

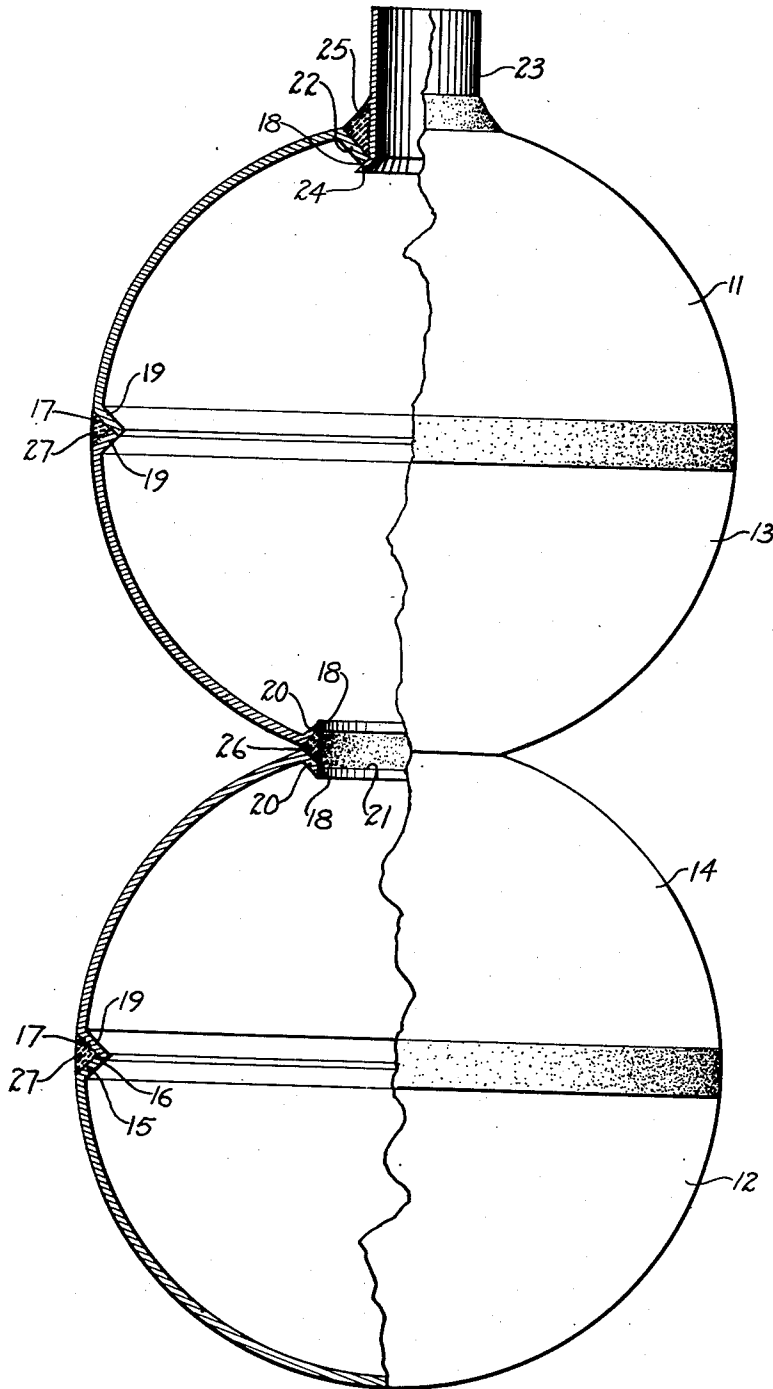
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PRESSURE VESSEL AND METHOD OF MAKING SAME

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PRESSURE VESSEL AND METHOD OF MAKING SAME

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This invention relates to metallic containers, and more particularly to pressure vessels comprising a plurality of interconnected and preferably intersecting hollow spheroids.

Such containers have been made by deforming cylindrical tubes, for example, by alternately constricting and expanding a tube to form spheroidal zones. Other pressure vessels of this type have been formed by casting or by welding together hollow sections.

The present invention relates to an improved method or process of construction whereby hemispherical shells may be stamped or otherwise formed, as from light sheet metal, and subsequently may be welded together circumferentially to form a series of interconnected spheroids. Employing hemi-spherical blanks or shells results in greater flexibility and greater economy in manufacturing methods.

