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(54) **Convex-bottom, two-piece containers**

(57) A container made of thin sheet metal such as aluminium comprises a cylindrical side wall 3 substantially thinner than the bottom 5 which has a generally spherical section with at least one nonsymmetrical projections thereon providing a seating surface 62 offset outwardly of the axes of

respective projection(s) to provide a stable support for the container. Transition areas between the projection(s) and the can bottom merge in broad curved surfaces which will not hinder spray coating of the bottom. The outer wall 63 of the or each projection forms a greater angle with the bottom than does the inner wall 64. The projection(s) may be oval, kidney-shaped circular or annular in plan view.

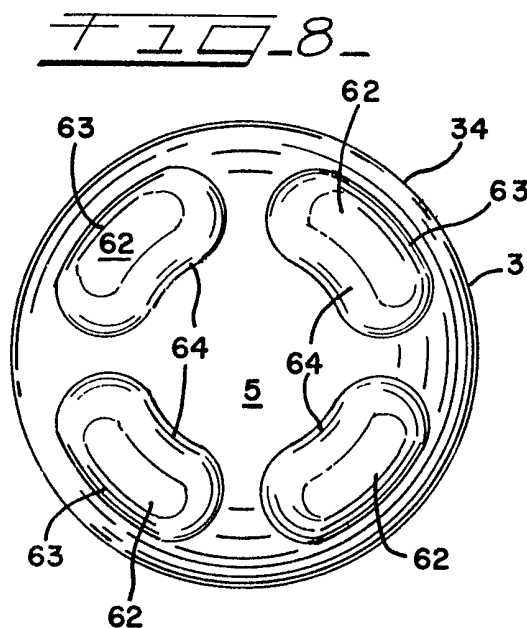


FIG. 1

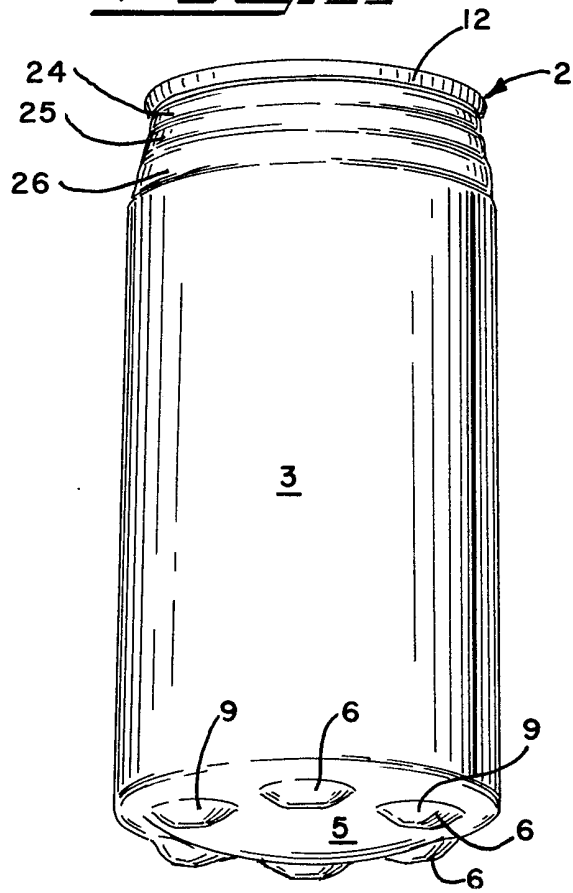


FIG. 2

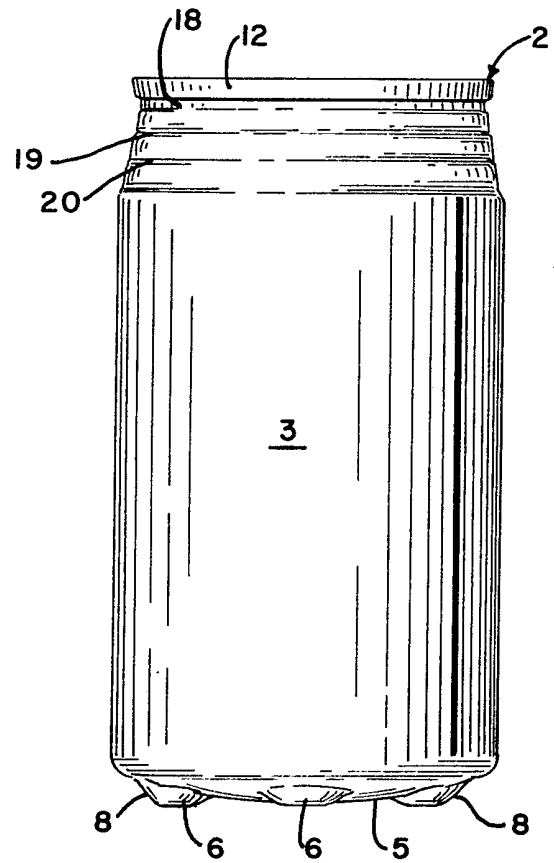


FIG. 3

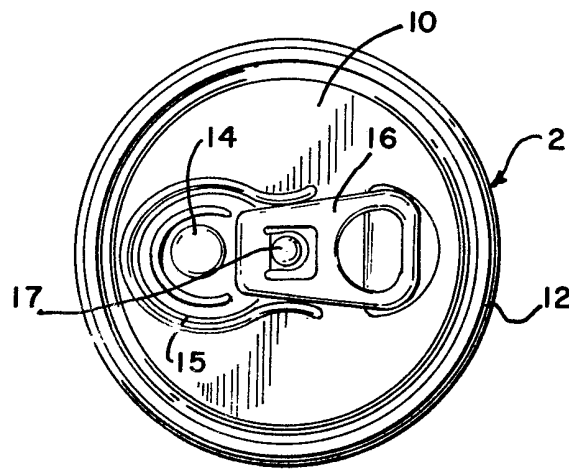


FIG. 4.

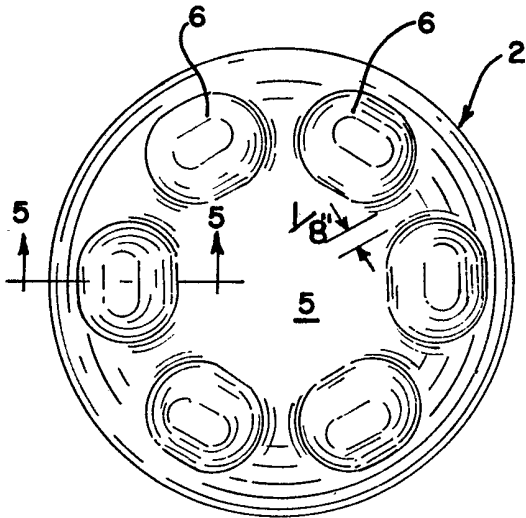


FIG. 8.

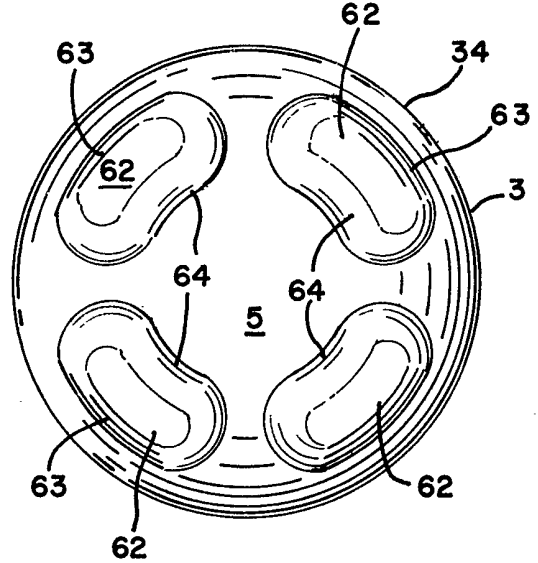


FIG. 9.

