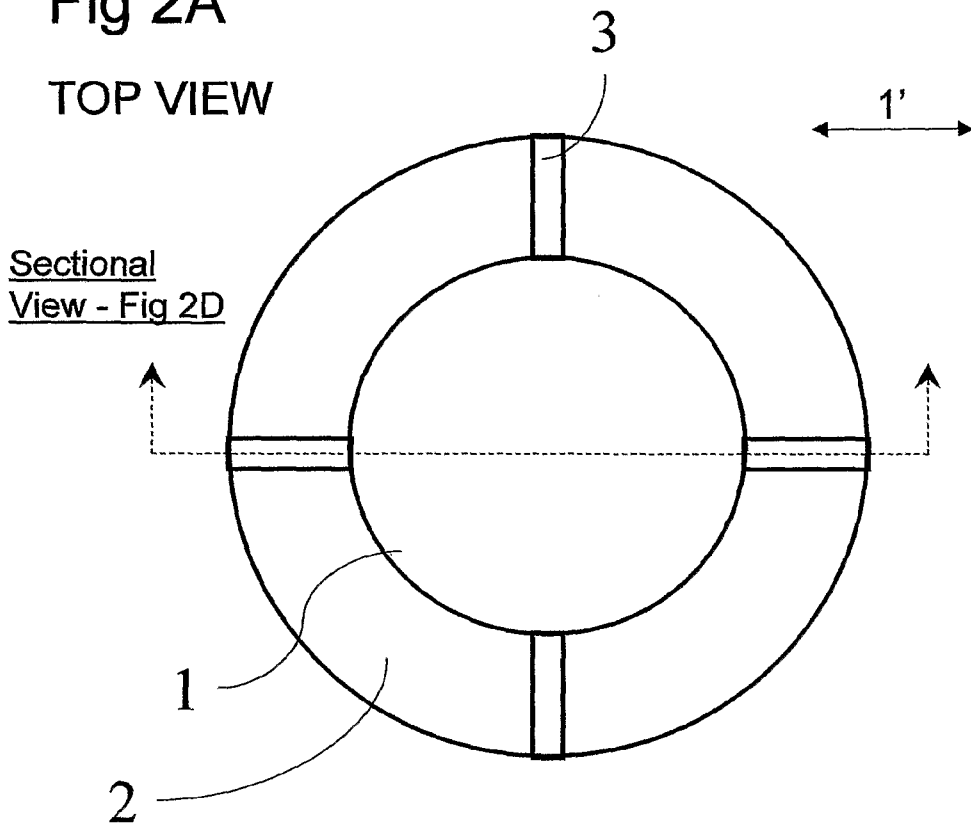


Fig 2B

SIDE VIEW

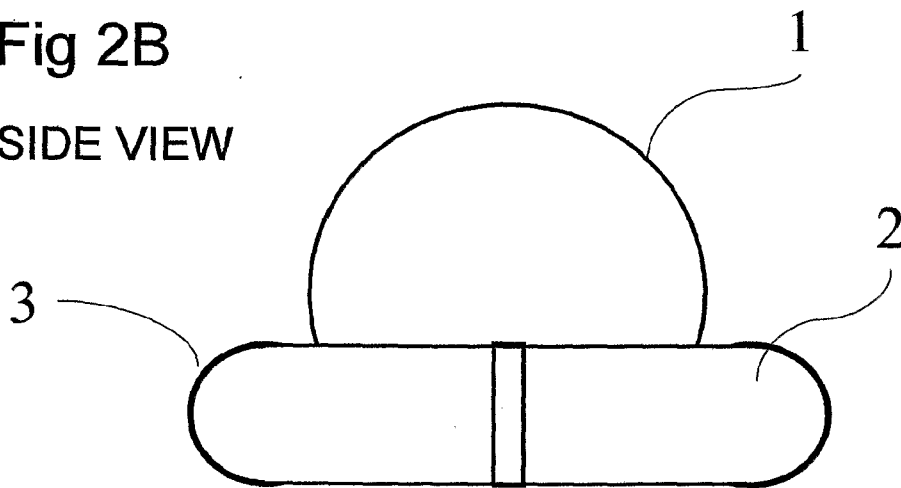


Fig 2C

BOTTOM VIEW

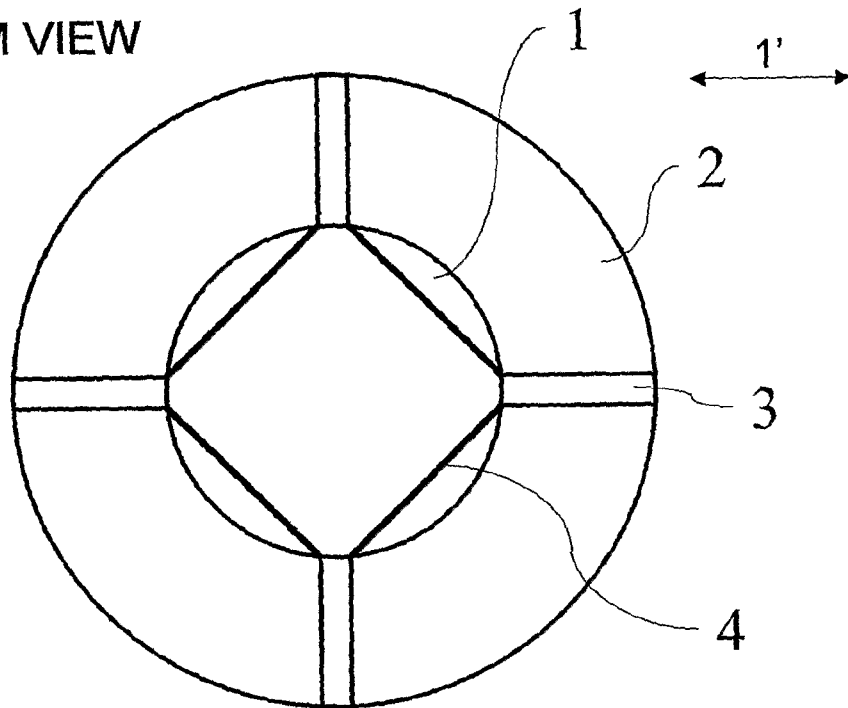


Fig 2D

SECTIONAL VIEW

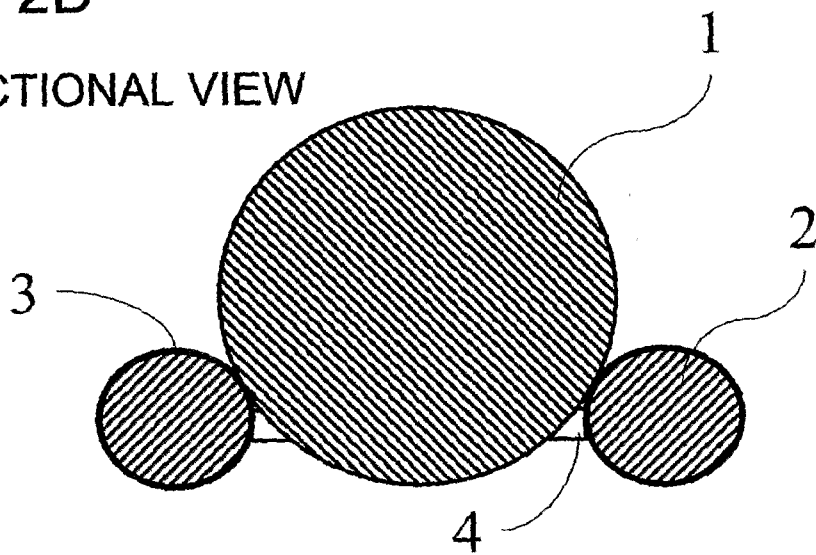


Fig 3A

TOP VIEW

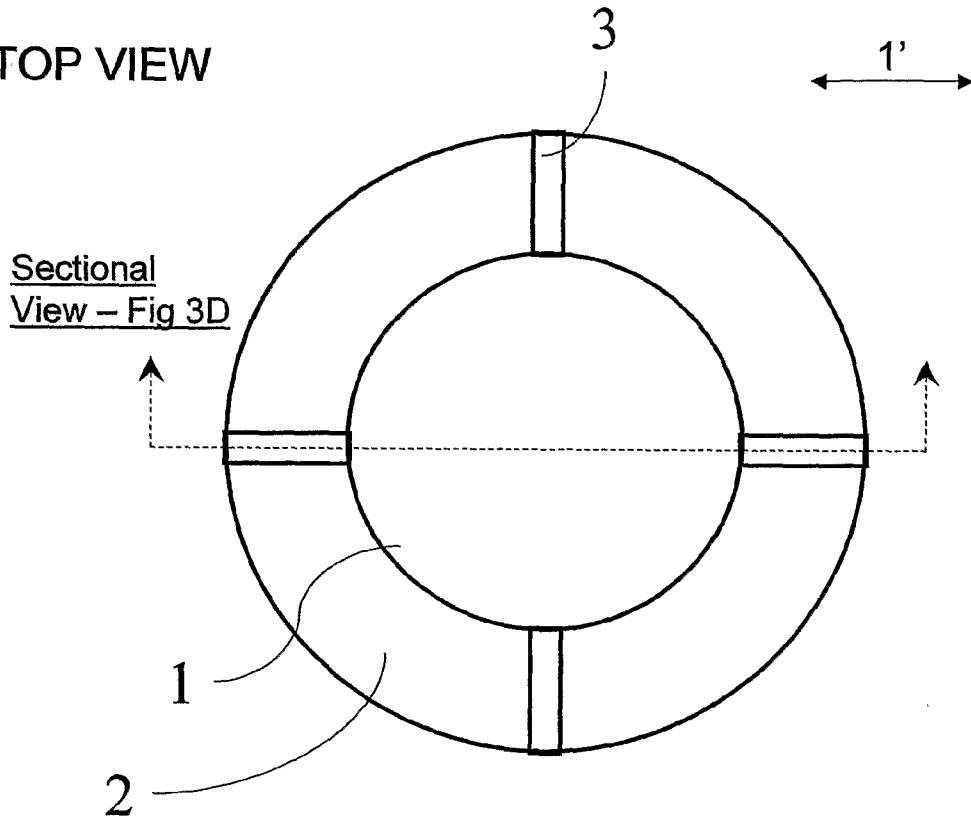


Fig 3B

SIDE VIEW

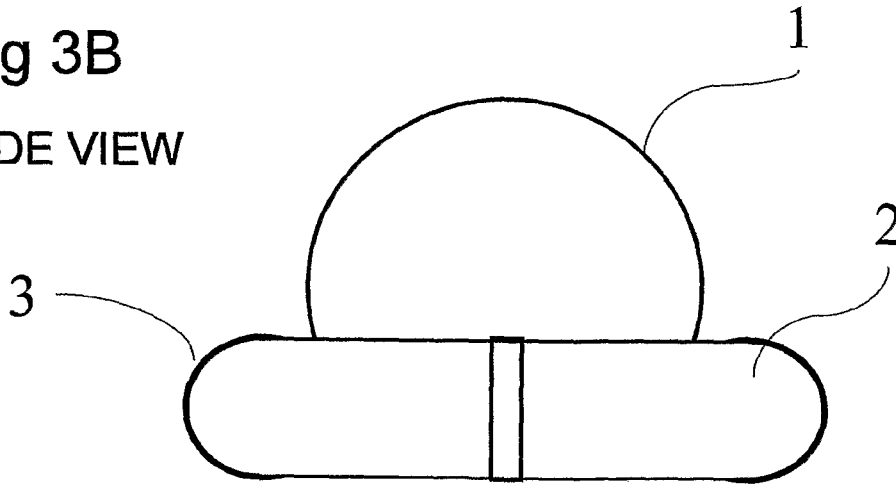


Fig 3C  
BOTTOM VIEW

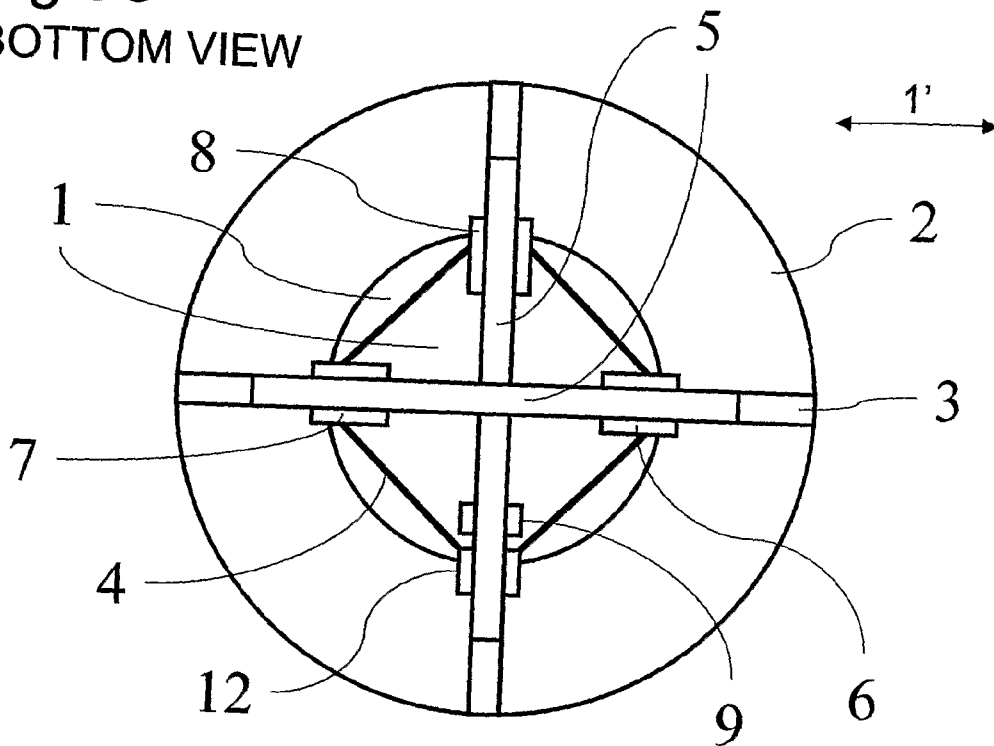


