Nov. 7, 1967 P. K. SHIMIZU 3,351,376

CHAIR

Filed Aug. 12, 1966 2 Sheets-Sheet 1

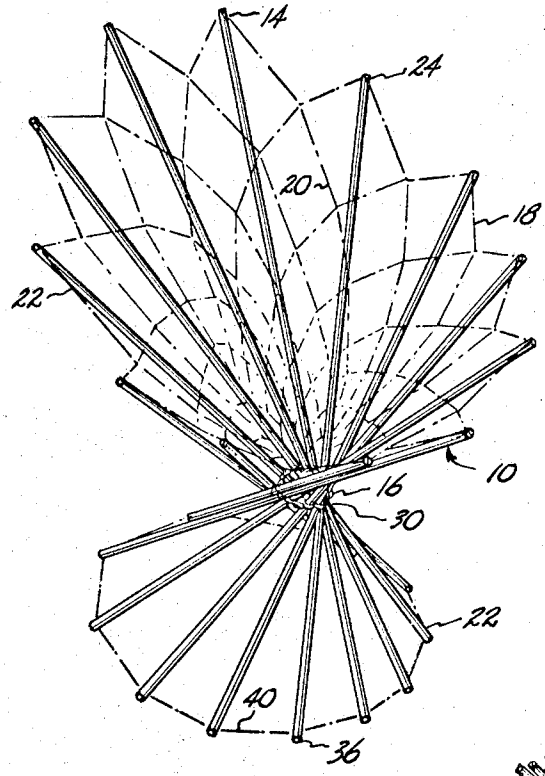


Fig. 1.

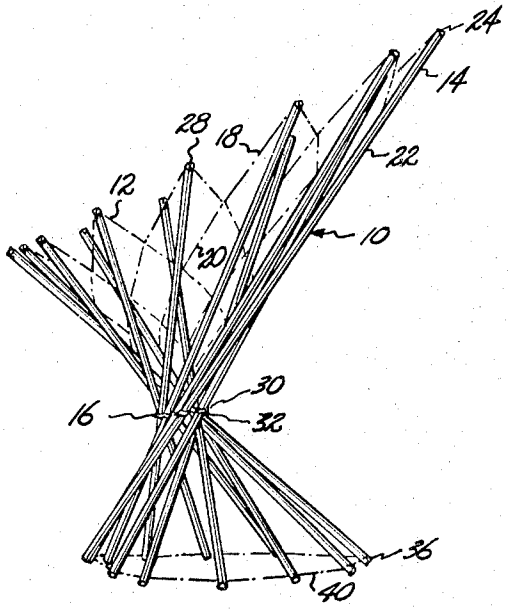


Fig. 2.

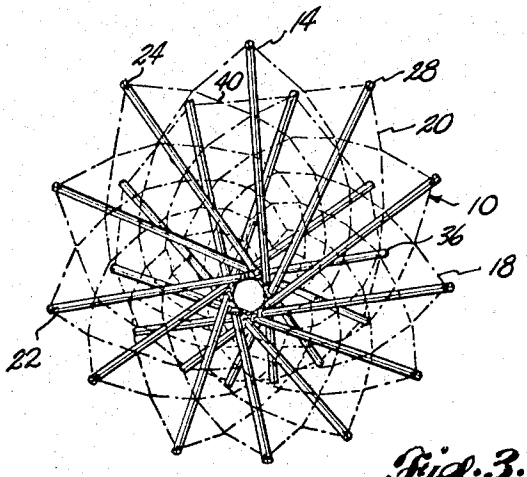


Fig. 3.

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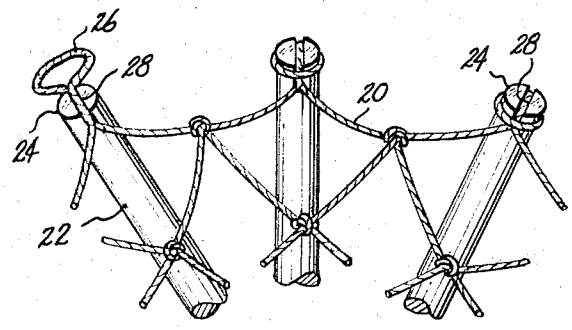


Fig. 4.

