E. L. GREENEWALD.

DOUBLE WALLED VACUUM INSULATED VESSEL.

APPLICATION FILED MAR. 27, 1914.

**1,237,327.** Patented Aug. 21, 1917.

Fig. 1.

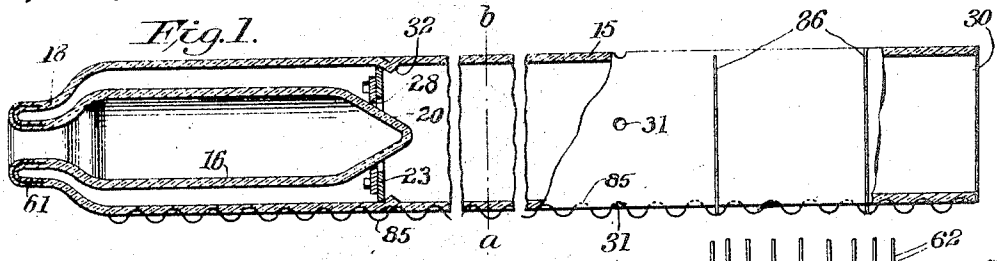



Fig. 2.

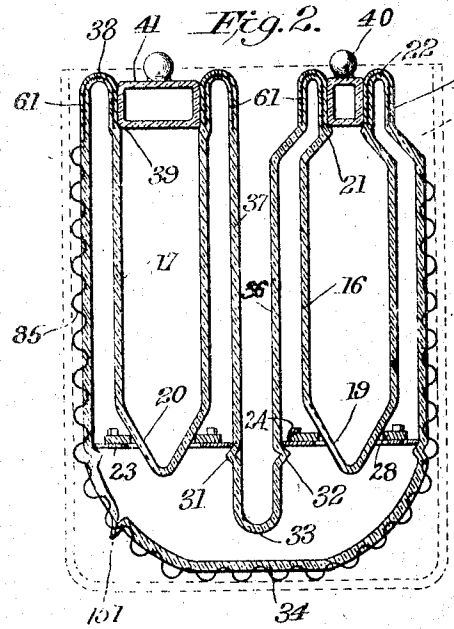



Fig. 4.

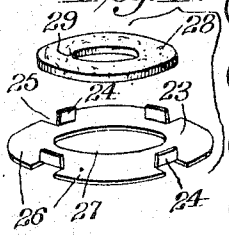



Fig. 3.

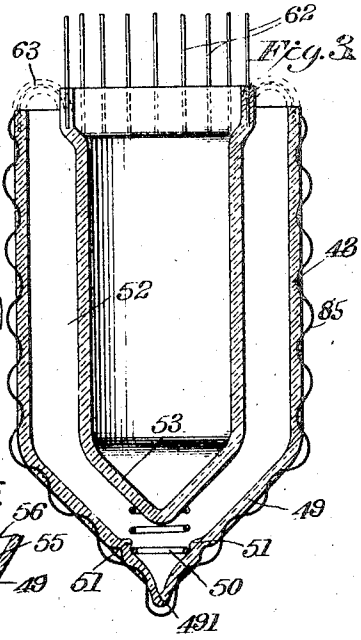



Fig. 5.

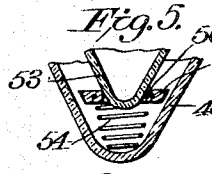



Fig. 6.

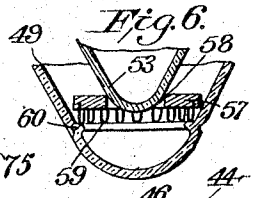



Fig. 10.

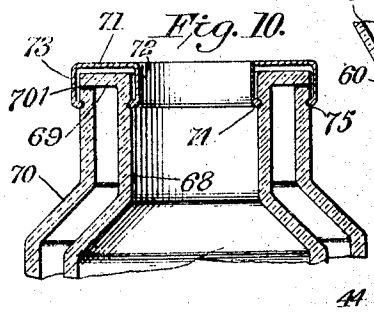



Fig. 7.

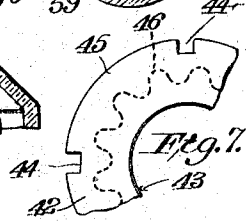



Fig. 11.

