United States Patent [19]

Johnson et al.

[11] **3,877,084**

[45] **Apr. 15, 1975**

[54] **INFLATABLE SAUNA**

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[22] Filed: **June 28, 1973**

[21] Appl. No.: **374,809**

[52] **U.S. Cl.** **4/160;** 52/2

[51] **Int. Cl.** **A61h 33/06**

[58] **Field of Search** ..... 4/160, 163, 164, 1, 179, 4/183; 128/367, 371; 52/2; 135/1 R

[56] **References Cited**

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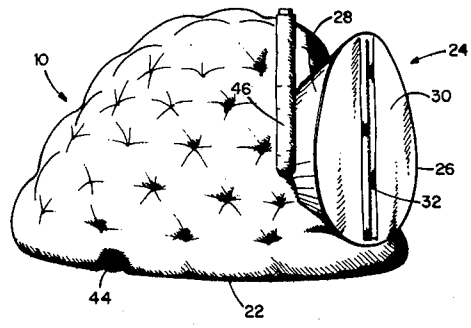
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[57] **ABSTRACT**

An inflatable sauna in the shape of a hollow free-standing dome. The dome has double walls which are fastened together by spaced-apart rivets and the space between the walls is low pressure inflated to erect the dome. An interior vertical partition divides the dome into a sauna room and a warming room. An interior heater/ventilator maintains the sauna room at a high temperature and the warming room at a moderate temperature, and also exhausts moisture-laden stale air from the sauna.

12 Claims, 6 Drawing Figures



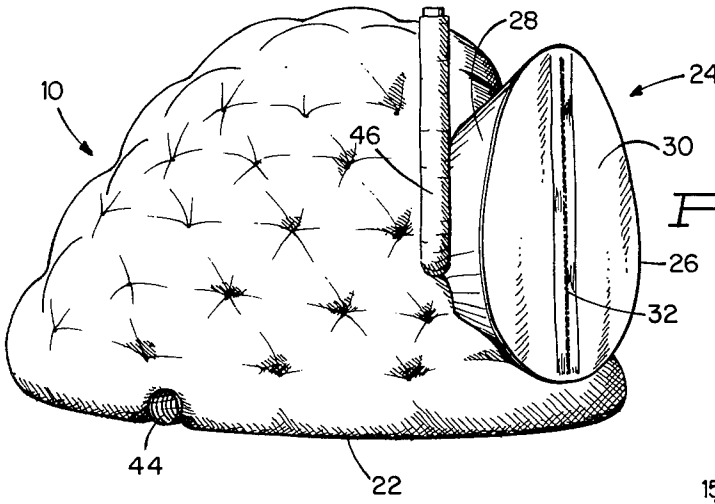


Fig. 1.

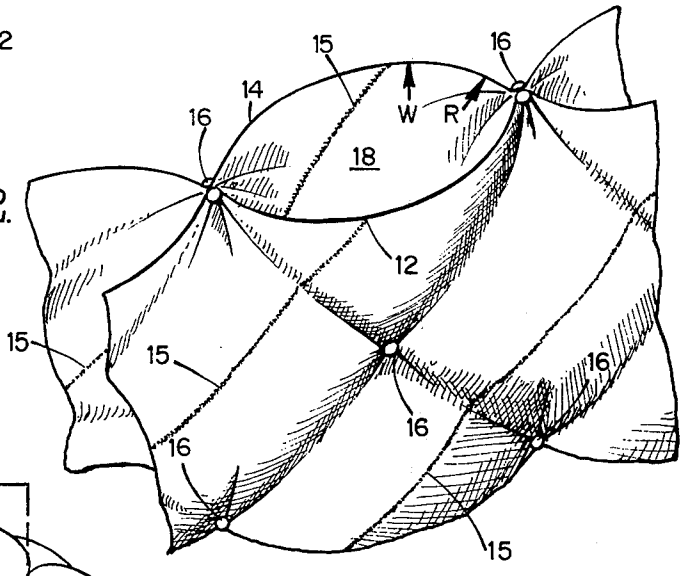


Fig. 2.