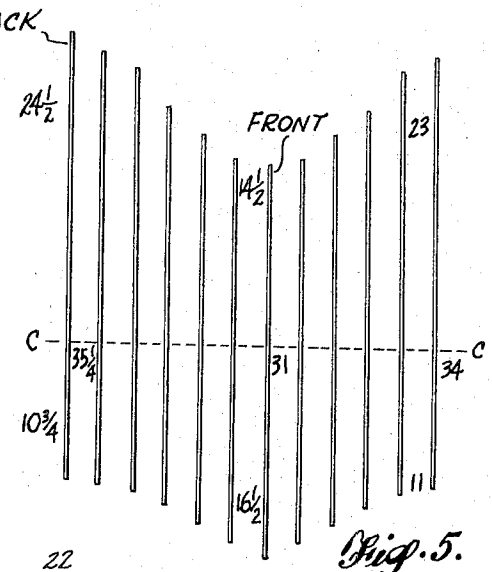
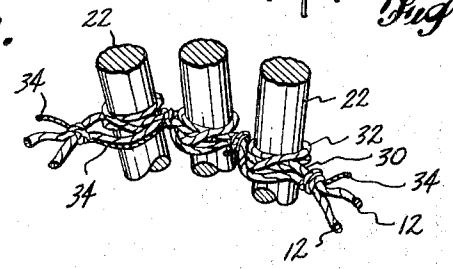


Fig. 5.

Fig. 6.



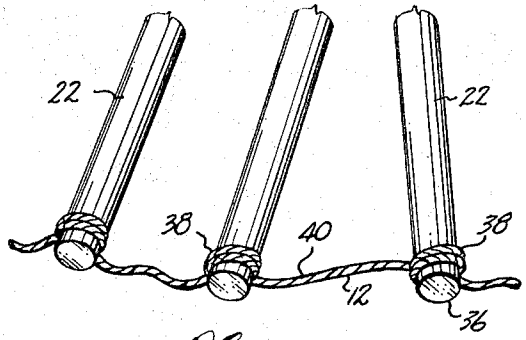


Fig. 7.

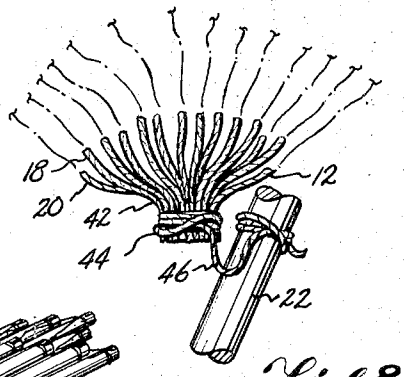


Fig. 8.

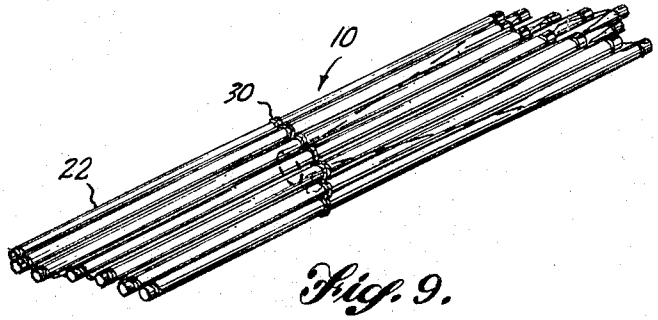


Fig. 9.

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5 Claims. (Cl. 297—16)

ABSTRACT OF THE DISCLOSURE

An artistic, comfortable, portable, foldable chair made from basic materials essentially by hand operations using a minimum number of conventional hand tools is provided by arranging multiple structural frame members to appear in a modified hyperboloid form creating top and bottom chair portions, with the top portions of the structural frame members collectively holding a body support of web forming members, which, thereafter, freely hand downwardly, clearing the remaining portions of the structural frame members for comfortably seating an occupant.

The cair comprises: structural frame members, such as ¾ inch dowels, which serve as load carrying members; and line members, such as a rope or cord, which serve to controllably position rod members and to provide a direct body contacting support that holds a person essentially away from frame members on a tied and laced suspended petal web or pine cone "nature" pattern of rope or cord.

