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3,081,089

MANIPULATABLE TOY

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2 Sheets-Sheet 1

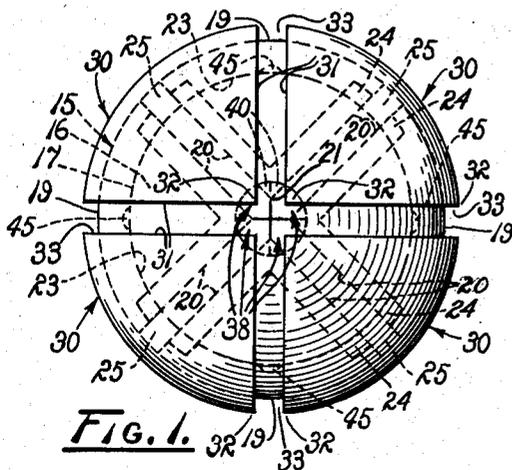


FIG. 1.

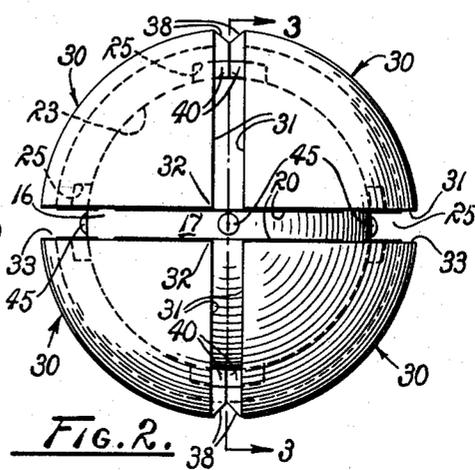


FIG. 2.

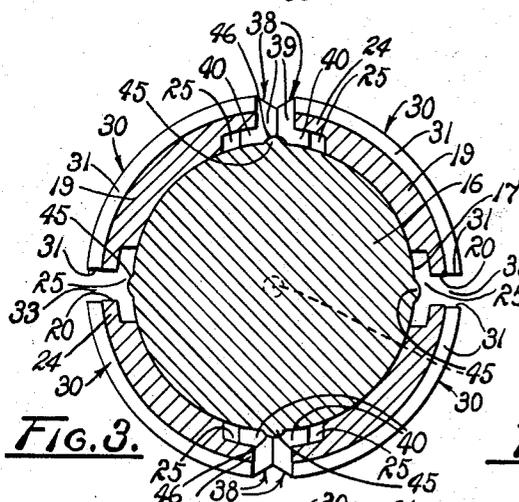


FIG. 3.

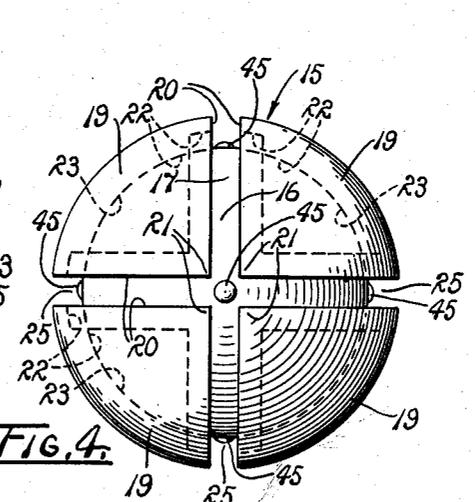


FIG. 4.

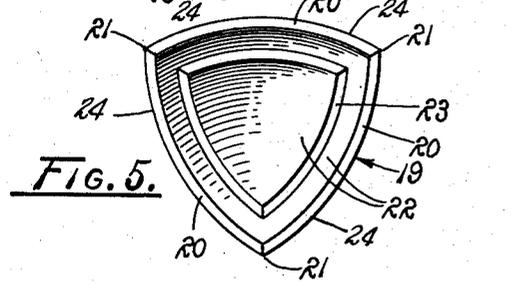


FIG. 5.