The principal objects of the present invention are to provide improved processes for the manufacture of containers having a plurality of interconnected spheroids; to provide an improved process for welding hemi-spheroidal shells together to form a container consisting of a series of interconnected hollow spheroids; and to provide a new and improved pressure vessel consisting of interconnected hollow spheroids which may be fabricated from elements formed from sheet metal. These and other objects of the invention will become apparent from the following description and from the accompanying drawing showing an elevational view partly in section of a container embodying features of the invention.

Referring to the drawing, a container made according to the present invention comprises a pair of end sections 11 and 12 consisting of hollow hemi-spheroidal elements, and a plurality of similar shaped elements or shells 13 and 14 comprising intermediate sections. The shells are preferably formed in any convenient manner from sheet metal according to any well known process, for example, by stamping or spinning. The bottom end section 12 consists of a cap of substantially hemi-spherical shape, preferably provided with an annular, inwardly projecting flange 15 at a zone adjacent to the rim 16 about the open end. The intermediate sections 13 and 14, and the top end section 11 comprise truncated hemi-spheroidal shells, each having an aperture 18, preferably of circular shape, formed by perforating the wall of the shell opposite the large-diameter end. The annular zone adjacent to the rim of the large-diameter end is bent inwardly to

form the flanges 19 so that when the respective sections are placed together, that is with the large-diameter ends of adjoining sections juxtaposed, a circumferential groove 17 is formed. Similarly the peripheral zone adjacent to the aperture 18 of each intermediate section is deformed so as to provide flanges 20 which form the inner annular groove 21 when adjacent sections are placed together with the large-diameter ends opposed. The zone adjacent to the aperture 18 of the top end section 11 may be provided with an inwardly projecting flange 22 which serves as a means for mounting a filling and discharge neck 23 for the container. The inner end 24 of the neck 23 preferably flares outwardly and overlaps the flange 22. Weld material 25 may be deposited in the annular groove formed between the flange 22 and the neck 23.

According to one method of assembling the pressure vessel, the desired number of intermediate sections 13 and 14 are assembled in pairs back to back, that is, with the large diameter ends opposed and with adjoining apertures 18 properly aligned so as to form the groove 21. The respective sections 13 and 14 may then be united in pairs by depositing solder, braze material, or weld metal 26 (all of which are herein described and claimed as weld metal or weld material) within the groove 21 through the large-diameter end of either section 13 or 14. The assembled pairs of intermediate sections may then be positioned adjacent one another so that the rims of the large-diameter ends align to form the grooves 17. Solder, braze material, or weld metal 27 may then be applied in the outer annular grooves 17 to unite the pairs of intermediate sections in a longitudinally extending series of interconnected spheroids, until the container has attained the desired length. The rims of the end sections 11 and 12 are then welded (or brazed, etc.) about the periphery to the respective large-diameter ends of the terminal intermediate sections in a similar manner so as to complete the container.

As an optional method of assembly, an end section may be welded about its rim to the adjoining hemi-spherical shell comprising an intermediate section, after which successive intermediate sections 13 and 14 may be welded alternately about the edges of the small diameter end or aperture 18 and about the rim of the large-diameter end until the container has attained the desired length, at which time the opposite end section may be welded in place. In either case the weld material may be deposited either within the groove 21, or simply about the edges of the

aperture 18 by inserting a welding tool from the open end of each shell.

As the inner end 24 of the neck 23 flares outwardly and bears against the flange 22, pressure within the vessel places the flange 22 under compression and exerts a minimum stress on the deposit of weld material 25. The neck 23 preferably is secured in place before the section 11 is welded in position. If desired, the respective flanges 15 and 19 may project inwardly a distance greater or less than the adjoining flange, as shown in the drawing and as shown and claimed in my United States Patent No. 2,148,234, to permit the rims to align themselves for welding when placed in the approximate position, and to obviate the need of a jig in the assembly operation. Otherwise, the flanges 15 and 19 may be made identical, in which case they abut along an annular edge. The grooves 17 and 21 may be made by flanging the rims of the hemi-spheroidal shells and the edges of the apertured portions, in any convenient manner, or the grooves may be formed by providing a slight space between the two adjoining parts and without deforming the edges. The groove 21 and the deposit of weld material 26 which serve to reinforce the spheroids at the plane of intersection, may be enlarged as the size of the aperture 18 decreases, to provide the additional support required for such change in the proportions.

Certain details of the hereindisclosed container and the processes of making the same may be varied without departing from the principles of this invention or sacrificing its advantages.