A preferred embodiment of this chair is illustrated in accompanying drawings, wherein:

FIGURE 1 is a substantially front perspective view of the chair;

FIGURE 2 is substantially side perspective view of the thereof;

FIGURE 3 is a top view thereof;

FIGURE 4 is a partial front perspective view thereof, indicating how rod members are spaced and joined together with rope members at the top of this chair;

FIGURE 5 is a schematic view of a grouping of the rod members thereof;

FIGURE 6 is a partial perspective view thereof, showing how rod members are joined together with additional rope members near the seat or pivot location of this chair;

FIGURE 7 is a partial perspective view thereof, illustrating how rod members are spaced and joined together with additional rope members at the bottom of this chair;

FIGURE 8 is a partial perspective view of rope termini of the tied and interlaced web patterns as they terminate to complete the seat which is supported from the rod tops and centered over the pivote location of the chair and,

FIGURE 9 is a perspective view thereof, as folded for convenient handling and storage.

As viewed in FIGURES 1, 2 and 3, the preferred embodiment of invention **10** is open and ready to support a person comfortably.

Observation of the unfolded chair as shown in FIGURES 1 and 2, indicates originating geometrical contours which are preferably derived by using hyperbolic functions. Such resulting contours serve as an actual or an imaginative "start" of the design, construction and use of this chair. The major common axis of the chair and the hyperboloid design is tilted forward. An imaginary floor level is selected and ultimately matched by bottom ends of elements of the hyperbolas. Thereafter a top contour with a raised back is derived to complete the "start" of the eventual form and size of this chair.

In matching this "start" form of the folding chair, the use of cord, line or rope and structural rods is employed throughout the illustrated embodiment.

Referring first to the top of chair **10**, multiple rope members **12** at top **14** and extending to pivot **16** of chair **10**, are interlaced, interwoven, and/or tied in overlapping petal configurations **18** to form a body cradling support **20**. When a person is seated, each rope member **12** is carrying a portion of the load and is undergoing a tensile stress.

This cord, line or rope cradle **20** is in turn held by multiple rod members **22** whereby the user's body load is ultimately distributed among them, being transferred preferably and essentially only to their spaced top ends **24**. Such transfer is made by passing rope loops **26** through slots **28** and around the rod ends **24** as shown in FIGURE 4. In this way any user of chair **10** is principally directly contacted and supported comfortably by petal cradling support **20**, which extends between the rods **22**. So positioned, the occupant is held essentially free of direct contact with structural rods **22**. By varying the vertical location of the tied termini of the body cradling support **20**, the occupant is selectively seated at various elevations.

To control the positioning of the variable length rods **22** at anytime and especially under load, they are closely spaced and joined at selected locations along their respective lengths. These individual rod selected locations are placed together thereby producing even more pronounced length variances.

Such a typical pre-arrangement of variable length structural members or rods **22** with respect to the ultimate common selected location where they are to be joined together is indicated in FIGURE 5. Dotted line C—C crosses each rod **22** at its selected location where it will be held with respect to the other rods **22**. In the embodiment illustrated, twelve rods are used. The longest rod for the center of the chair back is the first rod shown on left of FIGURE 5. The shortest rod for the front center of the chair seat is the seventh rod from the left in FIGURE 5. On the left and right side of the chairs each of the remaining rods have an equal and opposite counterpart.

The preferred rod dimensions of such a twelve rod chair are given on FIGURE 5. The dimensions at line C—C are the respective total rod lengths. The top dimensions indicate the proprotional length of each rod **22** above line C—C. The bottom dimensions indicate the proportional length of each rod **22** below line C—C.

The specific joining of rods **22** at this common selected location may be done with various materials including rope, wood plastic and metal formed to provide rod receiving holes preferably arranged in circle. As illustrated in FIGURE 6, rope is preferred in the embodiment shown to carry on the "continuity of materials used," as commenced with the selection of rope **12** in providing body cradling support **20**.

Rope **12** for this joining purpose is arranged in a central rope ring **30** of respective clove hitches **32** or of similar knots. It is used to respectively grip and encircle each rod **22** at this overall selected pivot location **16** where each rod **22** transfers from one chair side to the other. The clove hitches **32** or similarly effective knots are generally tied adjacent to one another to control spacing between rods **22** about rope ring **30**. An additional smaller diameter rope **34** is used about ring **30** to wrap around rope **12** to essentially confine ends of rope **12** and to increase stability of the clove hitch spacing. For clarity of the drawings, rope **34** is only shown as being continuous at one location in FIGURE 6.