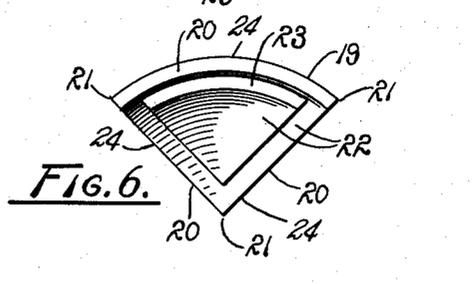


FIG. 6.

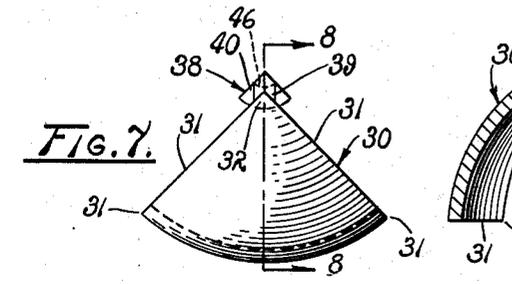


FIG. 7.

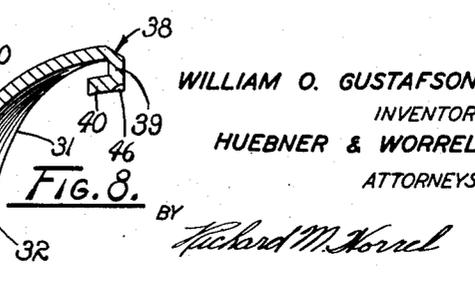


FIG. 8.

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3,081,089

**MANIPULATABLE TOY**

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6 Claims. (Cl. 273-156)

The present invention relates to a manipulatable toy and more particularly to a mechanical puzzle having a plurality of vari-colored parts which are movable relative to each other to form various patterns.

The present application is a continuation-in-part of my prior copending United States patent application, Serial No. 793,872, filed February 17, 1959, and now abandoned in favor of this application. It is known in puzzles to employ a plurality of parts adapted for connection or disconnection, or for relative movement, in a predetermined and possibly baffling manner, sequence, or ordered arrangement. Such puzzles challenge the user's ingenuity, manual dexterity, patience and intelligence to effect a solution. It is to this type of puzzle that the manipulatable toy of the present invention relates.

Accordingly, it is an object of the present invention to provide a manipulatable toy having a plurality of vari-colored parts movable relative to each other to form various patterns.

Another object is to provide a manipulatable toy having a plurality of movable elements in random or shuffled arrangement and which present problems of relative movement to preconceived ordered arrangement.

Another object is to provide a puzzle adapted to test color perception.

Another object is to provide a puzzle adapted to challenge the intelligence and understanding of the user.

Another object is to provide a puzzle utilizing movable parts which require manual dexterity to arrange or rearrange into predetermined positions relative to each other.

A further object is to provide a device of the character described which is in the form of a sphere having movable segments.

Another object is to provide such a toy which is easy to construct and assemble and which can be disassembled, if desired.

Other objects are to provide a puzzle or toy which is economical to manufacture, challenging to use, and which is adapted for use by persons of all ages.

These, together with other objects, will become more fully apparent upon reference to the following description.

In the drawings:

FIG. 1 is an end elevation of a puzzle embodying the principles of the present invention and showing hidden inner portions thereof in dashed lines.

FIG. 2 is a side elevation of the puzzle of FIG. 1 rotated through substantially ninety degrees from the position shown in FIG. 1.

FIG. 3 is a transverse section taken on line 3-3 of FIG. 2.

FIG. 4 is an end elevation of an internal ball-shaped member forming part of the puzzle of the subject invention.

FIG. 5 is a somewhat enlarged inside face view of an inner spherically triangular segment as utilized in the subject puzzle.

FIG. 6 is an edge view of the segment of FIG. 5.

FIG. 7 is an outside face view of an outer segment and tongue both of which form a part of the puzzle of the present invention.

FIG. 8 is a cross-section taken on line 8-8 of FIG. 7.

FIG. 9 is a view similar to FIG. 3 and showing a modified form of the subject invention.

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FIG. 10 is a view similar to FIG. 5 showing an inner segment constituting a part of the second form of the present invention.

FIG. 11 is a view similar to FIG. 7 showing an outer segment embodying the principles of the second form of the invention.

FIG. 12 is a fragmentary radial section of the puzzle of the modified form of the subject invention.