Fig 3D  
SECTIONAL VIEW

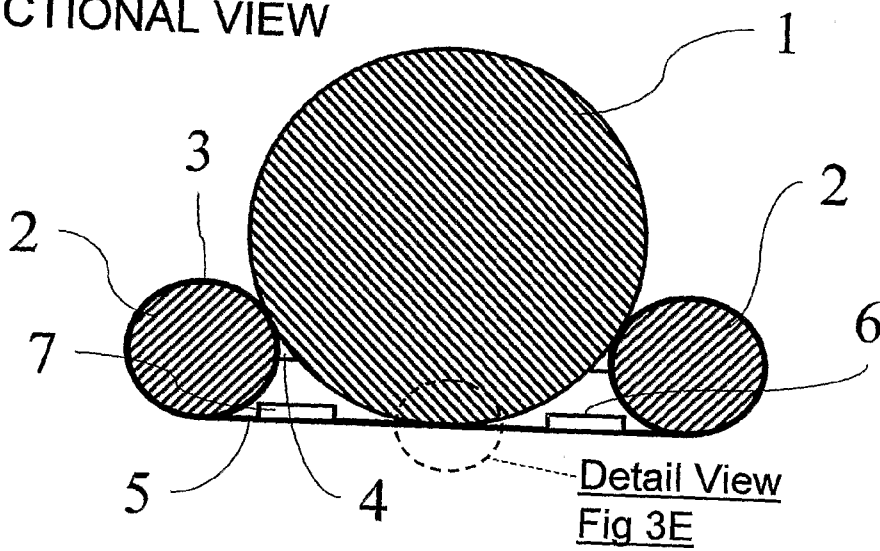




Fig 3E  
DETAIL VIEW

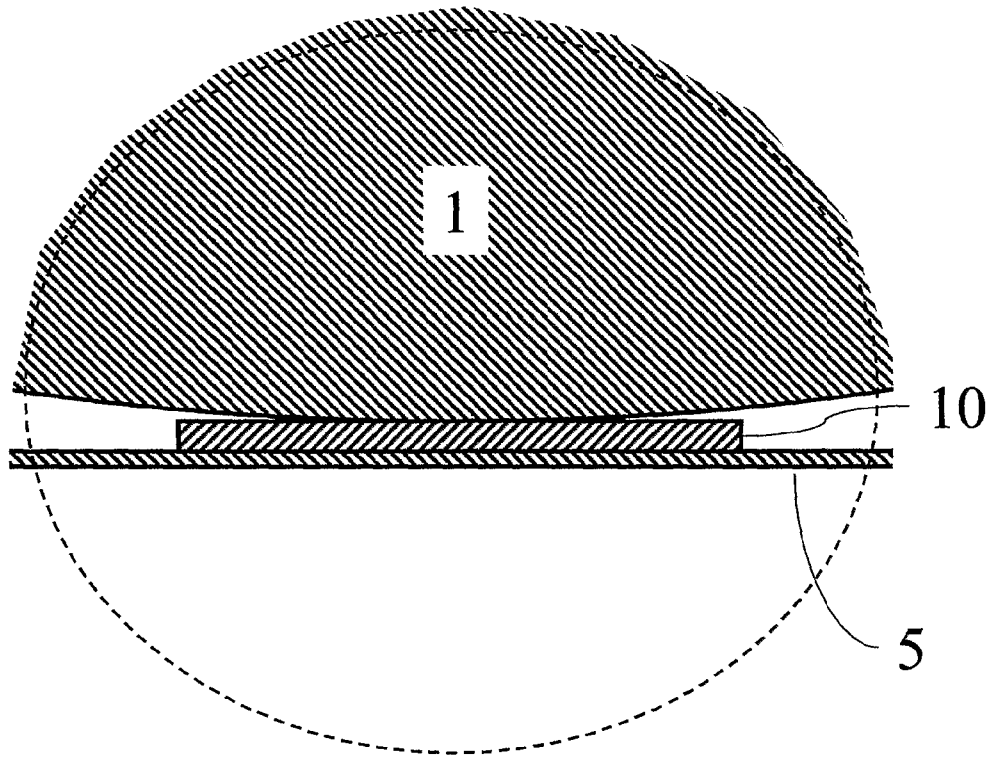


Fig 3F

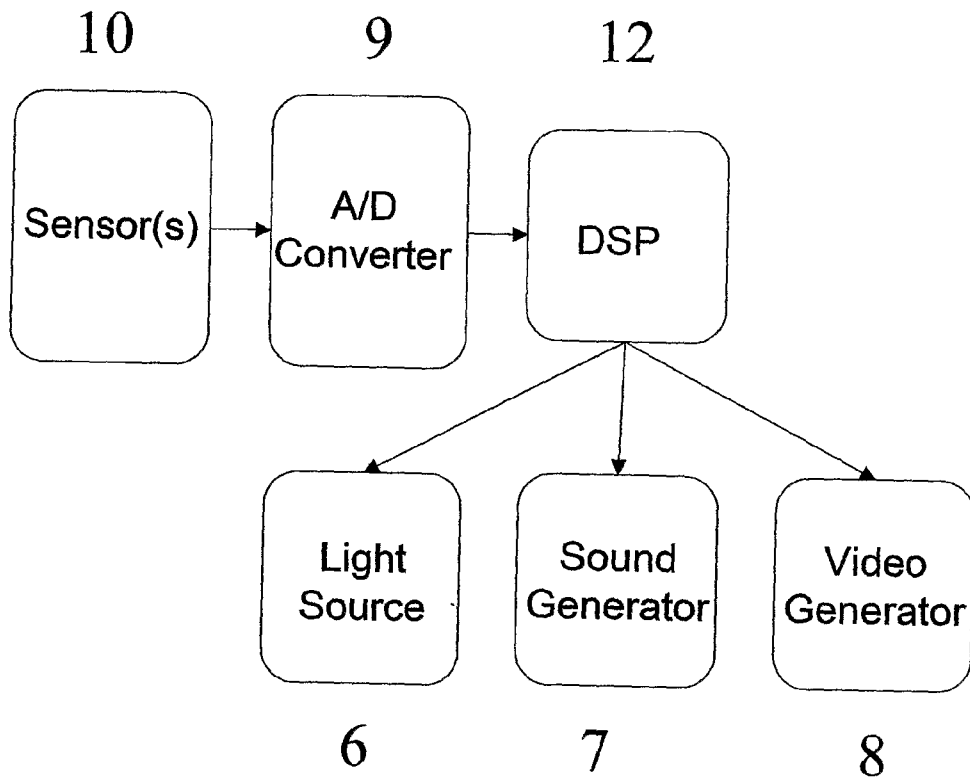


Fig 4A

TOP VIEW

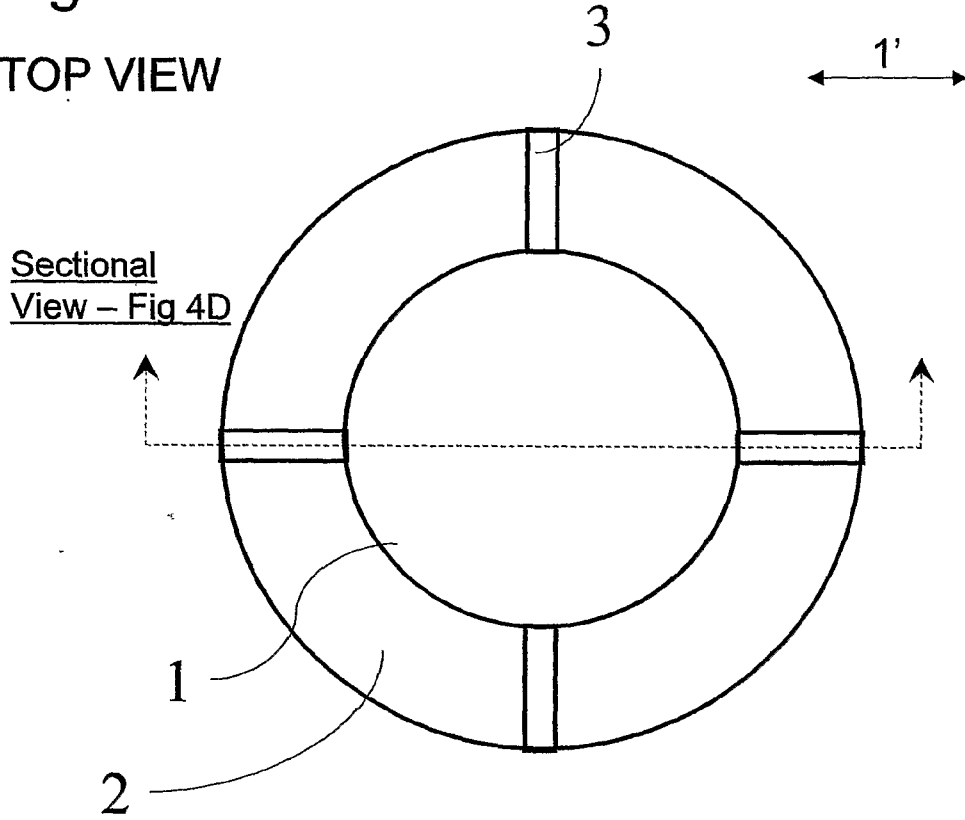


Fig 4B

SIDE VIEW

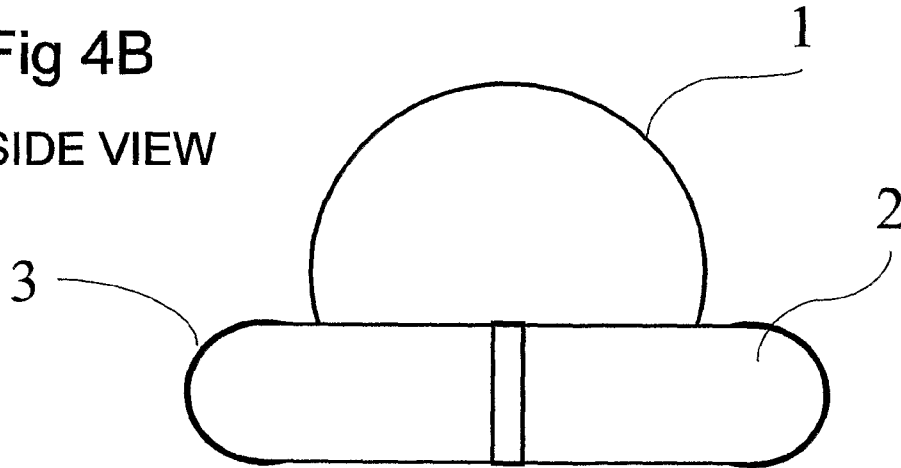


Fig 4C

BOTTOM VIEW

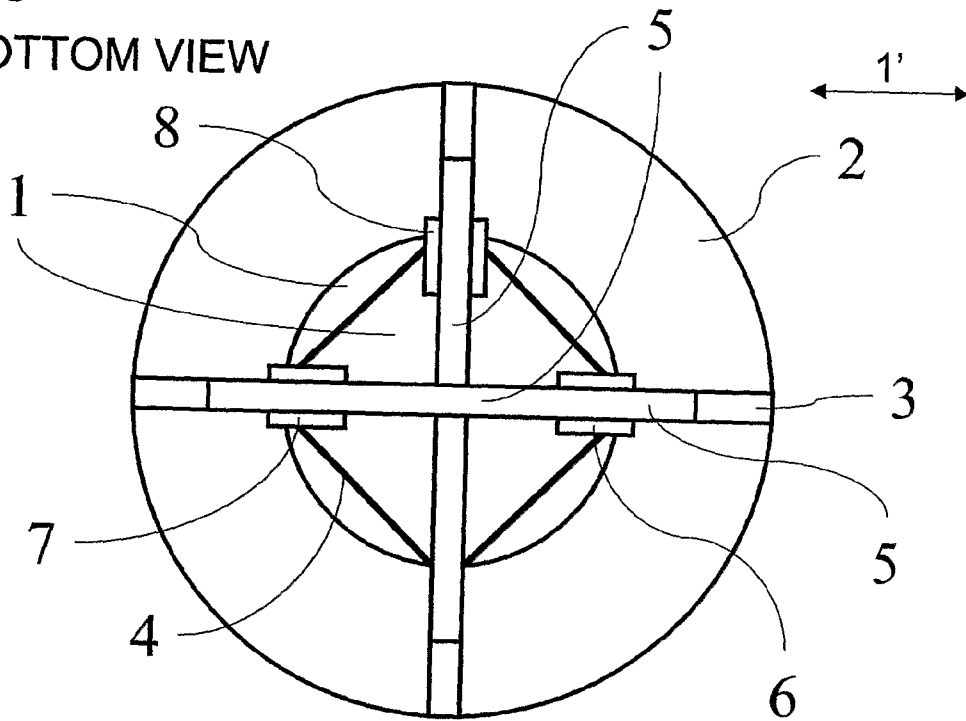


Fig 4D