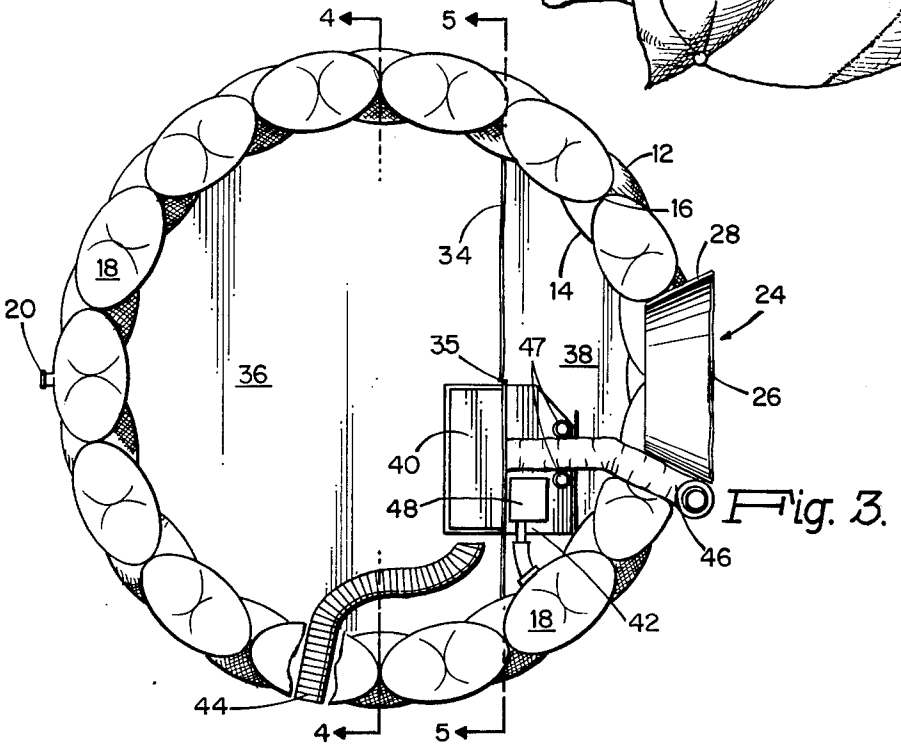


Fig. 3.

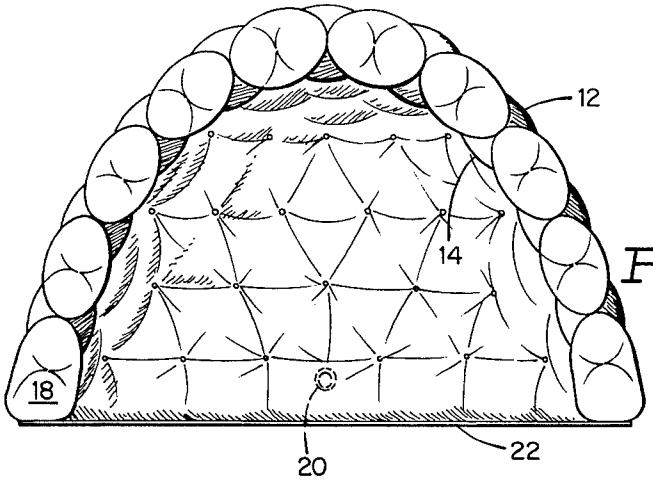


Fig. 4.

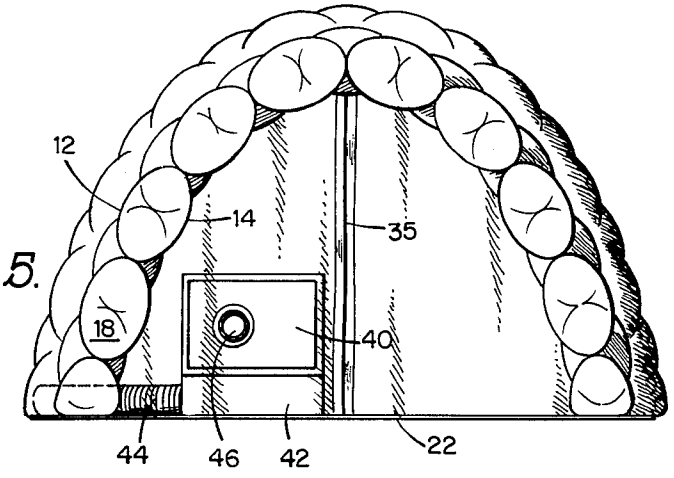


Fig. 5.

