United States Patent

Starworth

[15] **3,683,517**

[45] **Aug. 15, 1972**

[54] **SECTIONAL CARTOGRAPHIC GLOBE**

[72] Inventor: **Irving J. Starworth,** 238-23 117th Road, Elmont, N.Y. 11003

[22] Filed: **Oct. 19, 1970**

[21] Appl. No.: **81,752**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 723,712, April 24, 1968, abandoned.

[52] **U.S. Cl.** .....**35/46 A**
[51] **Int. Cl.** **G09b 27/08**
[58] **Field of Search**.....35/46 A, 47, 72; 46/31, 21, 46/30, 17

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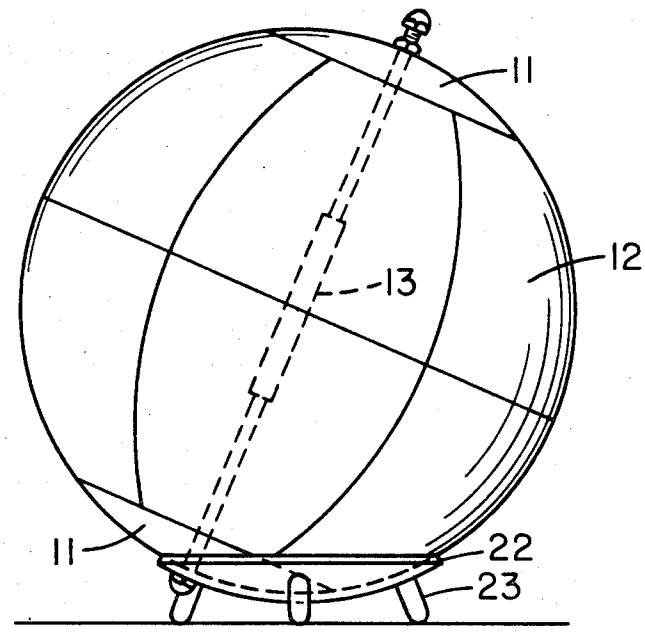
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Primary Examiner—Jerome Schnall
Attorney—Milton Zucker

[57] **ABSTRACT**

A new, simplified and compact knockdown cartographic globe is described, which is readily assembled and disassembled. This globe is made of readily deformable sheet material, shaped into a plurality of sections, including two end members (ordinarily polar caps of a terrestrial globe), and connecting side members which are adapted to be locked to each other and to the end members, all the side sections and end sections covering identical spherical angles, so that the globe, disassembled, fits into a container whose dimensions need be no greater than those of one section of the disassembled globe. The sections are readily replaceable to reflect geographic or political changes; and because of their relative size and shape, distortion during manufacture is minimized. A simplified base for the globe, which both provides support and rotation at the correct angle of declination of the axis, and facilitates assembly of the sections, is described. The side sections are locked to each other by rotation in the plane of a great circle passing through the pole, to provide perfect register when fully seated.