SECTIONAL VIEW

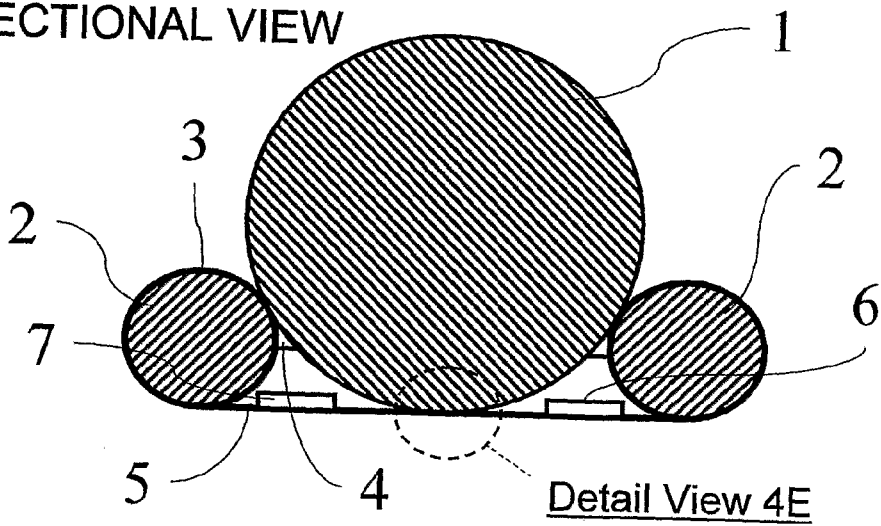


Fig 4E  
DETAIL VIEW

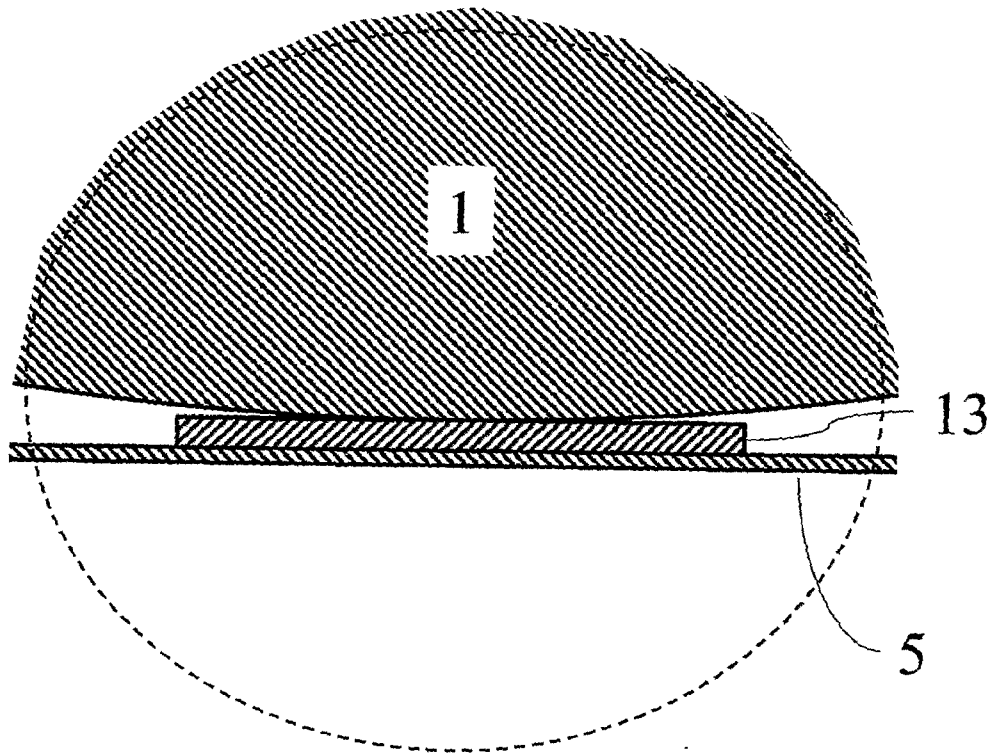


Fig 4F

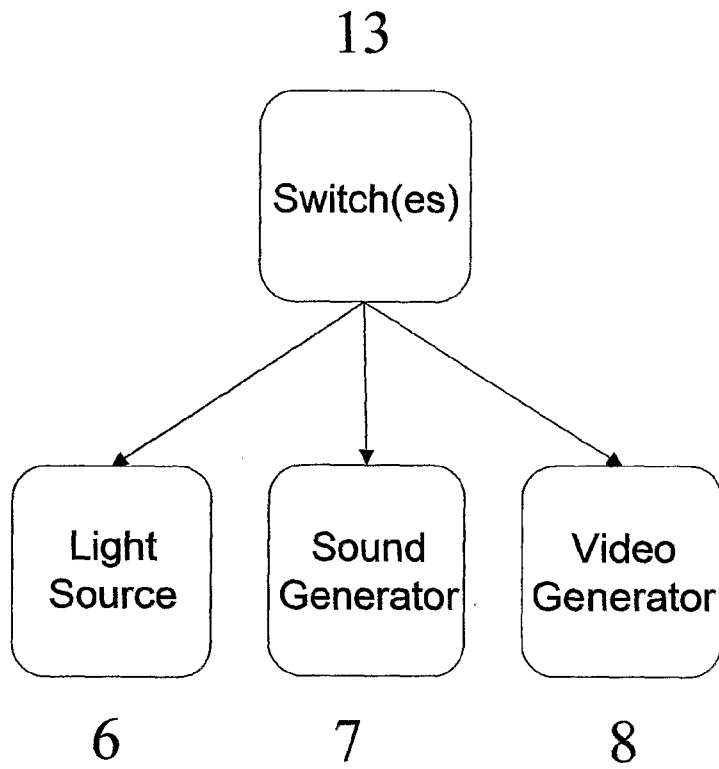


Fig 5A  
TOP VIEW

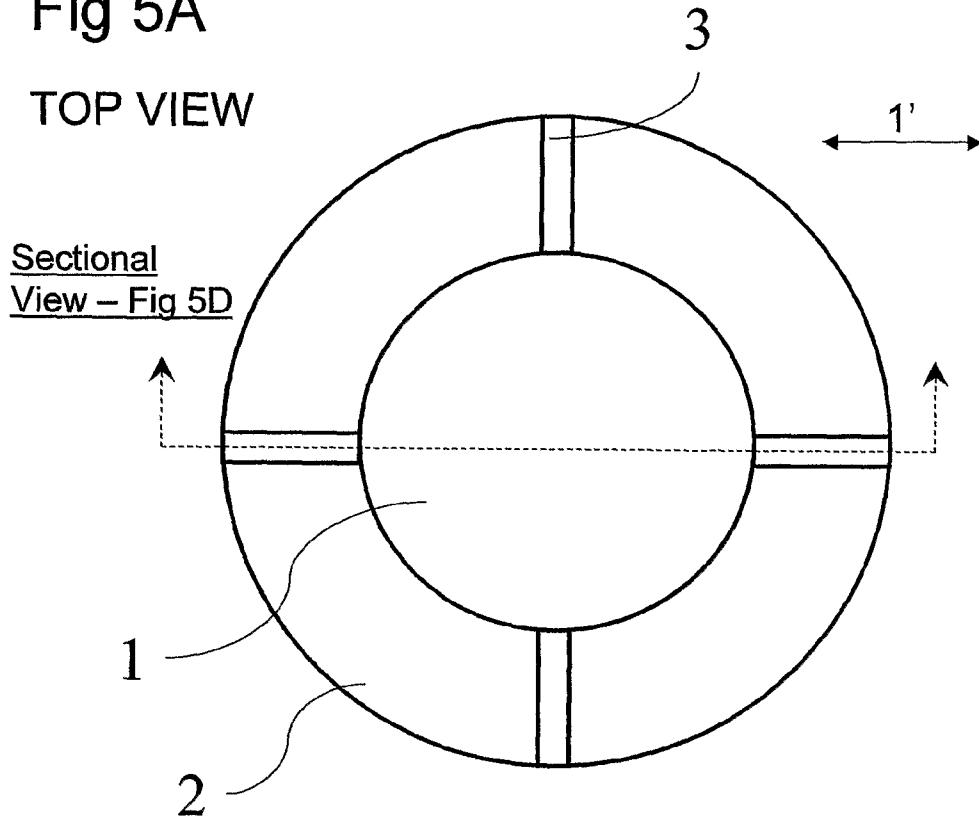


Fig 5B  
SIDE VIEW

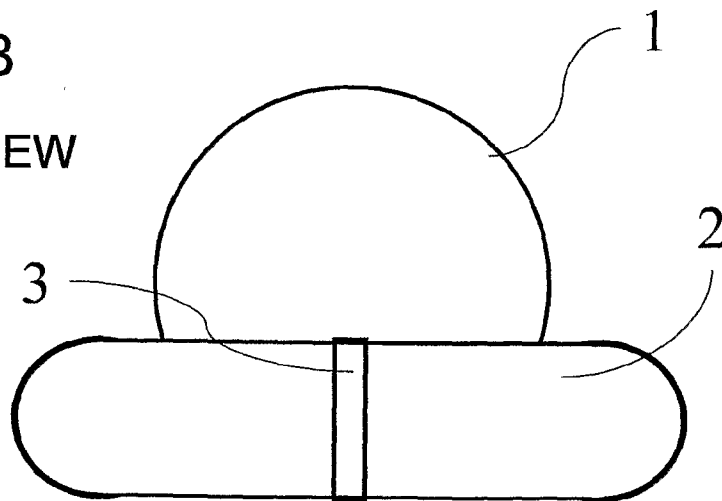


Fig 5C

BOTTOM VIEW

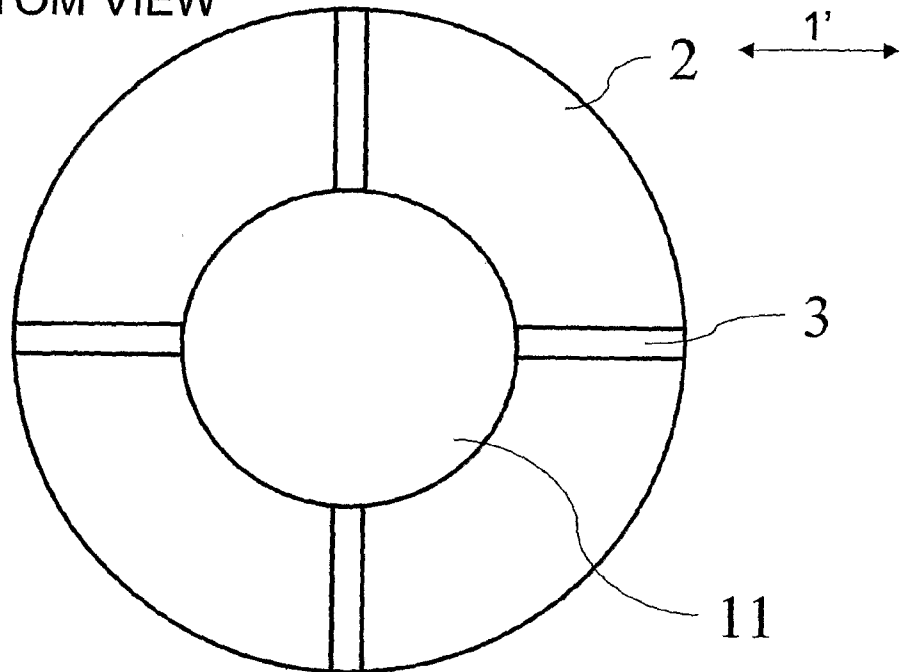
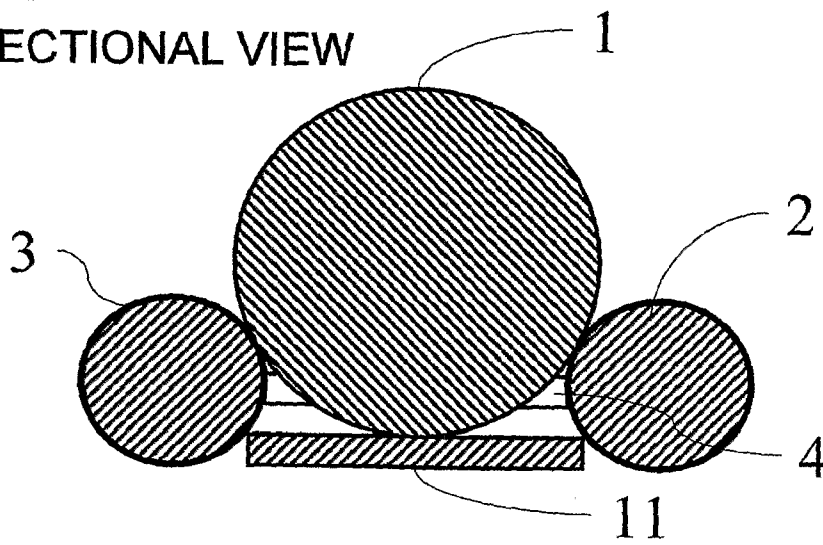


Fig 5D