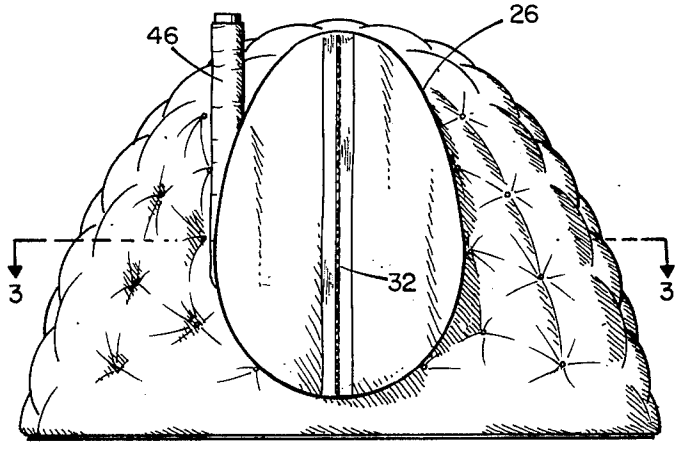


Fig. 6.

INFLATABLE SAUNA

BACKGROUND OF THE INVENTION

In the past, saunas have usually been constructed as permanent installations made of heavy rigid materials, such as redwood. Prior attempts to construct portable saunas have encountered the problems of how to achieve a lightweight total package, how to achieve the needed high temperatures without destroying the sauna structure materials, and how to ventilate the moisture from the sauna without also ventilating the hot air.

It is an object of this invention to provide an inflatable suana which is stable, which is self-supporting without poles, and which is not pressurized within the sauna interior.

It is another object of this invention to provide an inflatable sauna which is lightweight and which can be collapsed and folded into a small portable package.

It is another object of this invention to provide an inflatable sauna which can maintain at least a 200° F. exterior/interior temperature differential, and which can maintain a low humidity, high temperature atmosphere without adversely affecting the sauna structure materials.

SUMMARY OF THE INVENTION

The foregoing objects are attained by providing a structure which, in its preferred embodiment, is double walled and has a dome shape. The space between the walls is inflated and the dome interior is not pressurized. The dome is quite sturdy and stable when inflated, yet is completely collapsible and foldable into a small lightweight package when deflated.

The dome interior is divided by a loose-handing, openable curtain partition into a heated sauna room and an adjoining warming room. The warming room is used as a clothes changing room as well as an intermediate temperature transition chamber between sauna room temperatures and outside temperatures. The warming room is entered through an exterior door.

DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of the inflatable sauna;

FIG. **2** is a perspective view of a small portion of the double wall structure of FIG. **1**;

FIG. **3** is a view in section taken along line **3—3** of FIG. **6**, the view being a top plan section;

FIG. **4** is a view in section taken along line **4—4** of FIG. **3**, the view being a front elevation section at the diameter;

FIG. **5** is a view in section taken along line **5—5** of FIG. **3**, the view being a front elevation section at the partition; and

FIG. **6** is a front elevation view looking directly at the exterior door.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, FIG. **1** shows the inflatable sauna structure **10** and FIG. **2** shows the structures's double walls in detail. Exterior wall **12** is fastened at spaced points to interior wall **14.** The walls are preferably made of PVC coated nylon which is tightly woven to have an extremely high tensile strength. This material resists cold cracking down to −30°F., has excellent weld adhesion strength characteristics, and resists creep and leakage up to approximately 250° F. The wall material is not significantly adversely affected by ultra-violet rays or by ozone, and resists mildew. It is self-extinguishing when exposed to flame and is translucent.