Referring to FIGURE 7, rods **22** terminate at the bottom of chair **10** to establish the chair base. Near these rod ends **36**, rods or structural members **22** receive portions of a lower rope ring **40** which are tied by knots **38** around rods **32** in a substantially non-slip relationship. Rod ends **36**, so held, are spaced apart at respective distances which collectively define a base pattern of a somewhat related

but smaller projected pattern of the chair top as viewed from above and indicated at FIGURE 3.

As shown in FIGURE 8, lower portions **42** of each flower petal pattern **18** of body cradling rope support **20** are joined together near pivot location **16** by a binding cord **44**. Then an extension **46** of this binding cord is wrapped around and tied to a rod **22** near ring **30** as shown or directly to rope ring **30** to conveniently maintain body cradling support **20** in its proper position when the chair is folded, unfolded, carried and stored. By selectively tying the lower portions **42** at a higher location the ultimate seating height of the chair **10** is raised.

In reference to storing or carrying chair **10**, FIGURE 9 illustrates how compactly its entire mass can be folded and rolled together. The stored chair **10** occupies a space of a diameter comparable to space filled by a like number of independent structural members or rods, and of a length determined by the rod extensions from central ring **30** tie points as shown in FIGURE 5.

This illustrated embodiment as described provides a user with a comfortable chair which he or she can handle, store and rest upon in ways never experienced previously. In its ready to assemble form its initial production and handling is enhanced and the ultimate customer and/or user has a pleasant hobby to undertake during its assembly.

As previously discussed and suggested variations of the illustrated embodiment are in order to meet slightly different specifications. Form variations are made possible by astute variable length selections and/or locations of respective portions of each rod with respect to central ring **30**. A higher or lower flared back, for example, may be selected in this manner to change the esthetic appearance of the chair. In so doing the overall positioning of an occupant may be slightly altered. Other form variations of rope and structural member relationships, include use of variable and/or different cross sectional rods or bars and/or other patterns of rope, strap and webbing.

As noted previously, in lieu of rope or cord, a central ring at chair pivot **16** made of wood, metal, or plastic with spaced holes (not shown) is used solely or in conjunction with rope or cord. In all embodiments, structural members **22** are held firmly longitudinally at pivot location **16** to create and maintain the structural stability of the chair core. In this respect, preferably slight cutting of the surfaces of structural members **22** at pivot location **16** is undertaken to receive members of the central ring **30**.

All these embodiments serve the inventive purpose of providing an artistic chair which is: comfortable; conveniently hand carried; easily folded into a minimum space; derived from a minimum quantity and variety of basic low cost materials; and assembled readily with minimum handling and tooling.

I claim:

1. A chair which is lightweight, portable and foldable, comprising: a chair frame having multiple, spaced minimum cross section structural frame members which are each held at one location along their length at a common elevation to all by a restraining means which grips and slightly spaces them and as so held each such respective location on the structural frame member divides its total length into different proportions above and below the common elevation location which also serves as the pivot location where each structural frame member changes over from one side to the other side of the chair, and these structural frame members are initially spaced apart at their top and bottom portions and held by respective top and bottom restraining means from increasing such initial spacing, and when so held at their top, common elevation and bottom portions, the said structural frame members substantially appear as modified elements of a hyperboloid creating the bottom and top forms of the chair; and a body support of web forming members which are suspended at their top portions from the top portions of the said structural frame members and which, from such top attachment, thereafter freely hang downwardly, clearing the remaining portions of the said structural frame members for comfortable seating.

2. A chair, as claimed in claim **1**, wherein said web forming members of the body support are suspended from the tops of the chair frame members and restricted at their bottoms by a tying member which is tied to adjacent chair components located at the pivot location of the chair.

3. A chair, as claimed in claim **2**, wherein said chair frame structural members are of substantially uniform diameter and slotted at their top ends.

4. A chair, as claimed in claim **3**, wherein said body support of web forming members, said top and bottom restraining members, and said cross over positioning and restraining members are derived from strong rope which is laced and tied.

5. A chair, as claimed in claim **1**, wherein the said cross over positioning and restraining member at the pivot location of the chair is constructed of a substantial material in which holes are made in a circular pattern to receive and to hold the said chair frame structural members.

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