SECTIONAL VIEW





# INTERNATIONAL SEARCH REPORT

International application No.

PCT/US06/10993

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC: **B63C 9/28( 2006.01)**

USPC: 441/129  
 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)  
 U.S. : 441/129

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)  
 East -- pool, donut ring, ball sphere

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X --- Y	US 4,519,605 A (LELAND) 28 MAY 1985 (28.05.1985), SEE ENTIRE DOCUMENT.	1-2, 4, 6-7, 10, 12-13, 15, 17
Y	US 5,102,131 A (REMINGTON ET AL) 07 APRIL 1992 (07.04.1992), SEE ENTIRE DOCUMENT.	5, 7-8, 16 1-17
Y	US 6,135,551 A (LINDER) 24 OCTOBER 2000 (24.10.2000), SEE ENTIRE DOCUMENT.	5, 7-8, 16
Y	US 5,476,404 A (PRICE) 19 DECEMBER 1995 (19.12.1995), SEE ENTIRE DOCUMENT.	1-17
Y	US 5,987,661 A (PETERSON) 23 NOVEMBER 1999 (23.11.1999), SEE ENTIRE DOCUMENT.	1-17
Y	US 4,847,925 A (PERRY) 18 JULY 1989 (18.07.1989), SEE ENTIRE DOCUMENT.	1-17

Further documents are listed in the continuation of Box C.       See patent family annex.

* Special categories of cited documents:	
"A" document defining the general state of the art which is not considered to be of particular relevance	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E" earlier application or patent published on or after the international filing date	"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
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"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
"O" document referring to an oral disclosure, use, exhibition or other means	"&" document member of the same patent family
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search 10 March 2007 (10.03.2007)	Date of mailing of the international search report <b>21 MAR 2007</b>
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Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (571) 273-3201	Authorized officer Allen Shoap <i>A. Hurley</i> Telephone No. (571) 272-4391
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