The fabric comprising each wall is cut into strips in a special pattern. The strips, when joined, form the dome shape which is a truncated ellipsoid. The fabric strips for each wall are joined together by being lap welded along lines **15** with a radio frequency welder. Then, the two walls are positioned face to face and are fastened together by airtight self-sealing rivets **16** which tightly fasten the exterior wall to the interior wall at spaced points only. The rivets are located in a regular pattern (preferably centered between the weld lines) at the projected centroids of the geodesic faces formed by projecting a four frequency, apex up, icosahedron on the truncated ellipsoid. This rivet fastening procedure produces a double walled dome having an inflation chamber **18** between the walls, which chamber is continuous throughout because the rivets are fastened solely at spaced points. Instead of rivets, the walls could alternatively be held against separation by interior webs at the spaced points referred to previously.

The locations of the weld lines and the rivet points are selected in accordance with the formula "tensile skin stress is proportional to the product of inflation pressure and skin radius." Thus, in order to reduce the tensile stress loads at the weaker weld lines **15,** the skin radius W (see FIG. **2**) is minimized. Conversely, to transfer the increased tensile stress loads (e.g. from heavy winds) to the stronger areas between the weld lines, the skin radius R is maximized.

It has also been found to be highly desirable to inflate inflation chamber **18** to a very low pressure (e.g. approximately 2 inches of water or 10 lbs./sq. ft.). This is because the structure walls will then not develop pin hole air leaks or "blow through." This air leakage tendency is caused by the combined action of high air pressure and high heat. When the air pressure is kept quite low, the air leakage problem is greatly reduced or is entirely eliminated.

In order to inflate inflation chamber **18,** a valve **20,** such as a conventional spring-loaded tire valve or a capped tube, is provided in exterior wall **12.** Inflation can be accomplished in a large number of ways, as for example by a source of compressed air, or a vacuum cleaner's outlet, or a foot-powered air bellows, or a take-off from an automobile's intake manifold. To deflate the chamber, the valve is opened.

Preferably, a floor **22** is sewn and sealed to the lower circular edge of the dome walls. Floor **22** is made of the same material as the dome walls. The floor forms a barrier against ground moisture and cold, and against low level air drafts. The entire dome is anchored to the ground by unshown pegs or tabs or other conventional ground anchors.

In order to enter into the dome interior, the dome is provided with an aperture formed in its walls. The aperture is oval and is large enough for an adult to pass through. An exterior door unit **24** is joined to the dome aperture to provide a combined closeable door and passageawy extending outwardly from the aperture. Door **24** has the shape of a truncated elliptical cone with a front oval frame **26** forming the cone base and unshown stiff members covered with a cone of PVC coated nylon fabric forming the cone sides **28.** The

door unit **24** is joined to the dome aperture periphery by a combination of taping and/or lashing to form a water-tight joint. The front frame **26** has an oval translucent plastic panel **30** affixed thereto which has a zipper **32** for opening and closing door **24.** Door **24** extends outwardly from the dome exterior wall **12** thereby providing full head room to a person standing in the doorway where exterior wall **12** is attached to floor **22.**

The dome is divided into two adjoining interior rooms by a partition **34** which is vertically hung from the interior wall **14.** Preferably, partition **34** is a hanging flexible sheet of translucent plastic which has a flap **35** included therein to serve as a door between the two rooms. The partition is mounted as shown in FIG. **3** so that it divides the dome interior into a larger rear sauna room **36** and a smaller front warming room **38.** The partition does not form an air tight seal between the two rooms and the amount of gap or space existing between the partition and the dome interior wall and the floor is adjustable. It will be seen that a person can enter warming room **38** through door **24,** and can enter the sauna room through the flap **35** in partition **34.**

In order to heat the sauna, a heating unit **40** is mounted on a base **42.** The location of the heating unit is in the sauna room, and the base extends from the sauna room into the warming room, as shown in FIG. **3.** Heating unit **40** is preferably a non-radiating, gravity convection, liquid propane gas-fired heater which is thermostatically controlled. The heater is insulated with glass matting and other insulation on much of its exterior surface to prevent the burning of occupants or the igniting of the surrounding structural elements.