7 Claims, 18 Drawing Figures



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3 Sheets-Sheet 1

FIG. 1

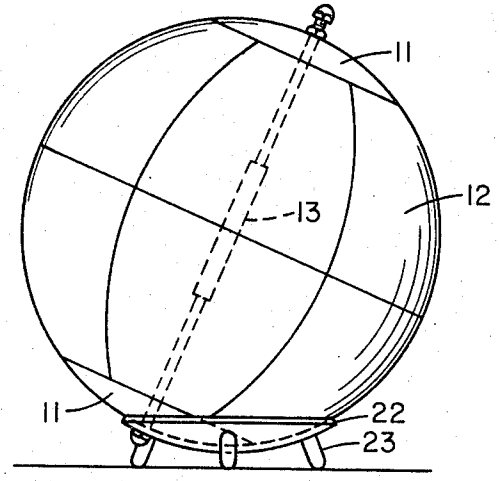


FIG. 2

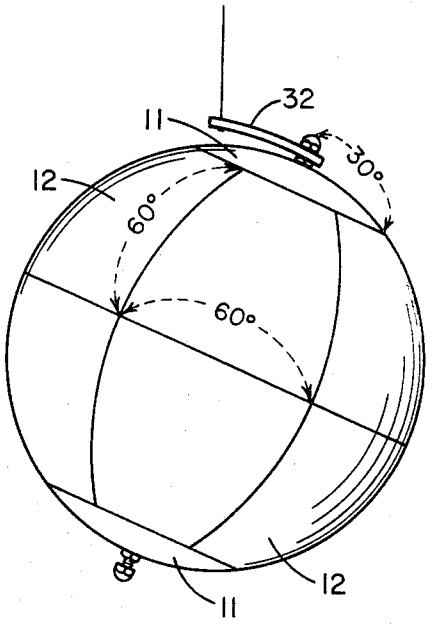


FIG. 4

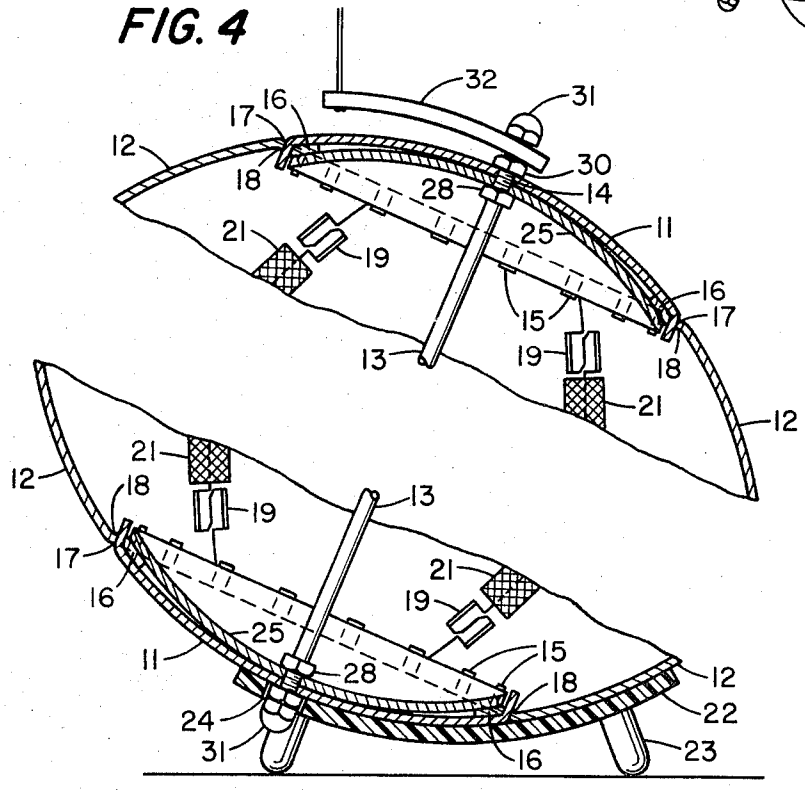
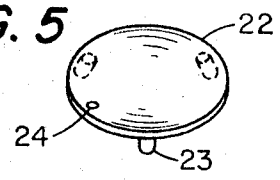