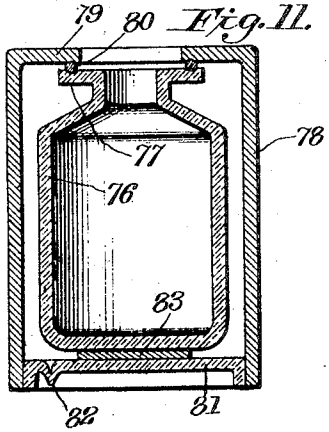



Fig. 8.

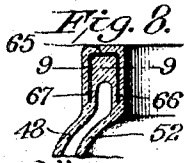



Fig. 9.

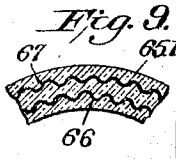
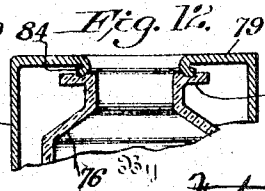



Fig. 12.




Witnesses

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Attorneys

# UNITED STATES PATENT OFFICE.

EUGENE L. GREENEWALD, OF WASHINGTON, DISTRICT OF COLUMBIA.

## DOUBLE-WALLED VACUUM-INSULATED VESSEL.

1,237,327. Specification of Letters Patent. Patented Aug. 21, 1917.

Application filed March 27, 1914. Serial No. 828,067.

*To all whom it may concern:*

Be it known that I, EUGENE L. GREENEWALD, a citizen of the United States, and resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Double-Walled Vacuum-Insulated Vessels, of which the following is a specification.

My invention relates to improvements in double-walled vacuum insulated containers and more particularly to that type of vessel generally known as vacuum bottles.

One of the objects of my invention is to improve the construction of the double vacuum bottles disclosed in the application of Charles F. P. Anders, Serial No. 814,236, matured into Patent No. 1,172,248, by providing two parallel, upright receptacles inclosed by a single wall, which wall is united to the receptacles at their mouths and separated from the bodies of the receptacles by a vacuum space. By such an arrangement the separate contents of the two receptacles inclosed by the single wall may be kept at the same or different temperatures for considerable periods of time. This construction has most of the advantages of two separate insulated containers with but a slight increased expense in manufacturing over a single vacuum bottle.

Another object of the invention is to reinforce the joint at the mouth of the receptacle member where it is united to the wall so that, if desired, the means usually employed for spacing the receptacle member from its wall may be omitted.

Another object is to provide simple and effective devices for yieldingly supporting and centering the receptacles within their inclosing wall and insulating the wall and receptacle from one another.

Another object is to permanently secure a resilient reinforcing and protecting frame to the outer wall of the bottle which also serves as a means for resiliently supporting the bottle in its outer casing and spacing it from the side walls of the casing.

The above and other objects and the novel features of the invention will be apparent from the following description, taken in connection with the drawing, in which—

Figure 1 is a view partly in section and partly in side elevation illustrating the outer wall and one of the receptacles fitted therein and secured thereto before the wall is bent;

Fig. 2 is a central vertical sectional view illustrating the bottle when the same is finished and showing in dotted lines the inclosing casing therefor;

Fig. 3 is a vertical cross sectional view of a vacuum insulated vessel having a single receptacle and embodying features of my invention;

Fig. 4 is a perspective view of a device for centering and supporting the receptacle member within its inclosing wall and for insulating said receptacle from said wall, the parts of said device being separated;

Figs. 5, 6 and 7 are views illustrating other devices for centering, supporting and insulating the inner member within the outer member;

Figs. 8 and 9 are respectively a vertical sectional view and a cross sectional view of a portion of a bottle embodying a reinforcement at the neck of the inner and outer members.

Figs. 10, 11 and 12 are other sectional views of receptacles embodying my invention and showing reinforcing means which may afford a reinforced and slightly resilient joint between the inner and outer members of the bottle or container.

Referring to the drawing, Figs. 1 and 2 in particular, 15 designates a tubular glass blank constituting the outer wall for the glass receptacle blanks 16 and 17 which are attached to the wall at their mouths and completely inclosed by the wall. The wall 15 is of substantially uniform diameter throughout except at one end where it terminates in a reduced portion or neck 18.