Referring more particularly to the accompanying drawings, the puzzle of the present invention includes an inner ball-shaped member, generally indicated by the numeral 15, and including a core 16 having an outer substantially spherical surface 17, as indicated in dashed lines in FIGS. 1, 2 and 4, and in full lines in FIG. 3. The ball-shaped member also includes a plurality of substantially octantal equilaterally spherically triangular, and therefore concavo-convex, inner segments 19 of substantially uniform size and thickness. The inner segments have substantially the same spherical curvature as the core and, thus, are adapted to fit complementarily against the outer surface of the core.

Each inner segment 19 includes three side edges 20 meeting in a corresponding number of apices 21 and defining equal angles therebetween. Each inner segment also provides an inner surface 22, an inner spherically triangular mounting portion 23 edgewardly inwardly spaced from the side edges of the segment and are marginally undercut to provide marginal flanges 24. The inner surfaces of the flanges are radially offset from the inner surface of the mounting portion.

The inner surfaces 22 of the mounting portions 23 of the inner segments 19 are complementarily fitted against the outer surface 17 of the core 16 so that the inner segments are collectively in substantially spherical formation concentrically circumscribing the core. The mounting portions space the inner surfaces of the flanges 24 radially outwardly from the outer surface of the core, as best indicated in FIG. 3. Further, the adjacent side edges 20 of adjacent segments are in spaced parallel relation to each other and define three annular intersecting T-shaped grooves 25 in concentric circumscribing relation to three right-angularly related axes extended through the center of the core. That is, the grooves are individually in three perpendicularly related planes, or great circle lines of division, passing diametrically through the core 16. The grooves extend laterally under said flanges 24 as well as radially outwardly between the adjacent side edges in said described T-shaped cross-section. Thus, each groove has a maximum width between edgewardly opposed mounting portions and a minimum width between opposed side edges. Preferably, a suitable cement intimately bonds the contacting inner surfaces 22 of the segment and the outer surface 17 of the core so that the segments are rigidly connected to the core.

The puzzle also includes a plurality of substantially octantal equilaterally spherical, isosceles, triangular, outer segments 30 of the same curvature as the inner segments 19. Likewise, the outer segments provide side edges 31 meeting in apices 32. The outer segments are slidably fitted in overlaying relation against the inner segments 19 in substantially spherical formation about, and substantially enveloping the inner segments, and are concentric to the core 16. Adjacent edges of adjacent outer segments are in substantially parallel spaced relation and define three annular intersecting great circle lines of division in the form of slots 33 concentrically circumscribing the core. These slots are in individual planes extended diametrically through the ball-shaped member 15. These planes are in mutually perpendicular relation to each other. Preferably, the slots are of the same width as the minimum width of the grooves 25. Thus, portions of the

inner segments are visible through the slots and, when the slots are in registration with the grooves, portions of the outer surface 17 of the core 16 are visible through the slots and the grooves.

With the outer segments 30 fitted over the inner segments 19, as above described, there are provided first and second sets of hemispherically related outer segments having generally oppositely diametrically related first and second sets of adjacent apices 32 at opposite poles of the core 16. These adjacent apices are in substantially rectangular relation to each other. Polar tongues 38 are individually rigidly connected to the apices of said first and second sets of apices. The tongues include legs 39 radially inwardly extended into the grooves 25 between opposed side edges 20 and quadrant-shaped slide members 40 connected to the legs and extended transversely in the grooves under the flanges 24. The slide members are between edgewardly opposed mounting portions in slidable contact with the outer surface 17 of the core 16 and the inner surfaces 22 of the flanges 24, all as best seen in FIGS. 1 and 3. As best indicated in FIG. 1, however, the slide members of each adjacent set of apices are in interfitted relation and collectively are in substantially circular formation having a diameter greater than the minimum width of the grooves but less than the maximum width of the grooves. It will be evident that the outer segments 30 are slidably connected to the inner segments 19 but that a tongue 38 extends only from one apex 32 of an outer segment.

Detents 45 are extended outwardly from the core 16 in the grooves 25 and substantially centered between the adjacent apices 21 of the inner segments at opposite poles of the three axes defined by the grooves. The slide members 40 collectively provide sockets 46 individually adapted to receive the detents upon movement of the outer segments 30 into positions with the slide members overlaying the detents.