FIG. 3

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FIG. 5



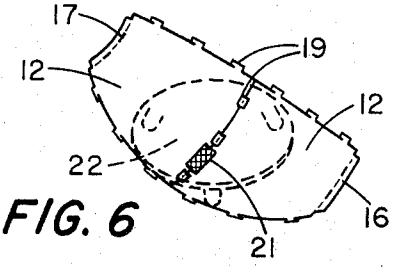


FIG. 6

FIG. 10

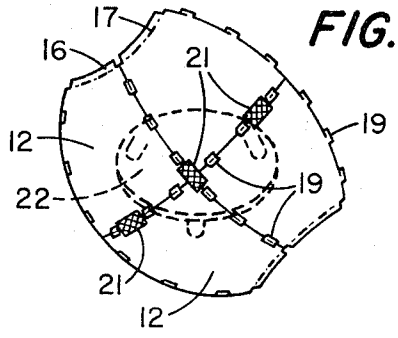


FIG. 7

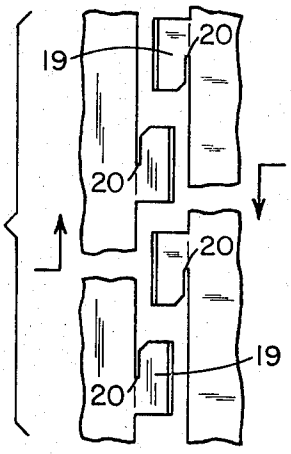


FIG. 11

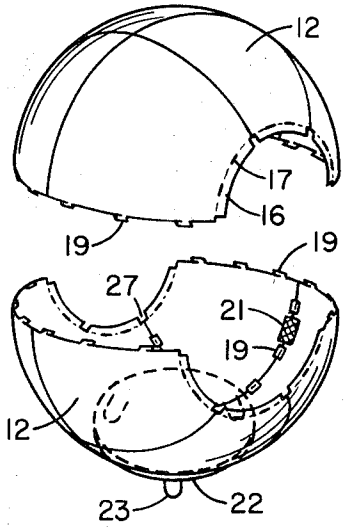


FIG. 8

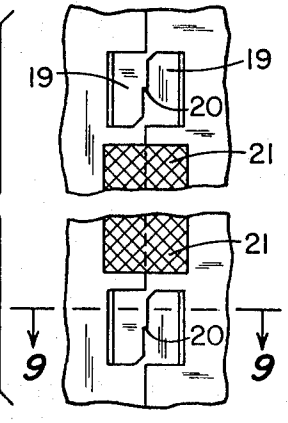


FIG. 12

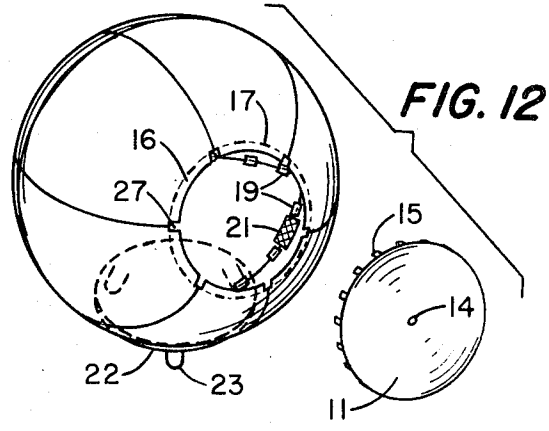
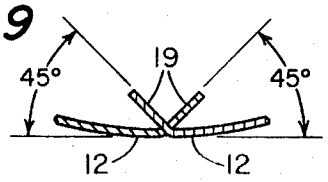


FIG. 9



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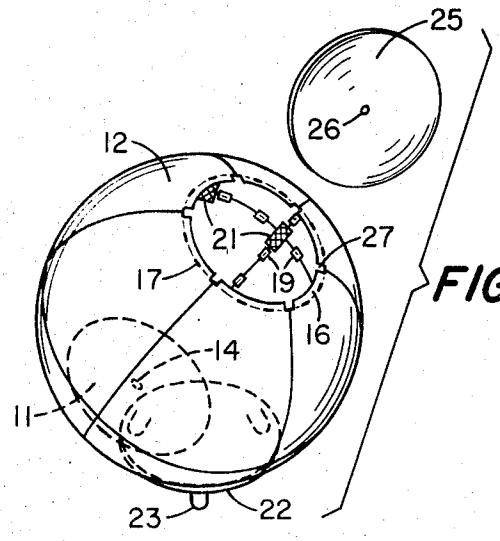


