Feb. 17, 1970 W. R. DEAN 3,495,874

SEA URCHIN CHAIR

Filed Feb. 12, 1968 4 Sheets-Sheet 1

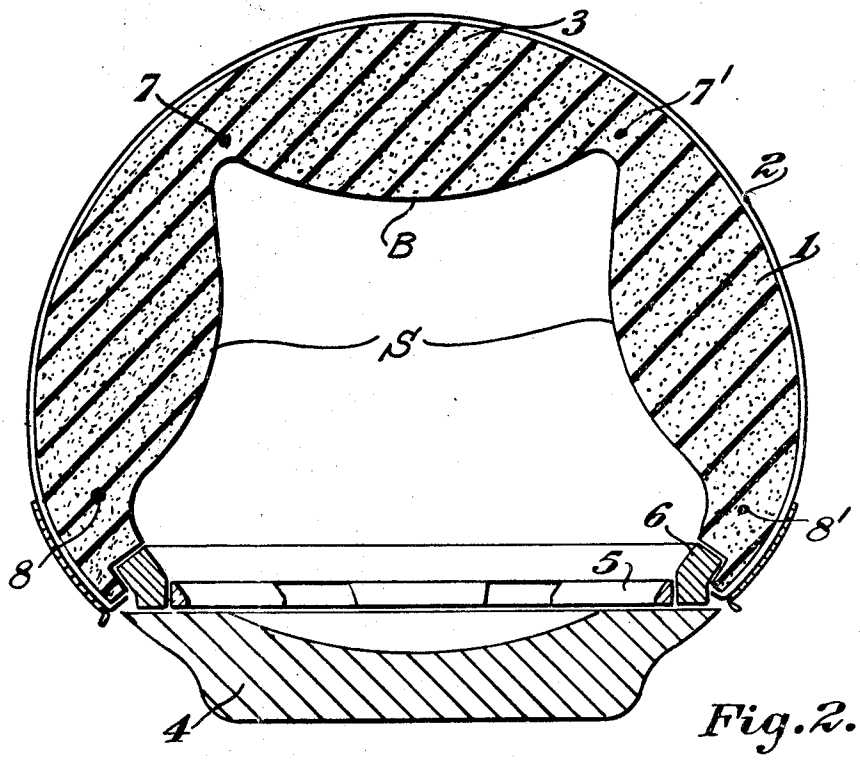

Fig. 2.

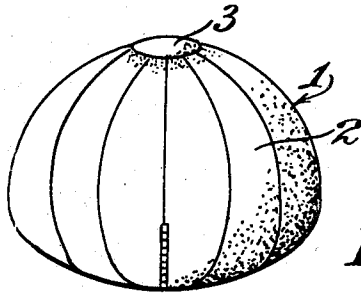

Fig. 1.

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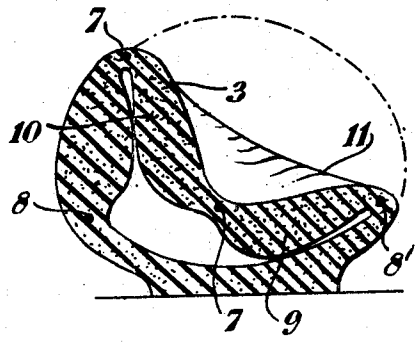


Fig. 3.

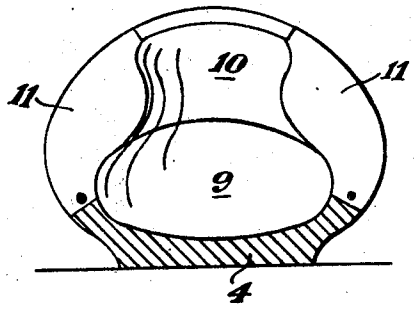


Fig. 4.