The receptacle members 16 and 17 have tapering bottoms 19 and 20 respectively which are shown as conical but may be rounded to any other desirable shape. The receptacle 16 has a narrow portion or neck 21 which fits within and is of a size to be spaced from the neck 18 of the wall 15. The receptacle 16 and wall 15 are permanently united together at their lips or ends, as at 22, by fusing or in some other suitable manner. The receptacle 16 is otherwise spaced and insulated from the wall 15. To

yieldingly support and center the receptacle 16 within the wall and at the same time insulate the receptacle and wall from one another, I provide the devices shown in Figs. 4, 5, 6 and 7. The device shown in Fig. 4 is employed in the container disclosed in Figs. 1 and 2 and comprises a circular plate of resilient sheet metal 23 having a number of struck-up portions or lugs 24 at its periphery leaving the notches 25 at the periphery and the supporting sections 26 between the notches 25. The plate 23 has a central hole 27 extending therethrough and a circular ring 28 of asbestos, mica or other suitable insulating material is superposed on the plate 23 and has a hole 29 extending therethrough and coaxial with the hole 27 in the plate 23. The disk 28 is held in place on the plate 23 and prevented from lateral movement by the upstanding lugs or projections 24, which latter may have their ends bent inwardly to permanently secure the disk 28 to plate 23. The hole 29 is of a smaller diameter than the hole 27 so that when the parts are fitted together the insulating disk will extend inwardly beyond the edge of the hole 27, at all points overlapping the edge of the hole 27. In making the bottle, the receptacle 16 is telescoped, neck end first, through the wide open end 30 of the blank 15 and so that the neck 21 and neck 18 are concentric. The member shown in Fig. 4 is then assembled and passed into the blank 15, the notches 25 being arranged to permit the plate to pass two rows 31 and 32 of interior lugs or beads formed by indents on the exterior of the wall 15. The projections 31 and 32 equal the notches 25 in number and when the device consisting of the two parts 23 and 28 has passed the projections 32 it may be turned slightly so that the notches no longer register with the projections and so that the parts 26 of the plate 23 may rest on said projections 32.

The tapering bottom 19 extends through the openings 29 and 27 and the bottom rests on the edge of the hole 29 in the insulating disk, whereby the receptacle member is yieldingly centered and supported in the wall 15 and also completely insulated therefrom as the tapering part 19 does not come into contact with the metal plate 23.

While the receptacle is being united to the wall at its mouth it is being yieldingly supported and centered at its lower end. The yielding support has the advantage that while the parts are being united and afterward, it will take up and compensate for any unequal expansion between the inner and outer glass blanks thus relieving the neck of such strains.

After the receptacle 16 has been joined to the wall 15, the latter is bent at or near the section *a*—*b* to produce a U-shaped outer wall having a bent part 33 and provided with a flat bottom part 34 supplying a base for supporting the container within an outer casing 35 which is shown in dotted lines. The two limbs 36 and 37 of the wall 15 are bent so that they will be parallel and stand close together.

A resilient centering, supporting and insulating device such as the one shown in Fig. 4 and hereinbefore described is inserted into the limb 37 through the wide mouth 30 and set so that the portions 26 of the plate 23 will rest on the beads 31. The receptacle blank 17 is then telescoped into the limb 37, the tapering end 20 being in the holes 27 and 29 so that the receptacle will be resiliently supported and centered while the end of the wall and the mouth of the receptacle 17 are being fused together at the point 38. There is a shoulder 39 at the neck of the receptacle member 17 and hollow walled stoppers 40, 41, are provided which fit the mouths of the receptacles 16 and 17 respectively. The wall 15 may be provided with a single sealing opening 151 preferably in the bent portion as shown and the air from within the wall and from about both receptacles may be exhausted through the single opening.

In Fig. 7 is shown another form of resilient centering, supporting and insulating device which comprises a disk 42 molded of asbestos or other suitable heat insulating material, being provided with a central hole 43 to receive the tapering end of the receptacle member, and notches 44 at its peripheral edge to pass over the beads on the interior of the wall as previously set forth and leaving parts 45 to seat on the beads. When the disk is molded or otherwise made a circular sinuous resilient metal wire 46 is completely embedded therein to reinforce the disk and also provide for the necessary resiliency to take care of the unequal expansion of the wall and receptacle.

Referring to Fig. 3, I have shown an outer wall 48 having a conical bottom 49 provided with a sealing opening 491 and a wide mouth through which is first inserted a spiral spring 50 of metal, the end spiral of which may be engaged beneath holding lugs or beads 51 on the interior of the bottom 49 to hold the spring centrally in place in the bottom of the outer wall. The receptacle blank 52 is substantially similar to the outer blank 48 and the tapering end 53 fits in the spiral spring 50 whereby the receptacle may be yieldingly centered and supported while the two blanks are being united at their mouths.