Preferably, the core 16, and the inner and outer segments 19 and 30, as well as the tongues 38, are made of either hard or soft plastic, but other materials may be employed, as will be apparent. Still further, the outer surface 17 of the core, and the outer surfaces of the segments are of a variety of colors. The outer surface of the core may be of a single color or have bands or sectors of various colors. Likewise, each segment may be of a single color or have bands or sectors of various colors.

#### Operation

The operation of the described embodiment of the subject invention is believed to be readily apparent and is briefly summarized at this point.

The described first and second sets of hemispherically related outer segments 30 may be individually rotated about a common axis extended diametrically of the core 16 substantially through the centers of the interfitted slide members 40. The outer segments are connected to the inner segments 19 and maintained in collective spherical formation about the inner segments because of the interlocking association between the slide members 40 and the flanges 24 of the inner segments, that is, because the slide members are confined between said flanges and the core, as illustrated in FIGS. 1 and 3. This applies, of course, whether the slide members are located at the intersections of the grooves 25, or at other positions along any one of the grooves, because the flanges always overlay the slide members. However, each of the outer segments can be separated from the ball-shaped member 15 by flexing the flanges outwardly, as may be visualized in FIG. 3, to allow the tongue 38 on said outer member to be slipped outwardly of the groove and from under the flange. This, of course, assumes that the outer segments and particularly the flanges thereof are made of flexible material. It is also well to note at this point that the inner and outer segments are assembled and connected to the core in one of two ways. First, and prior to cementing the inner segment to the core, the slide member

of the outer segment is fitted under the flange of the inner segment at one of the apices 21 of the inner segment and so that the segments are substantially congruent. Thus, with this method of assembly, both of the segments are applied to the core at the same time. Alternatively, the inner segments are cemented to the core in the described positions and, thereafter, the outer segments are applied by flexing the flanges outwardly and inserting the slide members under the flanges in a manner now believed evident.

Additionally, the outer hemispherically segments 30 may be collectively rotated about any one of the three axes of the grooves 25. Of course, it is necessary to move the first and second sets of outer segments in small increments relative to each other in effecting collective rotation. When the sockets 46 fit over the detents 45, a slight clicking sound occurs, in addition to a vibration imparted to the user's fingers. This informs the user of the relative positions of the inner and outer segments 19 and 30 and of his progress in rotating the outer segments. At any intersection of the grooves 25, the first and second sets of outer segments may be individually rotated about core axes extended through said points of intersection, as described above.

#### Second Form

With particular reference to FIGS. 9, 10, 11, and 12 a ball-shaped member 115 includes a spherical, solid core 116 having an outer surface 117. This core has a plurality of elongated bores 118 extended radially inwardly from the outer surface of the core at predetermined positions about the periphery of the core. There are four pairs of bores in the illustrated embodiment, only one of which is shown in FIG. 12. Each pair of bores is in coaxial alignment and each of said axes extends through the center of the core. Said axes are in perpendicular relation to each other so that the axes of adjacent bores intersect in ninety degree angular relation to each other.

A plurality of substantially equilateral, spherically triangular, inner segments 119 are provided, as before. These inner segments have a plurality of side edges 120 meeting in apices 121. The inner segments also have inner concave surfaces 122, inner mounting portions 123 inwardly spaced from the side edges, marginal flanges 124, and elongated pins 125 integrally connected to the inner mounting portions centrally of the segments and extended radially inwardly from the mounting portions.

The inner surfaces 122 of the mounting portions 123 are complementarily fitted against the outer surface 117 of the core 116 with the pins 125 individually fitted in the bores 118. Prior to fitting of the inner segments against the core, the inner surfaces and the pins are preferably coated with a liquid bonding cement. Obviously, the outer surface of the core and the bores may also be given a thin coating of liquid cement so that when the segments are fitted in the described manner against the core, the segments are adherently bonded to the core. Because of the location of the bores and the fitting of the pins therein, the segments are automatically collectively fitted in substantially spherical formation in concentrically circumscribing relation to the core. This fitting could be assured to an even greater degree by making the pins and bores non-circular. The relationship between the inner segments and the core is the same as that previously described and is not considered in any greater detail at this point except to note that three annular intersecting T-shaped grooves 126 are again defined by the core and the inner segments.