The heating unit **40** has a fresh air inlet conduit **44** which extends from outside the dome to under the dome walls to adjacent the heating units. The heating unit also has a combustion gas exhaust flue **46** which is connected to the heating unit and which extends outside the dome between the dome aperture and the door side walls **28,** as shown in FIGS. **3** and **6.** Flue **46** is supported by a pair of posts **47** mounted in heater base **42.**

The heater has several functions. It heats the dome interior; it exhausts moisture from the dome interior; and it helps to maintain the necessary pressure in the dome inflation chamber. Heater **40** draws in fresh air from the outside through low level conduit **44** which opens beneath the heater. The fresh air passes partially into the interior combustion chamber of the heater and partially over the exterior heat exchange elements of the heater after which it convectively rises and slowly circulates in the sauna room. The combustion gases are directly exhausted through flue **46.**

As the rising heated air circulates in the sauna room, it absorbs moisture, becomes cooler, and falls toward the floor of the sauna. This cooler wetter air is drawn into the interior combustion chamber of the heater and is exhausted through flue **46.**

Thus, the thermostatically operated heater convectively heats the fresh air from inlet **44** and maintains it in the sauna room at a pre-selected temperature level of approximately 170° to 225° F. By occasionally opening flat **35** in partition **34,** the temperature level in warming room can be maintained at approximately 70° to 90° F. The heater also exhausts the cooler stale wet air and replaces it with fresh air drawn from intake conduit **44.** Additional fresh air can also be drawn in through door **24** and through partition **34** to meet peak demands. It will be appreciated that dome **10** has no roof vent which would undesirably exhaust the hot sauna air, but instead exhausts the cool wet air through the heater's low level combustion chamber intake duct leading to flue **46.**

The heater heats the air within the dome interior and also heats the air within inflation chamber **18.** By warming the interior wall **14** and the inflation chamber air, a two-fold effect is achieved. First, the inflation chamber acts as an insulation barrier separating the hot air within the sauna room and the outside cold air. Second, the heated inflation chamber air expands, thereby reducing the amount of inflation air initially required and the amount of inflation air required to compensate for air leakage.

The inflation chamber usually needs to be periodically replenished with additional air to maintain the pressurized structural rigidity of the dome. This need is caused by pin hole leaks which develop with the passage of time. This topping can be done by the simple method of reinflating the chamber through valve **22** whenever the walls appear to be growing soft and the dome begins to sag. On the other hand, this invention also contemplates a more sophisticated automatic topping method and device **48.** If the heater is of the type which is fired by liquid propane gas, the liquid fuel can be boiled off and expanded in a positive displacement cylinder having a piston which drives an air bellows by means of a connecting rod. The bellows is connected by a conduit to valve **20** (which in this case is a one way check valve). The bellows will feed air through valve **20** on a demand basis to maintain pressure in inflation chamber **18.**

As a precaution, inflation chamber **18** is provided with an unshown air pressure safety valve. This valve operates to vent pressure which exeeds a predetermined level. Such a safety valve can take any of several conventional forms.

In use, the inflatable sauna of this invention can be folded into a relatively small bundle and easily transported in the trunk of a car or in a similarly small space. It can also be stored in the attic or basement when not needed. The sauna can be quickly set up by coupling valve **20** to an inflation source and inflating chamber **18** until the dome assumes the shape shown in FIG. **1.** The heater, its fuel tank, and its inlet and exhaust conduits are also easily positioned and installed.

The heater is then turned on and the sauna room is heated until it reaches the desired temperature within the range of 170° to 220° F. The warming room is simultaneously brought to a desired temperature range of 70° to 90° F. The sauna can be comfortably occupied by from one to six persons. The warming room can be used as a clothes changing area, as well as a transitional temperature chamber for body temperature adjustment before and after entering the sauna room. The warming room can be provided with accessories such as a portable shower, clothes hanging devices, and the like. The warming room also provides a convenient alcove for those in the sauna who temporarily desire a lower temperature to cool off.