The wire spring 50 may be covered with

some suitable heat insulating material or such devices as are shown in Figs. 5 and 6 may be employed. In Fig. 5, the end spiral of a spring wire 54 is embedded in an asbestos disk 55 and encircles a hole 56 in said disk, the said hole being designed to receive and center the tapering end 53 of the receptacle blank. The spring 54, like the spring 50 is arranged co-axially with both inner and outer blanks and rests on the interior of the bottom of the outer blank. In Fig. 6, I have illustrated another form in which a disk 57 of asbestos or like material has a hole 58 to receive and center the tapering end 53 of a receptacle and a resilient sinuous wire 59 is partly embedded in the disk 57 and extends throughout its under side near the circumferential edge, resting on a ledge 60 on the interior of the bottom wall 49. The above described devices yieldingly support and center the inner blank while it is being secured to the outer blank and take up strains of unequal expansion and contraction afterward when the container is in use. The devices also afford effective heat insulating spacers between the inner and outer walls.

In order to reinforce the joint between the inner and outer blanks of the vacuum bottles shown in Figs. 1, 2 and 3, I embed a suitable resilient reinforcement 61 therein which extends from the wall of the inner blank to the wall of the outer blank through the joint therebetween. As shown in Fig. 3, a series of metal wires 62 of suitable resilient non-oxidizable material are preferably embedded in the end of one of the blanks, the inner one in this instance, and when the blanks are fused together the wires 62 are bent around and embedded into the glass at the joint 63. The wires provide a U-shaped reinforcement which is resilient and will compensate for differences in expansion or contraction of the inner and outer receptacles at the joint and the usual spacers between the blanks may be dispensed with. In actual use and when a filled vacuum bottle is laid on its side or receives a sudden jar the leverage of the filled receptacle part subjects the joint at the neck to an excessive strain which breaks many bottles. The reinforcement overcomes this defect in the bottle.

In the construction illustrated in Figs. 8 and 9, I have shown an inner and outer blank joined together by a solid neck section 651. An annular metal U-shaped plate 65 has corrugated inner and outer flanges 66 and 67 which are pressed into or embedded in the plastic glass of the solid neck portion 651 of the bottle and fused thereto. The corrugated flanges provide for resiliency in all directions, the flanges extending into the inner and outer walls. The top portion of the plate 65 may be entirely embedded in the neck 651 or rest on the upper edge thereof.

A bottle is illustrated in Fig. 10 in which the inner blank 68 has an outwardly extending flange 69 at its mouth. The flange 69 overlaps and rests on but is not united to the upper end of the outer blank 70 and a washer of asbestos 701 may be placed therebetween. The blanks 68 and 70 are closed at their bottoms and the space therebetween, as in all bottles herein shown, has the air exhausted therefrom and a vacuum sealed therein. It will be understood that in certain embodiments of the invention it will be unnecessary to exhaust the air from the space between the inner and outer blanks, as for some purposes the dead air space between the blanks provides sufficient heat insulation. In order to provide a sealed connection between the inner and outer blanks at the top or mouth, I make use of a metal U-shaped plate 71 of resilient material and having the inner and outer flanges 72 and 73 provided with beads at their edges whereby the flanges are connected or fused in any suitable manner to the glass banks 68 and 70 as at 74 and 75 providing air tight seals. The resiliency of the flanges permits the bodily movement of the inner blank and prevents breakage due to excessive jar.

In Fig. 11, the inner glass bottle 76 has an outer flange 77 at its mouth and is introduced through the bottom of the metal wall 78 which has an inwardly extending flange 79 overlapping the flange 77. A resilient circular sinuous wire 80 is inserted between the two flanges 77 and 79, and is fused to the glass flange 77 and welded to the metal flange 79, whereby a resilient connection is effected between the inner and outer blanks. The flanged bottom 81 is welded to the outer blank 78 and has a sealing opening 82 for exhausting the air from the space between the walls. The spacer 83 of asbestos or of resilient heat insulating material may be inserted between the bottom of the receptacle 76 and the bottom 81 or may be omitted if desired.