The second form of puzzle also includes a plurality of substantially equilateral, spherically triangular, outer segments 130 having the same shape as the outer segments 30 of the first form of the present invention. These outer segments have side edges 131 meeting in apices 132. In the illustrated embodiments, there are eight inner and outer segments 119 and 130 with the inner segments individually overlying the bores 118.

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However, tongues 138 are provided at each of the apices 132 of each of the outer segments 130. As before, these tongues include legs 139 outwardly extended from the apices and slide quadrants 140 transversely extended from the legs relatively inwardly of the outer segments. The outer segments are slidably fitted in overlying relation against the inner segments 119 and complimentary thereto so as to provide a plurality of sets of adjacent apices 132. The adjacent quadrants at the intersections of the grooves 126 are interfitted in circular formation in the same manner as that illustrated in FIG. 1 and described in connection with the first form of the present invention. Of course, since tongues are provided at each apex, there are adjacent interfitted apices at each of the intersections of the grooves. The side edges 131 of adjacent outer segments 130 are in spaced parallel relation and provide annular, intersecting slots 143.

The core 116 also has a plurality of detents 145 extended outwardly from the outer surface 117 and centered between adjacent apices 121 at the intersections of the grooves 126. The slide quadrants have sockets 146 adapted to receive the detents individually therein when the sockets are located at the intersections of the grooves, as previously described in connection with the first form of the invention.

It is to be understood that the outer segments 130 are assembled in the puzzle in the following manner. Prior to connection of the inner segments 119 to the core 116, the outer segments are placed in overlaying congruent relation with the inner segments and with the slide members 140 underlying the flanges 124 at the apices 121 of the inner segments. Thus, when the inner segment is attached to the core, the outer segment is automatically positioned in proper location.

While the foregoing procedure is preferred, alternatively, the flanges 124 and outer segments 130 and tongues 138 are sufficiently flexible to enable the outer segments and tongues to be fitted over the inner segments after the latter have been attached to the core 116.

The puzzle is operated in substantially the same manner as that described in connection with the first form of the invention. That is, the outer segments 130 can be collectively, incrementally rotated about any one of the three axes concentrically circumscribed by the grooves 126. This is accomplished by moving the four sets of collectively interfitted slide quadrants 140 located in any one of the grooves 126 about the core 116 in said groove while the opposite sets of collected slide quadrants diametrically oppositely related to each other simply turn about their respective detents 145 on the axis of the groove traversed.

When the three slots 143 are individually in registration with the three grooves 126, that is, when the outer segments 130 are individually in congruent overlaying relation to the inner segments 119, either set of four outer segments constituting a hemisphere can be independently rotated about the core. Thus, it is evident that by employing various colors for the core, the inner segments, and the outer segments, that an intriguing and interesting puzzle is provided. The second form of the invention is assembled and held together in a different manner from the first form of the invention and may be preferred if it is desired to associate the outer segments with the inner segments in a more dependable relationship.

It will be evident from the foregoing that by the described movement of the outer segments 30, or 130, relative to the inner segments 19, or 119, and remembering that the core 16, or 116, and the segments are variously colored, that a variety of color combinations and patterns can be obtained. Assuming that certain color patterns are established in advance as the puzzle goals or solutions, it will further be understood that after the segments have been displaced from said established patterns that considerable imagination and color perception are required