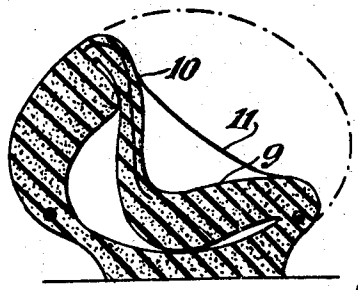
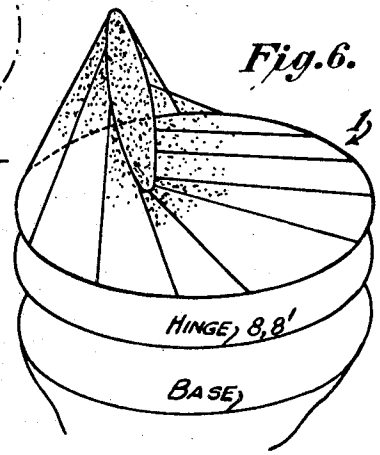


Fig. 5.

Fig. 6.



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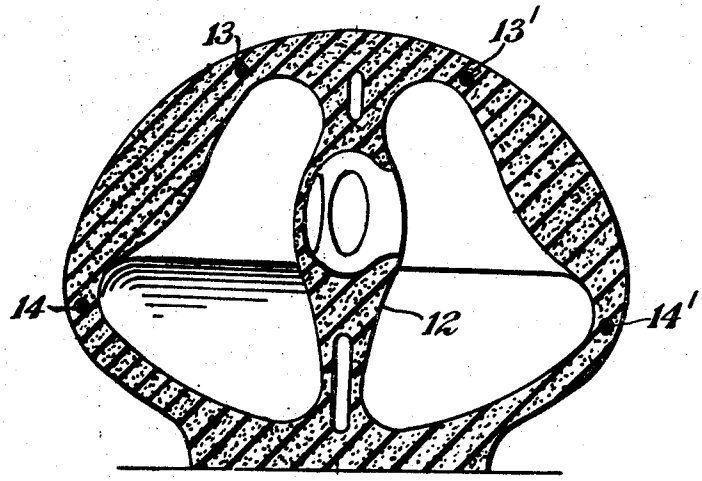

Fig.7.

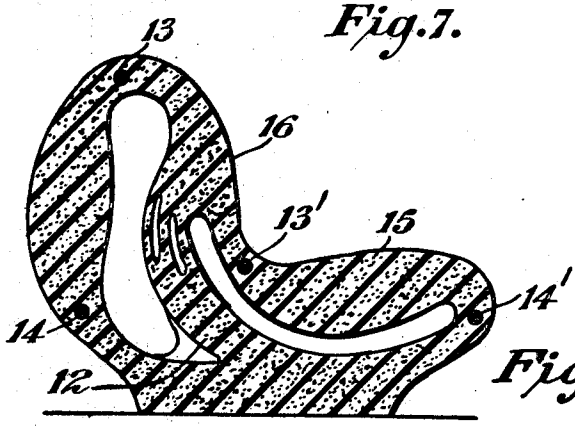

Fig.8.

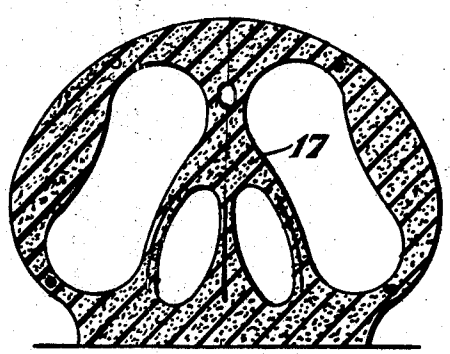

Fig.9.