FIG. 13

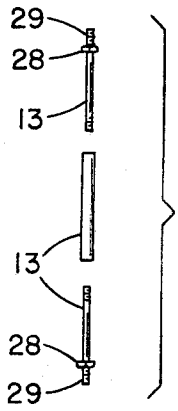


FIG. 14

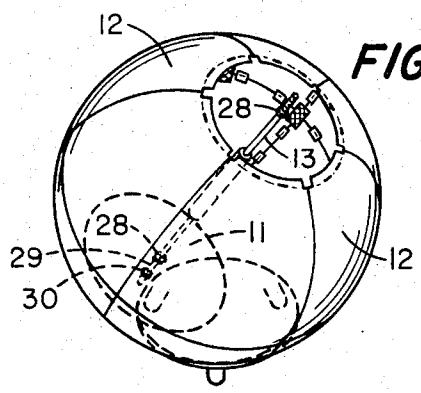


FIG. 15

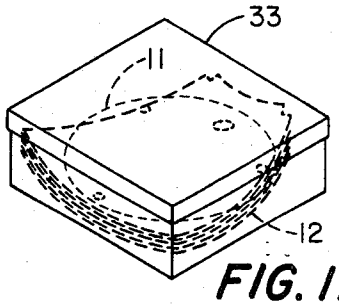


FIG. 17

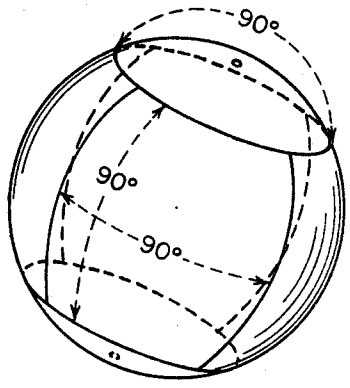


FIG. 18

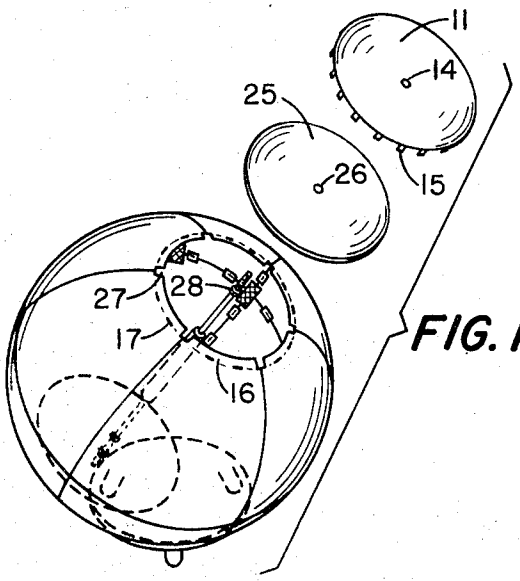


FIG. 16

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SECTIONAL CARTOGRAPHIC GLOBE

RELATED APPLICATION

This application is a continuation-in-part of my application, Ser. No. 723,712 filed Apr. 24, 1968, now abandoned.

SUMMARY OF THE INVENTION

This invention relates to the art of cartography, and particularly to a readily assembled, disassembled, and stored globe having replaceable sections, characterized by accuracy, economy of manufacture, ease of assembly, and compactness when disassembled.

PRIOR ART

The closest prior art of which I am aware if represented by my own patent, U.S. Pat. No. 2,228,736. The knockdown globe described therein embodies the principle of a replaceable sectional globe which may be printed accurately with minimal distortion. Except for my own concepts of a practical sectional globe, in the manufacture of terrestrial and celestial globes where an accurate representation of the earth or heavens is desired, it has been conventional practice to prepare a sphere of metal, wood, plaster, plastic or other base material, and a skin of paper or parchment, printed flat and then cut to shapes approximating segments of the finished globe. The skin is then applied to the sphere and secured to it by means of an adhesive. Proper application requires skilled hand labor, so that the cost of globes increases with the accuracy of the representation and the size of the ball. Once the skin is applied, changes cannot be made except by applying a new skin. Since changes in the map of the world occur frequently, the market for these expensive globes, which cannot be brought up to date, is rather limited.

I have now found, however, that not only these conventional globes but my own prior sectional globe may be substantially improved, as hereinafter described, to produce a new, more useful, and mechanically simpler construction, of greatly enhanced versatility and of substantially improved precision. The improved globe described herein is more economical to fabricate and more readily assembled, accurately reproduces the earth's surface, and thus is of broader utility and value.

A principle problem with the globe of my U.S. Pat. No. 2,228,736 is that there is of necessity some play in the elements fastening the sections together, so that perfect register cannot be assured in the assembly. Moreover, while the disassembled globe packs into substantially less space than an assembled globe, it still occupies a substantial volume. Finally, it is necessary to construct the globe of relatively rigid metal or heavy plastic, in order to ensure adequate assembly. For all these reasons, the globe as never been successfully marketed.