In Fig. 12, the edge of the flange 79 has been inturned to provide a resilient roll or bead 84 which is fused or permanently connected to the flange 77 to provide a resilient, air-tight seal between the inner and outer blanks.

Referring to the construction shown in Figs. 1, 2 and 3, the outer wall of the bottle is provided with a reinforcing and protective frame consisting of a series of resilient metal wires or bands 85 extending longitudinally of the wall and being sinuous or wavy in form and embedded in the wall at

intervals in their length leaving resilient loops between the embedded loops. The resilient loops project out beyond the outer wall of the bottle and serve to form a guard or protective covering permanently united to the bottle. This covering relieves the bottle of the effects of jars and yieldingly spaces and supports the same within the inclosing casing 35. The longitudinal wires 85 are joined together into the form of a frame by the circumferentially extending wires 86 which may be sinuous and embedded in the wall 15. It is to be understood that where a "wide-mouth" member is referred to in this description or the annexed claims I mean a member whose mouth is substantially the same diameter as the body of the member, and where a "narrow-mouth" member is referred to, a member is meant whose mouth is smaller in diameter than the body. The neck portion of a wide-mouth member or blank means that portion of the body near the mouth of the body or blank and the neck portion of a narrow-mouth member refers to the reduced portion of the body near the mouth.

While I have shown and described my invention in detail, I do not wish to be limited to the exact construction as set forth.

Having thus described my invention, what I claim is:

1. A container comprising an outer tubular wall having two upwardly extending tubular limbs communicating at the bottoms thereof, and receptacle members fitting within said limbs.

2. A container comprising an outer wall in the form of a tubular body bent intermediate its ends and providing two upwardly extending limbs and a receptacle member fitting within each of said limbs.

3. A container comprising two upright receptacle members and a single tubular casing therefor spaced substantially a uniform distance from each receptacle member entirely around the same, said casing being joined to each receptacle member and inclosing both said members.

4. A container comprising two upright receptacles, and a single casing therefor and joined to each receptacle at the mouth thereof, said casing inclosing both receptacles and being separated a uniform distance from the bodies thereof by a vacuum space and by heat insulating devices.

5. The combination with a casing, of a hollow walled heat insulated container in said casing having a reinforcing and protecting means permanently united with the outer wall thereof and spacing said container from the inside of said casing, whereby an air space is provided between said container and casing.

6. A double-walled glass vessel comprising an outer wall having two upwardly extending limbs and a narrow mouthed receptacle and a wide mouth receptacle fitting in the limbs of said wall and secured thereto.

7. A double walled glass vessel comprising a receptacle having a mouth as wide as the body of said receptacle, a second receptacle having a mouth smaller in diameter than the diameter of the body of said second receptacle, said receptacles being arranged parallel to each other and upright, and a single inclosing wall therefor and secured thereto.

8. In a vacuum bottle, the combination of an outer wall having a projection on the interior thereof, a notched plate resting on said projection, a heat insulating ring resting on said plate, and a receptacle member secured to said wall and having a part spaced from said wall and held in position by said ring.

9. In a vacuum bottle, the combination of an outer wall having a beaded portion on the interior thereof, a centering and supporting device resting on said beaded portion, said device comprising a metal member and a heat insulating member connected together, and a receptacle member spaced from said wall and adapted to be held in position by said device.

10. A heat insulating device for double-walled vessels comprising a disk of heat insulating material having an opening therein, and resilient means surrounding the axis of said opening.

11. A double walled container comprising an inner receptacle member, an outer wall member joined to said inner member, and separate metal devices connected to said members and embedded in the joint between the latter.

12. In a double walled container, the combination of an outer blank, a receptacle blank in said outer blank, united therewith and having the body thereof spaced from said outer blank, the surface of one of said blanks having a bead thereon projecting into the space between said blanks, and a heat insulating device between said blanks comprising an annular member of heat insulating material, and a resilient member associated with said annular member, one of said members having a notch therein whereby said device may be slipped past said bead and above the latter, said bead serving to support said device in place when said device is turned to move the notch therein out of registry with the bead.

13. A heat insulating device for double-walled vessels comprising an annular member of heat insulating material having a continuous inner edge and a resilient member

associated therewith, one of said members being provided with notches along its peripheral edge for the purpose set forth.

14. A heat insulating device for double-walled vessels comprising a concentrically recessed member of heat insulating material and a resilient member embedded therein and extending around the axis of the recess of said recessed member.