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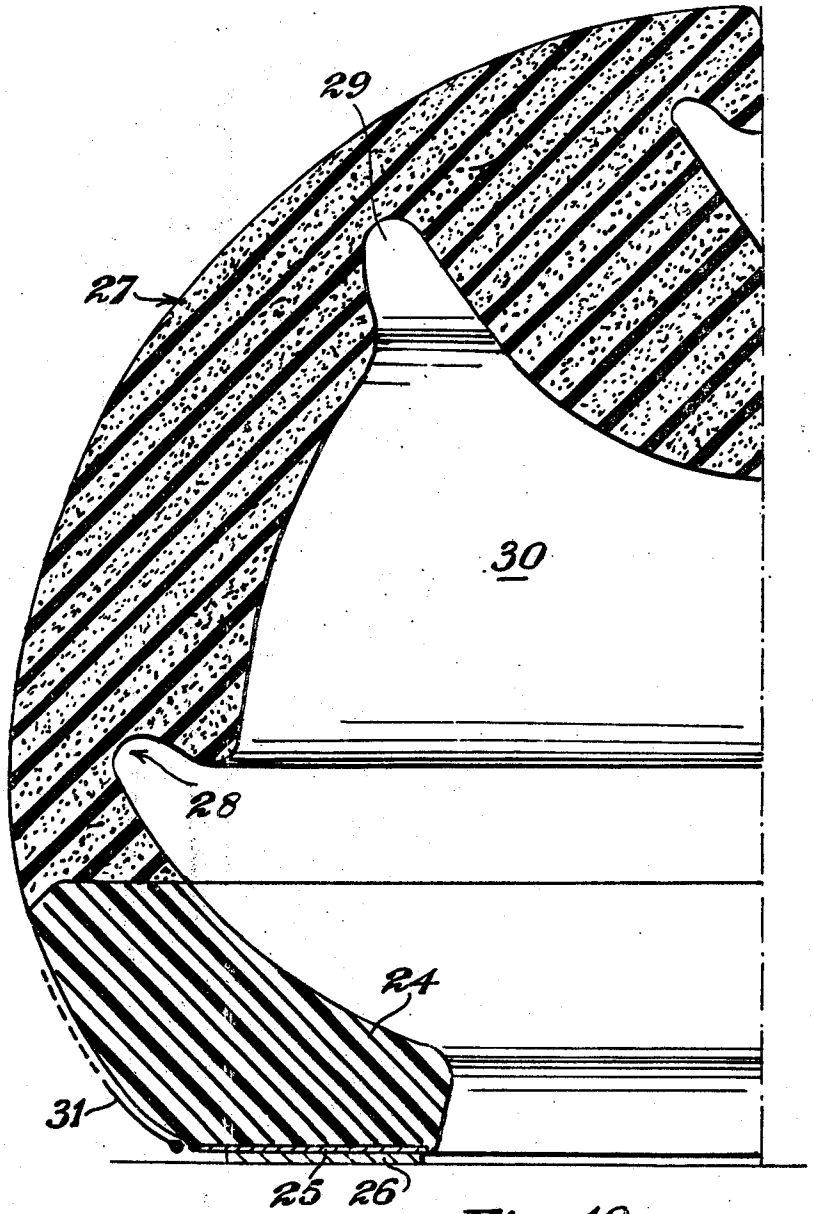

Fig. 10.

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Int. Cl. A47c 4/54, 9/00
U.S. Cl. 297—456 8 Claims

ABSTRACT OF THE DISCLOSURE

The invention resides in a chair in the form of a ball-like or spheroidal structure formed of deformable material having a resiliance such that when it rests it is self-supporting but will deform under load, as when a person sits thereon, to provide the seat and back portion, the wall formation of the structure having lower and upper areas of relative weakness extending substantially in horizontal planes, the lower one being at the point of maximum width or at or adjacent the junction with a ground base so that in whatever angle or position load is applied to the structure it will yield and accommodate the load in a position of equilibrium.

This invention comprises a chair device of novel construction.

Conventional chairs or seats are normally based upon a substantially rigid framework comprising legs and means of support for the seat, back and possibly arms of the occupant, the framework being, if desired, suitably upholstered to provide the requisite degree of comfort in relation to the functional requirements of the chair or seat.

The applicants have now discovered that a chair of unusual but pleasing appearance may be constructed without resort to a substantially rigid framework if the chair is formed in the shape of a self-supporting, hollow spheroid which is deformable under load.