STATEMENT OF THE INVENTION

The problems encountered with my previous globe are overcome, in accordance with this invention, by constructing a sectional globe consisting, like my previous globe, of a pair of end members — generally polar caps of a terrestrial globe — and a plurality of side members, each made of deformed sheet material, the

members being capable of being fitted together to form a complete spherical globe. I solve the problem of exact register by having the sides of the side members cut in great circle planes going through the poles of the globe. The side members have attached thereto slotted tongues which are opposed to matching slotted tongues on the adjacent side members, so designed that when they are interlocked and the sections moved relative to each other in the plane of the great circle as far as they will go, the exactly desired register is obtained. The pieces are then locked together against retrograde motion in any desired fashion, as by strips of pressure-sensitive adhesive tape, to give an exactly registered enlarged globe section, and finally a complete globe.

This construction is sufficiently rigid, after assembly, to permit construction of the sections from relatively thin, readily deformable metal or from readily deformable plastic. With such materials, assembly of the parts is simplified by providing a rigid base on which the assembled globe rests, of the same curvature as the globe; this base can be used as a support during assemblage, to prevent deformation of the material, while the sections are being rotated relative to each other in the plane of the great circle to get them into register, and while the locking strips are applied.

The problem of packing space is solved by making all the pieces — end members and side members — of the same angular dimensions, so that they nest together perfectly in minimum space. There are only two practical combinations. Where each of the parts covers 90° of are, I use four side members and two pole caps — a construction I prefer for 12 inch globes. For larger globes, I prefer that each of the parts covers 60°, and there are two end members and 12 side members. It is interesting to note that, with this construction, a 16 inch globe with 14 pieces packs into less space than a 12 inch globe with six pieces.

After complete assembly of the side members, the end members are attached by any useful mechanism, and a polar axis is inserted which preferably locks the assemblage to the base, or which may be used without a base to lock the assembly together.

DESCRIPTION OF THE DRAWINGS

A preferred embodiment of my invention is shown in the accompanying drawings, in which

FIG. 1 is an elevation of my improved globe with 60° sections, assembled and mounted, showing the polar axis locking the end members in place, and the base supporting the globe at the proper angle of declination of the earth to the average solar plane.

FIG. 2 is another elevation of the assembled globe, showing the hanger from which the globe is suspended at its axis, to hang at the proper angle of declination.

FIG. 3 is a partial section of FIG. 1, showing details of the lower assembly including the base.

FIG. 4 is a partial section of FIG. 2, showing details of the upper assembly including the hanger.

FIG. 5 is perspective view of the base.

FIG. 6 is perspective view showing two hemilateral side members joined to give a full north-south lateral segment, supported on the base.

FIG. 7 is an enlarged fragmentary view of the slotted tongues by which the side members are joined.

FIG. 8 is view similar to FIG. 7, showing the slotted tongues in a joined position, with locking tapes in place.

FIG. 9 is a sectional view along the line 9—9 of FIG. 8, showing the angle of set of the tongues.

FIG. 10 is a view similar to FIG. 6, showing the next step in assembly of the sections.

FIG. 11 is a view similar to FIGS. 6 and 10, showing the hemispheres ready for joining.

FIG. 12 is a perspective view and partial section, showing the partly assembled globe supported on the base, and the lower polar cap just prior to assemble.

FIG. 13 is a view similar to FIG. 12, showing the lower locking cap prior to assembly.

FIG. 14 is an elevation of the polar axis, disassembled.

FIG. 15 is a perspective view and partial section, showing the polar axis in place in the partly assembled globe.

FIG. 16 is a view similar to FIG. 15, showing the upper locking cap in place prior to assembly of the upper polar cap.

FIG. 17 is a perspective view and partial section showing the disassembled globe in its container.

FIG. 18 is a view similar to FIG. 1, showing a globe with 90° sections.