I claim:

1. Process for producing a metallic pressure vessel having a series of interconnected hollow spheroidal zones, said process comprising deforming sheet metal to form hollow hemi-spheroidal end sections and hollow hemi-spheroidal intermediate sections, axially aperturing the intermediate sections, joining the respective intermediate sections in axial alignment by welding the margins of adjoining apertures together and by welding the rims of adjoining sections together, and welding the rims of the end sections to the rims of the opposed intermediate sections.

2. Process for producing a metallic pressure vessel having a series of interconnected hollow spheroidal zones formed of assembled hollow hemi-spheroidal end sections and hollow axially apertured hemi-spheroidal intermediate sections, said process comprising bending the rims of the end sections and the rims of the intermediate sections inwardly to form an outer annular groove when adjacent sections are in assembled position, bending the edges of the respective apertures inwardly to form an inner annular groove when adjacent sections are in assembled relation, and securing the respective sections together by depositing weld metal in the respective grooves.

3. Process for producing a metallic pressure vessel consisting of a series of interconnected hollow spheroidal zones, said process comprising forming hollow hemi-spheroidal end sections, forming hollow hemi-spheroidal intermediate sections, aperturing the intermediate sections, placing each pair of intermediate sections adjacent to one another with the large-diameter ends oppositely disposed and with the respective apertures juxtaposed, securing the respective intermediate sections together in pairs by welding about the edges of adjoining apertures, welding such pairs together about the ribs of adjoining large-diameter ends, and welding the rims of the

end sections to the outwardly disposed rims of the terminal intermediate sections.

4. Process according to claim 3 wherein the edges of the apertures and the rims of the large-diameter ends are flanged inwardly forming annular grooves when the sections are assembled, and wherein the welding is performed in the annular grooves.

5. Process according to claim 1 wherein the adjacent intermediate sections are successively welded alternately about the apertures and about the rims.

6. Process according to claim 3 wherein at least one of the end sections is welded about its rim to the adjoining intermediate section after the intermediate sections have all been welded together.

7. In the process of producing a metallic pressure vessel having a series of interconnected hollow spheroidal zones formed from a pair of hollow end sections and at least one pair of axially perforated hemispheroidal intermediate sections, the steps comprising mounting the intermediate sections with the perforations adjacent, securing said intermediate sections together by welding about the edges of the perforations, and welding the rims of said end sections to the oppositely disposed rims of said intermediate sections.

8. In the process of forming a pressure vessel of intersecting hollow spheroids by assembling a series of hemispheroidal shells having apertures opposite the large-diameter ends; the steps comprising positioning the shells together alternately with the apertures and large-diameter ends in juxtaposed relation and welding the shells together about the edges of the apertures and about the rims of the large-diameter ends.

9. In the process of forming a pressure vessel of intersecting hollow spheroids by assembling a series of hemispheroidal shells having apertures opposite the large-diameter ends; the steps comprising positioning the shells together alternately with the apertures and large-diameter ends in juxtaposed relation and welding the shells together about an inner annular zone adjacent to the periphery of the apertures and about an outer annular zone adjacent to the rims of the large-diameter ends.

10. In the process of forming a pressure vessel of intersecting hollow spheroids by assembling a series of hemi-spheroidal shells having apertures opposite the large-diameter ends; the steps comprising positioning pairs of shells together with respective apertures in juxtaposed relation, welding the shells about an inner annular zone adjacent to the periphery of the apertures, subsequently positioning the respective welded pairs together with the rims of the large-diameter ends in juxtaposed relation and welding the pairs together about an outer annular zone adjacent to the rims of the large-diameter ends.

11. A pressure vessel of interconnected hollow spheroids comprising hollow substantially hemispherical end sections, and a plurality of hollow substantially hemi-spherical intermediate sections, each of said intermediate sections being provided with an aperture opposite its large-diameter end, said intermediate sections being mutually welded together adjacent to the periphery of the respective adjoining apertures and about the rims of the respective adjoining large-diameter ends, the end sections being welded about the rims to the rims of the terminal intermediate sections.

12. A pressure vessel comprising a plurality of truncated substantially hemi-spherical shells joined together to form a longitudinally extending series of interconnected spheroids, said shells being secured by joints extending alternately about the large diameter and small diameter ends of said shells, said joints being welded.

13. In a pressure vessel comprising a plurality of interconnected hollow spheroids; a structural element comprising a truncated substantially hemi-spherical shell, the large diameter rim and the small diameter rim of each shell being flanged inwardly.

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