A chair device according to the invention comprises a ground locating base portion and a seat and back portion in which the seat and back portion comprises the major segment of a hollow ball-like or spheroidal structure, the seat and back portion at least being formed of deformable material having a resilience such that when at rest it is self-supporting, but under load will deform, as when a person sits thereon, the structure having a wall formation which has lower and upper areas of relative weakness extending in substantially horizontal planes, the lower of which is at or adjacent its junction with the ground base so that in whatever angular position load is applied to the structure it will yield and accommodate the load in a position of equilibrium.

Location of the chair device so that it remains in an upright position in relation to the ground may be achieved simply by providing a flat surface on its underside but, for convenience, the spheroidal structure is mounted on a substantially rigid base which is preferably circular in shape and adapted to provide a suitable anchorage for the spheroidal shell.

In practice, the base is preferably fabricated from wood or rigid plastics material but it is also contemplated to employ a metallic structure, a foam structure or an inflatable base, adequate stability of the chair being ensured if the maximum diameters of the base and spheroid are approximately in the ratio of 5:6. In one arrangement the chair comprises a spheroid from the bottom of which a segment has been removed along a horizontal plane of diameter approximately 0.8 times that of the spheroid, the

residual major segment of the spheroid being attached at this basal plane to a substantially rigid base.

Attachment of the major spheroidal segment to the base may be achieved by any convenient means. For example, the spheroidal segment may be directly moulded on to the base or the upper surface of the latter may be provided with a rigid, stabilizing ring of wood, metal or plastics etc., the ring having an external diameter slightly less than that of the base at its greatest diameter and being of substantially V-section whereby the basal edge of the spheroidal segment is located and secured within the arms of the V.

The spheroidal shell may be moulded or formed as a single unit or may, if desired, be fabricated from a number of separate panels zipped or otherwise joined together. Such panels may be substantially "petal shaped." That is, if the major segment of a spheroid is placed upon its basal plane and circumferential lines are drawn upon its surface in vertical planes passing through the centre of the spheroid, that portion of the surface enclosed within any two adjacent circumferential lines will constitute a panel of the type hereinafter referred to as a "petal shaped" panel. In practice, a spheroidal surface embodying twelve such petal shaped panels has been found to be readily manufactured and of pleasing appearance, although any convenient number of appropriately dimensioned panels may be employed.

For ease of manufacture, a chair according to the invention may be formed from a shell comprising an oblate spheroid, i.e. a spheroid which is substantially flattened at the poles by removal of a spheroidal segment on a horizontal plane at either extremity of the vertical axis of the spheroid. The spheroidal shell is then completed by attachment to the uppermost planar section of a dome-like segment and the complete shell is secured to a substantially rigid base in the normal way.

The shell is conveniently fabricated from plastics foam or like material which is sufficiently rigid to be self-supporting when not in use, yet is readily deformable about the pivot areas when a person sits upon the chair and is sufficiently resilient to regain its spheroidal shape when the deforming load is removed. If desired, the chair may be provided with a central, vertical core of flexible foam or like material which collapses when the chair is sat upon but aids the return to sphericity on removal of the load.

It is also contemplated to build up the internal profile of the chair from individual blocks of resilient material adhering to (and arranged in horizontal rings around) the internal surface of the shell.

A chair according to the invention, being symmetrical about the vertical axis may, of course, be approached and sat upon from any direction and may, if required, accommodate more than one occupant simultaneously.

The invention is illustrated in the accompanying drawings of which FIGURE 1 is a perspective view of a chair device according to one embodiment of the invention and illustrating the arrangement of the dome and panel sections.

FIGURE 2 is a vertical section of the chair of FIGURE 1 when at rest.

FIGURE 3 is a vertical section corresponding to FIGURE 2 but partly in perspective, of the chair in use and showing the relative positions adopted by the shell.

FIGURES 4 and 5 are vertical, sectional views of a chair device in accordance with a second embodiment of the invention consisting of a spheroid in which the dome section is of a thickness approximately equal to that of the pivot area of relative weakness at or adjacent the base and showing the chair at rest and in use positions.

FIGURE 6 is a diagrammatic, perspective representa-

tion illustrating the principle on which the chair device shown in FIGURES 4 and 5 operates.