DETAILED DESCRIPTION

Referring to FIGS. 1 to 17 of the drawings, my globe comprises a pair of end members 11, preferably corresponding to all or a portion of the polar regions in the case of a terrestrial globe, and a plurality of side members 12. The end members 11 are preferably each of about 30° extent as measured from the central or polar axis 13, thus covering a total arc of 60°. The side members 12 are preferably identical to each other in size and shape, each having a latitudinal extent of 60° at the equator, and a longitudinal extent of 60°. As shown in FIG. 2, the side members comprise twelve upper and lower hemilateral sections of the globe. The extent of the end members may vary from as little as about 23° (to correspond to the arctic and antarctic circles) to a few degrees greater than 30°; however, any substantial variation from the preferred extent of 30° will require enlargement of the volume of the container for the disassembled globe, thereby reducing the packing and storage advantages of the preferred embodiment. The edges of the side members 12 are all in the plane of the sphere's edges of the side members 12 are all in the plane of the sphere's great circles, with the exception of the two edges which abut the end members. The side and end members are all arcuate, so that they form a sphere of the desired size. Each of the end members has a hole 14 at the pole, and a plurality of tongues 15 depending from the edge of the member, at least equal in number to the number of the side members and preferably parallel to the polar axis of the assemblage. The side members 12 have flanges 16 at their polar ends, having slots 17 therein into which the tongues 15 will fit. Said flanges 16 are preferably offset by an amount which corresponds to the thickness of the material of which the members are made, as shown at 18, thereby producing a smooth outer surface. The side members 12 have joining means on their three remaining sides, shown as a plurality of slotted tongues 19, which tongues are bent to depend to the interior of the globe when assembled, preferably at 45° from the tangent plane, as shown in FIG. 9. The bases 20 of the tongues 19 are so spaced that, when the tongues are fully seated, the edges of the side members are in exact register. Locking means, such as strips of adhesive tape 21, are provided so that the sections are retained in fully seated, registered position.

A base 22 is provided, comprising an arcuate cup the curve of which corresponds to the curve of the globe, and legs 23 or other support for the cup. The base has a depression or hole 24, offset from the center so that when the lower end of the polar axis is inserted into the hole, the globe is at the proper angle of declination, i.e., 23°33′ or as close thereto as is readily obtainable in production, and may be rotated on the base while maintaining this angle of declination.

In the assemblage of the device, preferably each set of upper and lower hemilateral side sections (side members 12) is joined first, as shown in FIG. 6, to give a full north-south lateral segment. Conveniently, the base 20 is employed as a support during the assemblage, since the base automatically faces the slotted tongues 19 in the plane of the great circle. Said tongues are preferably then joined by sliding in the plane of the great circle to full seating at the seats 20, as shown in FIGS. 7 and 8, interlocking the side members with tongues in the interior of the globe. The 45° angle of the tongues reduces to a minimum the gap on the outer surface, thereby producing the smoothest possible surface, at the same time reinforcing the assemble against inward displacement. The parts are then locked in position by applying the locking strips 21 of pressure-sensitive tape, or by any other desired locking device.

The full north-south lateral segments are then joined, as shown in FIG. 10, preferably into two hemispheres. The assemblage of the hemispheres is carried out by supporting one hemisphere on the base 20, and lowering the other hemisphere thereon, as shown in FIG. 11. The hemispheres are interlocked by fully seating the tongues 19, by rotating the edges of the hemispheres one upon the other, to form a truncated sphere, and are then locked with tapes 21. One of the polar caps 11 is then placed on the assembly, as shown in FIG. 12; the tongues 15, which are set parallel to the polar axis, are placed in the slots 17 in the flanges 16. After the first polar cap is in place, most conveniently the entire assembly is rotated on the base 22 to the position shown in FIG. 13, for insertion of the locking member 25. Said locking member 25 is a reinforcing sphere segment, approximately equal or slightly smaller in diameter to end member 11, and preferably fabricated of a rigid plastic or other material. Said locking member has a hole 26 at its center, adequate in diameter to accommodate the polar axis. The locking member 25 is adapted to fit just within the tongues 15 of the polar cap and, with the edges of the polar cap, to lock in place the flanges 16 of the side members, as shown in FIGS. 3 and 4. This imparts substantial rigidity and strength to the entire assemblage. The lower locking member 25 is inserted into the sphere as shown at FIG. 13, by passing through the assembled side members at the apertures 27, which apertures need extend to a depth and width only large enough to permit insertion of said locking member.

The polar axis is preferably separable into two or three lengths, as shown in FIG. **14**, so that it may fit into the same box containing the disassembled globe. The axis bears at each end a stop **28**, which for convenience may be a nut which is threaded on corresponding screw threads **29** at each end of the axis. Said threads **29** extend a sufficient distance along the axis to position said nut at the inner boundary of locking member **25**. Referring to FIG. **15**, the assembled axis bearing an upper and lower nut **28** is inserted into the assembly, the lower end of the axis penetrating, at lower threads **29**, both the lower locking member **25** and the lower end member **11**; the axis is there secured, on the outside of the globe, by a securing means **30**, which conveniently is a second nut which is tightened against the end member, thereby pressing together the end member and the locking member and securely holding the flanges between them. A crown nut **31** may be added to finish the construction, and also to provide an adequate extension for insertion into hole **24** in base **20**.