After using the warming room, the sauna room can be entered through the flap in the partition. Collapsible furniture can optionally be provided for the comfort of the occupants. The heater can be regulated to adjust the temperature levels for individual preferences. The sauna dome is preferably made of translucent material so that the sunlight sufficiently lights the sauna interior.

The inflatable sauna can be used in the winter or the summer. It can be erected in the back yard or at a campsite. It is quick and simple both to set up and to take down. The sauna is made of materials which are not overly expensive and it can be manufactured in quantity on an assembly line basis. The inflatable sauna of this invention is the logical answer for those who want a substitute for a fixed installation in their homes, and is also the answer for those who want a portable sauna. Actually, this inflatable sauna has all of the essential features of a permanent sauna in combination with all of the advantages of portability.

The above description obviously suggests many possible variations and modifications of this invention which would not depart from its spirit and scope. It should be understood, therefore, that the invention is not limited in its application to the details of structure specifically described or illustrated and that, within the scope of the appended claims, it may be practiced otherwise than as specifically described or illustrated.

We claim:

1. An inflatable sauna comprising:

(a) a hollow, free-standing collapsible structure having an exterior wall, and having an interior wall fastened face to face to said exterior wall solely at spaced locations to form a single interconnected inflation chamber therebetween;

(b) an air valve mounted on one of said walls and communicating with said inflation chamber for use in inflating and deflating said chamber;

(c) a partition disposed vertically within said structure and being affxied to said interior wall to divide the interior of said structure into a sauna room and a warming room, said paritition including closable passage means for permitting occupants to pass between said rooms;

(d) door means mounted in said structure to provide a closable entrance and exit to and from said warming room;

(e) a heating unit mounted within said structure for heating the air within said sauna room to at least 170°; and

(f) an exhaust conduit having its inlet end positioned in communication with said heating unit within the interior of said structure at a height nearer to the lowermost portion than to the uppermost portion of said structure, and having its outlet end positioned outside of said structure whereby heating unit exhaust gases and cool moist air are continuously exhausted from said structure.

2. The inflatable sauna of claim **1** wherein said inflation chamber is inflated to a pressure of less than 20 lbs./sq.ft.

3. The inflatable sauna of claim **1** wherein said structure has the shape of a truncated dome.

4. The inflatable sauna of claim **1** wherein said interior wall is fastened to said exterior wall at points forming a uniform pattern.

5. The inflatable sauna of claim **1** wherein airtight, self-sealing rivets are employed to fasten said interior wall to said exterior wall.

6. The inflatable sauna of claim **1** wherein said heating unit is a gas-fired convection heater having a casing having an upper opening and a lower opening, said upper opening being connected to said exhaust conduit inlet end, and said lower opening being unconnected and unobstructed.

7. The inflatable sauna of claim **6** wherein said heating unit includes means for continuously trickle inflating said inflation chamber, said means being powered by the gas fuel.

8. The inflatable sauna of claim **1** wherein said door means includes a separate frame mounted vertically, and an openable panel closing said door frame, said door means extending entirely exteriorly of said exterior wall whereby full head room is provided to a person standing in said structure adjacent to said door means.

9. The inflatable sauna of claim **1** wherein said heating unit is powered by combustible fuel and is housed within a heater unit casing, and said exhaust conduit has its inlet end connected to said heating unit casing to receive and exhaust the combustion gases produced by the heating unit operation.

10. The inflatable sauna of claim **9** further having a fresh air conduit, said fresh air conduit having its inlet end disposed outside of said structure and having its outlet end positioned adjacent to said heating unit casing to furnish air for the heating unit operation.

11. The inflatable sauna of claim **1** further having a fresh air conduit, said fresh air conduit having its inlet end positioned outside of said structure, and having its outlet end positioned within said structure at a height nearer to the lowermost portion than to the uppermost portion of said structure, said outlet end being positioned adjacent to said heating unit to furnish fresh air thereto.

12. The inflatable sauna of claim **11** wherein said heating unit includes means for convectively heating the air within the sauna room, said heating unit means causing the heated air to rise and circulate therein, causing fresh air to be drawn into said structure through said fresh air inlet conduit, and causing moist stale air to be drawn out of said structure through said exhaust conduit.

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