FIGURES 7 and 8 are vertical sectional views of a chair in accordance with a third embodiment of the invention consisting of a spheroid provided with an internal, flexible core and showing the chair at rest and in use positions.

FIGURE 9 is a vertical section, partly in perspective, through the centre of a spheroidal chair device having a modified, central, flexible core.

FIGURE 10 is a half vertical section of a preferred embodiment of the invention.

Referring to FIGURES 1 and 2, a chair device according to the invention comprises a shell indicated generally at **1** made up of panels **2** and a dome section **3**, the shell being attached to a relatively rigid base **4**. Located on and secured to the base **4** by means of blocks **5** is a rigid stabilising ring **6** of V-section which locates the shell on the base and provides a convenient anchorage for the shell. The latter is profiled, as shown in FIGURE 2, leaving relatively thin areas located on two horizontal planes **7**, **7'** and **8**, **8'**, these relatively weak areas of the shell constituting hinge or pivot areas about which the shell is deformable as when sat upon.

The shell may be of substantially the same thickness throughout if appropriate stiffening means are employed therein or thereon, but in a preferred embodiment the shell is thickened to a profile within the spheroid such that two areas S.B of increased thickness are formed, one area S encircling the shell on a horizontal plane passing approximately through the virtual centre of the spheroid and the other area B in the uppermost segment or dome region of the spheroid on a vertical plane passing through the virtual centre of the spheroid. Thus, the shell is relatively thin in the region of two horizontal planes, one at or slightly above the base of the chair and the other in the uppermost section of the spheroid but below the dome-like segment, the shell thickness being progressively increased from these thin regions to the aforementioned regions of maximum thickness.

This arrangement gives rise to a spheroidal shell possessing two areas of relative weakness as described above lying on horizontal planes, (one) area **7–7'** in the uppermost and (one) area **8–8'** in the lowermost region of the shell, the areas of relative weakness being designated as hinge or pivot areas about which the shell tends to deform when sat upon by one or more persons. In effect, the region of the shell surface lying between the two pivot areas acts as the seat portion of the chair and the dome region of the shell surface above the uppermost pivot area serves as the back of the chair. Consequently, the vertical separation between the two pivot areas must be adequate to provide a satisfactory relationship between the seat and back portions of the chair. In practice, it has been found that when employing a spheroidal shell approximately three feet in diameter, the vertical separation between the pivot areas is conveniently 0.5 times the diameter of the spheroid, the vertical distance from the uppermost pivot area to the dome of the spheroid being approximately 0.21 times the diameter and the vertical separation between the lowermost pivot area and ground or floor level being approximately 0.27 times the diameter of the spheroid. These dimensions are, of course, approximate and the relative positions of the pivot area in relation to the vertical axis of the spheroid may be varied as required.

The position into which the shell is deformed when used by one occupant is shown in FIGURE 3, the thicker wall portion of the shell folding inwardly about the lower hinge axis to form a seat portion **9** while the dome section **3** similarly folds about the upper hinge axis to form a back rest portion **10** for the occupant.

Support for the arms and sides of the occupant is provided by those portions **11** of the shell located on opposite sides of the seat portion **9** which will also fold

inwardly under the weight of the occupant, these inwardly folded portions **11**, being under tension, also providing resilient supports for the seat **9**.

It will be realized that the dome-section **3** of the shell need not be thickened but may be of dimensions similar to that of the shell at pivot areas **7**, **7'**, this arrangement resulting in a relative increase in seating area of the same or a smaller size of spheroid In other words, the embodiment illustrated in FIGURES 4, 5 and 6 enables the volume of material within the shell to be reduced, thereby providing approximately the same seating capacity in a chair of somewhat smaller dimensions.

Referring to FIGURES 7 and 8, the chair comprises a shell provided with a central, vertical, resilient core **12**. When occupied, i.e. under load, the shell deforms about pivot areas **13**, **13'** and **14**, **14'**, to the position shown in FIGURE 8, thereby providing a seat portion **15** and a back rest portion **16** for the occupant, the core **12** being stretched and distorted. Any support provided by core **12** is incidental to its main purpose which is to aid the return of the chair to its spheroidal shape (FIGURE 7) when the load is removed.