The upper locking member **25** and end member **11** are then added to the assembly, as shown in FIG. **16**, by first inserting the locking member through the apertures, where it is supported flush below and against flanges **16** by nut **28**, and then adding upper end member **11**, and fastening in place as before. As shown in FIG. **4**, a hanger **32** may be included in the assembly. This hanger is of sufficient length so that when hung from its outer end, as shown in FIG. **2**, the globe depends at an angle which approximates the correct angle of declination of the earth's axis.

The disassembled globe, including the base and the axis sections, fits into a box **33** as show in FIG. **17**, whose length and width need be no greater than those of one of the side sections **12**.

The sections of the globe are preferably made of readily deformable material such as thin sheet metal or plastic, but can be made of thicker metal or plastic, provided they are deformable by heat and pressure. Preferred materials are thermoplastic resinous materials, such as the various polyvinyl chlorides, polystyrene, polyethylene, acrylate polymers and copolymers, and many other plastic materials which may have adequate structural strength and deformability for use herein. The sections are ordinarily printed flat, and then fabricated to the necessary shape. Since the area of any single member represents such a small fraction of the total area of the sphere, no substantial distortion of the member is obtained, as with large segments that must necessarily be subjected to deep draws.

If desired, the globe can be embossed with the desired topography, or celestial and astronomical globes can be prepared, all by printing or embossing the sections of the globe. The assembly is also useful as a mathematical model to facilitate the teaching and understanding of spherical geometry and trigonometry.

Other advantages and variations in the invention described herein will be obvious to those schooled in this art, and can be achieved without departing from the scope of my invention which is defined in the following claims.

I claim:

1. A hollow sectional spherical globe made of deformed sheet material comprising two sphere-segment polar end members, and a plurality of spherical segment side members which together with the end members are assembled into a spherical globe with said end members defining the polar regions, the side members having longitudinal edges all of which are in planes of great circles of the globe passing through the poles, and latitudinal edges following a circle of latitude of the globe, a plurality of notched tongues on the longitudinal edges of each side member, each of said notched tongues on a single longitudinal edge facing in the same direction, said notched tongues interlocking with oppositely disposed notched tongues on the matching longitudinal edge of the next side member to ensure exact register of the side members when they are fully seated by rotation in the plane of their matching edges, said notched tongues being disposed on the inside of the globe and being inclined at an angle to the plane of the great circle in which the edges are rotated for closure, and means bridging the edges of both side members to lock the registered pieces in position against retrograde movement out of register, means on the latitudinal edges of the side members to attach the side members to the adjacent polar end members, means on the polar members to attach them to said means on the corresponding edges of the side members to complete the globe, all these attaching and locking means being disposed on the inside surface of the globe, a polar axis member passing through said end members of the assembled globe, and locking members on the polar axis member cooperating with said polar end members to lock the assemblage into place.

2. The globe of claim **1**, in which the notched tongues are inclined at an angle of 45° to the plane of the great circle in which the edges are rotated for closure.

3. The globe of claim **1**, in which the side members are equiangular on all sides, and the end members have the same latitudinal angular displacement as the side members, whereby all the elements of the globe nest in minimum space.

4. The globe of claim **3**, in which there are two end members and twelve side members, and the angle of displacement is 60°, whereby one latitudinal edge of each side member will lie along the equator of the assembled globe.

5. The globe of claim **4**, in which the edges of the side members lying along the equator have the same register and locking devices as their longitudinal edges.

6. The globe of claim **3**, in which there are two end members and four side members, and the angle of displacement is 90°.

7. The globe of claim **1**, in which the deformed sheet material of construction is readily deformable, and comprising also a rigid base having an upper spheroidal surface of the same curvature as the globe, and thereby adapted both to support the assembled globe, and to act as a support during assemblage of the globe to facilitate assembly to prevent deformation during rotation of the members into register, and locking of the members together in register.

* * * * *