15. A double-walled container comprising an inner blank constituting a receptacle, an outer blank constituting the inclosing wall of said receptacle, said outer blank being joined to the inner blank at the neck thereof and separated therefrom below said joint by a space, and means for reinforcing said joint.

16. A double-walled glass container comprising an inner glass blank, an outer glass blank joined to the inner blank at the neck thereof and separated therefrom below said joint by a space, said outer blank completely inclosing the inner blank and resilient means for reinforcing said joint.

17. A double-walled vacuum insulated container comprising an inner blank, an outer blank joined to the inner blank at the neck thereof and separated therefrom below said joint by a vacuum space, said outer blank completely surrounding the body of the inner blank and means embedded in the joint for reinforcing the same.

18. A double walled heat insulated container comprising an inner blank having a body and a neck and constituting a receptacle, an outer blank having a body and a neck completely inclosing the inner blank, said blanks having the bodies and necks thereof spaced apart and means for connecting said blanks comprising a member secured in the necks of said blanks and extending from within the neck of the inner blank into the neck of the outer blank.

19. A double-walled vacuum insulated container comprising an inner blank, an outer blank joined to the inner blank at the neck thereof and separated therefrom below said joint by a vacuum space, said outer blank completely inclosing the inner blank, and metal wires embedded in the joint and extending from the inner blank to the outer blank to reinforce the joint therebetween.

20. A double-walled container having two receptacle members, a wall inclosing said receptacle members and joined thereto, and a reinforcement means for the joints between said receptacles and the wall.

21. A double-walled container comprising an inner receptacle blank and an outer blank surrounding the receptacle blank, and a joint between the two blanks comprising a resilient U-shaped metal member united to each of the blanks.

22. A double-walled vessel comprising an inner receptacle member, and an inclosing outer wall secured to said receptacle at its mouth and otherwise separated from said inner member, and a reinforcement permanently secured to the outer wall.

23. A double-walled vessel comprising an inner receptacle member, and an outer wall secured to said receptacle at its mouth and otherwise separated from said inner member, and a resilient reinforcing and protective means permanently attached to the outside surface of said outer wall.

24. A double-walled vessel comprising an inner receptacle member, and an outer wall secured to said receptacle at its mouth and otherwise separated from said inner member, and a resilient metal device permanently united with the outer wall and extending around the sides and bottom thereof.

25. A double walled vacuum insulated vessel having a reinforcing and protecting frame permanently secured thereto, said frame being composed of resilient wires or bands.

26. A double-walled vacuum insulated vessel comprising an inner blank and an outer blank joined at their mouths, and a frame partially embedded in the outer blank and comprising sinuous wires or bands of resilient material.

27. A double-walled vacuum insulated vessel having an inner blank and an outer inclosing blank and a joint between the two blanks comprising a metallic element embedded in each of the blanks and serving to form a resilient connection between the two blanks at their mouths.

28. A double-walled container comprising an inner member having a mouth, an outer member joined to said inner member at the mouth of the latter, one of said members having beads thereon extending into the space between said members, and a ring between said members having spaced notches in its edge, whereby, in assembling, said ring may be slipped past said beads and then by a slight turn may be positioned so that it will be supported in place by said beads.

29. A glass vacuum bottle comprising an inner glass blank, an outer glass inclosing blank joined to the inner blank at the neck thereof and separated therefrom below said joint by a vacuum space, and reinforcing means of material different from glass, said means terminating in the neck portions of said blanks and extending across the joint therebetween.

30. A heat insulating device for a double-walled container comprising a metal ring carrying heat insulating means, said ring having integral lugs bent to hold said heat insulating means in place on said ring, said

lugs being punched from the metal along one edge of the ring to form notches along said edge, for the purpose set forth.

31. A glass vacuum bottle comprising an inner glass blank, an outer glass inclosing blank joined to the inner blank at the neck thereof and separated therefrom below said joint by a vacuum space, reinforcing means comprising members having spaces between them and extending from the inner blank to the outer blank across the joint therebetween.

32. A container having an openwork protective device only partially embedded in the outside wall thereof and comprising wires embedded at intervals in their length in the material of the container, said wires having parts thereof spaced from the wall of said container.

In testimony whereof I affix my signature in presence of two witnesses.

EUGENE L. GREENEWALD.

Witnesses:
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M. H. BRAKHAGEN.