A slightly modified core **17** by which the thrust action to return the deformed shell to its spheroidal shape is distributed more evenly on the base is shown in FIGURE **9**.

Referring now to FIGURE 10 the chair comprises a base **24** of rigid polyurethane having on its underside an annular inset **25** of plywood surmounting a base plate **26**. The upper face of the base is domed to receive the body part **27** of flexible polyurethane having lower and upper zones of relative weakness as indicated **28** and **29**, the lower zone **28** as shown coinciding with the position of maximum width or diameter.

In order to create a feeling of softness, to the small of the back when sitting on the chair i.e., create flexibility at the top of the chair the upper part of the body is provided with an interior hollow **30**.

The chair may be upholstered as indicated at **31** by a cover of stretch fabric or by a fitted cover secured in position by a zip type fastener.

Not only, therefore, does a chair in accordance with the invention constitute an article of furniture of unusual and intriguing appearance, but it provides for the occupant or occupants a high degree of comfort and support in a variety of reclining positions.

What is claimed is:

1. In a chair device having a ground locating base portion and a seat and back portion the improvement in which the seat and back portion comprises the major segment of a hollow spheroidal structure formed of deformable material having a resilience such that, when at rest, it is self-supporting and shape returning but capable when under load of deforming, said structure having a wall formation which varies in thickness to provide isolated lower and upper areas of relative weakness which extend in substantially horizontal planes, so that in whatever angular position load is applied to the structure it will yield and accommodatae such load in a position of equilibrium.

2. In a chair device having a ground locating base portion and a seat and back portion the improvement in which the seat and back portion comprises the major segment of a hollow spheroidal structure formed of deformable material having a resilience such that, when at rest, it is self-supporting but capable when under load of deforming, said structure having a wall formation which varies in thickness to provide lower and upper areas of relative weakness which extend in substantially horizontal planes, so that in whatever angular position load is applied to the structure it will yield and accommodate such load in a position of equilibrium, the spheroidal structure having a wall formation, portions of which wall on the inside are of increased thickness, one such portion encircling the shell in a horizontal plane

passing approximately through the vertical center of the spheroid and the other portion which is in the uppermost segment, lying on a vertical plane passing through said center thereby forming two relatively thin pivot centers.

3. A chair device according to claim 1 comprising a spheroidal structure wherein the lower zone of relative weakness is arranged to coincide substantially with the point of maximum width.

4. A chair device according to claim 1 comprising a ground base formed of rigid material onto which the spheroidal structure is moulded directly.

5. A chair device according to claim 1 comprising a spheroidal structure wherein a void is formed in the upper wall part to increase softness.

6. A chair device according to claim 1 comprising a spheroidal structure having a resilient vertical core part interconnecting the base and upper portion of the structure.

7. A chair device comprising a ground locating base portion and a seat and back portion in which the seat and back portion comprises the major portion of a hollow spheroidal structure formed of deformable material having a resilience such that, when at rest, it is self supporting but capable, when under load, of deforming the structure having a wall formation, portions of which wall on the inside are of increased thickness, at least one such portion encircling the shell in a horizontal plane passing through the virtual center of the spheroidal structure so that in whatever angular position load is applied to the structure it will yield and accommodate such load in a position of equilibrium.

8. A chair device comprising a ground locating portion and a seat and back portion in which the seat and back portion comprises the major segment of a spheroidal structure formed of deformable material having a resilience such that, when at rest, it is self supporting but capable, under load of deforming, said structure having a wall formation, portions of which on the inside are of increased thickness, one such portion encircling the shell in a horizontal plane passing approximately through the virtual center of the spheroidal structure and another portion which is in the uppermost segment, lying on a vertical plane passing through said center thereby providing two relatively thin pivot centers and so that in whatever angular position load is applied to the structure it will yield and accommodate the load in a position of equilibrium.

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