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again to move the segments into the established patterns. Thus, in this manner, a puzzle is provided for challenging the visual acumen, manual dexterity, and patience of the user and providing training in recognizing and associating various colors.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A toy puzzle comprising a core having a substantially spherical smooth outer surface substantially concentric to the center of the core; a plurality of substantially triangular fractionally spherical inner and outer segments of substantially uniform size having side edges, the inner segments having mounting portions providing inner surfaces secured to the core with said inner segments in substantially spherical formation and providing marginal flanges having inner surfaces in radially spaced relation to said outer surface of the core and substantially concentric to the center of the core with adjacent edges of the flanges of adjacent segments being in spaced parallel relation so as to define a plurality of annular intersecting grooves in concentric circumscribing relation to axes extended through the center of the core, the outer segments rotatably slidably overlying the inner segments in substantially spherical formation concentric to the core with adjacent edges of adjacent outer segments being in substantially parallel spaced relation to define a plurality of slots disposed in substantially perpendicularly related planes passing through the center of the core, there being first and second sets of semi-spherically related outer segments having tongue members individually rigidly connected thereto and extended radially inwardly toward the core through said grooves and slidably interlockingly engaging the flanges of the inner surfaces of the inner segments for enabling relative rotatable movement of the first and second sets of outer segments on the inner segments and for enabling collective rotatable movement of the outer segments relative to the inner segments about the axes of the grooves.

2. The puzzle of claim 1 wherein each tongue member includes a leg rigidly connected to the outer segments, and a slide member connected to the leg of its respective tongue, the slide members associated with each set of semi-spherically related outer segments having a collective dimension greater than the minimum width of the grooves but less than the maximum width of the grooves.

3. The puzzle of claim 1 wherein the inner surfaces of the inner segments are cemented to the outer surface of the core.

4. The puzzle of claim 1 wherein the core has a plurality of bores radially inwardly extended from the outer surface of the core and individually located substantially centrally of the outer segments, and wherein pins are individually integrally centrally connected to the inner surfaces of the inner segments, said pins being individually radially inwardly extended into the bores and being adherently connected to the core.

5. A toy puzzle comprising a core having a substantially spherical, smooth outer surface substantially concentric to the center of the core; a plurality of substantially triangular fractionally spherical inner and outer segments of substantially uniform size having side edges meeting in apices, the inner segments having mounting portions integral with the core with said inner segments in substantially spherical formation and providing marginal flanges having inner surfaces in radially spaced relation to said outer surface of the core and substantially concentric to the center of the core with adjacent edges of the flanges of

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adjacent segments and being in spaced parallel relation so as to define a plurality of annular intersecting grooves in concentric circumscribing relation to axes extended through the center of the core, the outer segments rotatably slidably overlaying the inner segments in substantially spherical formation concentric to the core with adjacent edges of adjacent outer segments being in substantially parallel spaced relation to define a plurality of slots disposed in substantially perpendicularly related planes passing through the center of the core, there being first and second sets of semi-spherically related outer segments having a plurality of pairs of diametrically oppositely related sets of adjacent apices at opposite poles of the core; and a tongue member rigidly connected to each apex of each outer segment and extended radially inwardly toward the core into said grooves for enabling relative rotatable movement of the first and second sets of outer segments on the inner segments and for enabling collective rotatable movement of the outer segments relative to the inner segments about the axes of the grooves.

6. A toy puzzle comprising a core having a substantially spherical smooth outer surface substantially concentric to the center of the core; a plurality of substantially triangular fractionally spherical inner and outer segments of substantially uniform size having side edges meeting in apices, the inner segments having inner surfaces, mounting portions complementarily secured to the outer surface of the core, and flanges marginally outwardly extended from the mounting portions and terminating in the side edges of the inner segments, the inner segments being thereby connected to the core in concentric substantially spherical formation thereabout with the flanges in

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radially spaced relation to the core and adjacent edges of adjacent segments being in spaced parallel relation and defining a plurality of annular intersecting T-shaped grooves in concentric circumscribing relation to axes extended through the center of the core, the outer segments rotatably slidably overlaying the inner segments in substantially spherical formation concentric to the core with adjacent edges of adjacent outer segments being in substantially parallel spaced relation to define a plurality of slots disposed in substantially perpendicularly related planes passing through the center of the core, there being first and second sets of semi-spherically related outer segments having oppositely diametrically related first and second sets of adjacent apices at opposite poles of the core; and tongues individually connected to the apices of the first and second sets of apices and extended radially inwardly toward the core into said grooves between said adjacent side edges and thence transversely under the flanges between said flanges and the core, the tongues being slidably between the flanges and the core for movement in the grooves to enable relative rotatable movement of the first and second sets of outer segments on the inner segments and to enable collective rotatable movement of the outer segments relative to the inner segments about the axes of the grooves.

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