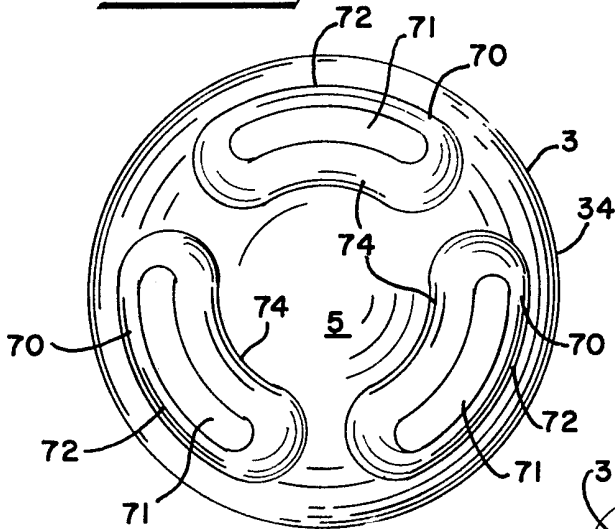


FIG. 10.

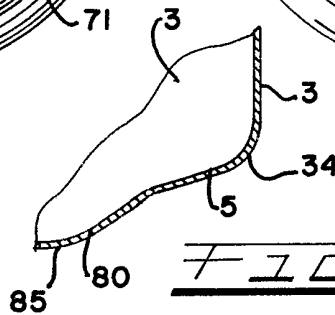
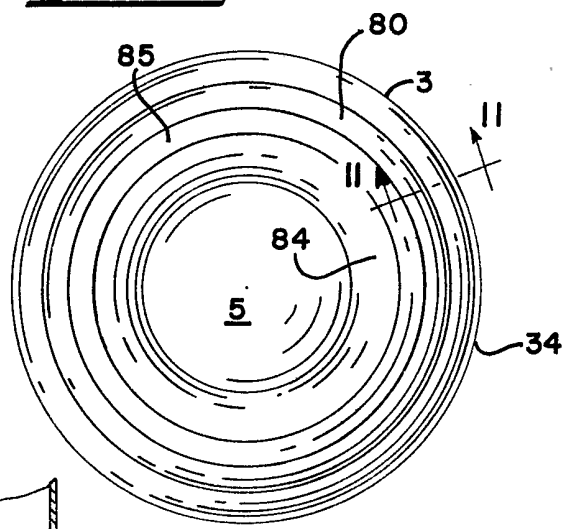


FIG. 11.

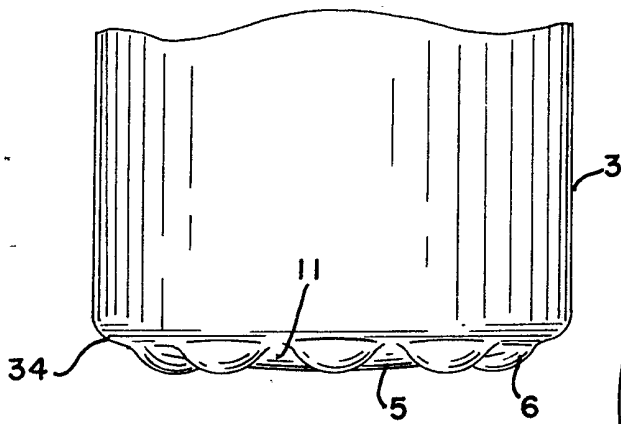


FIG. 6

FIG. 7

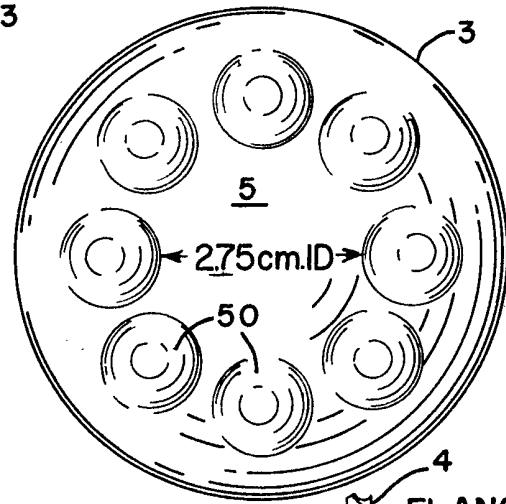
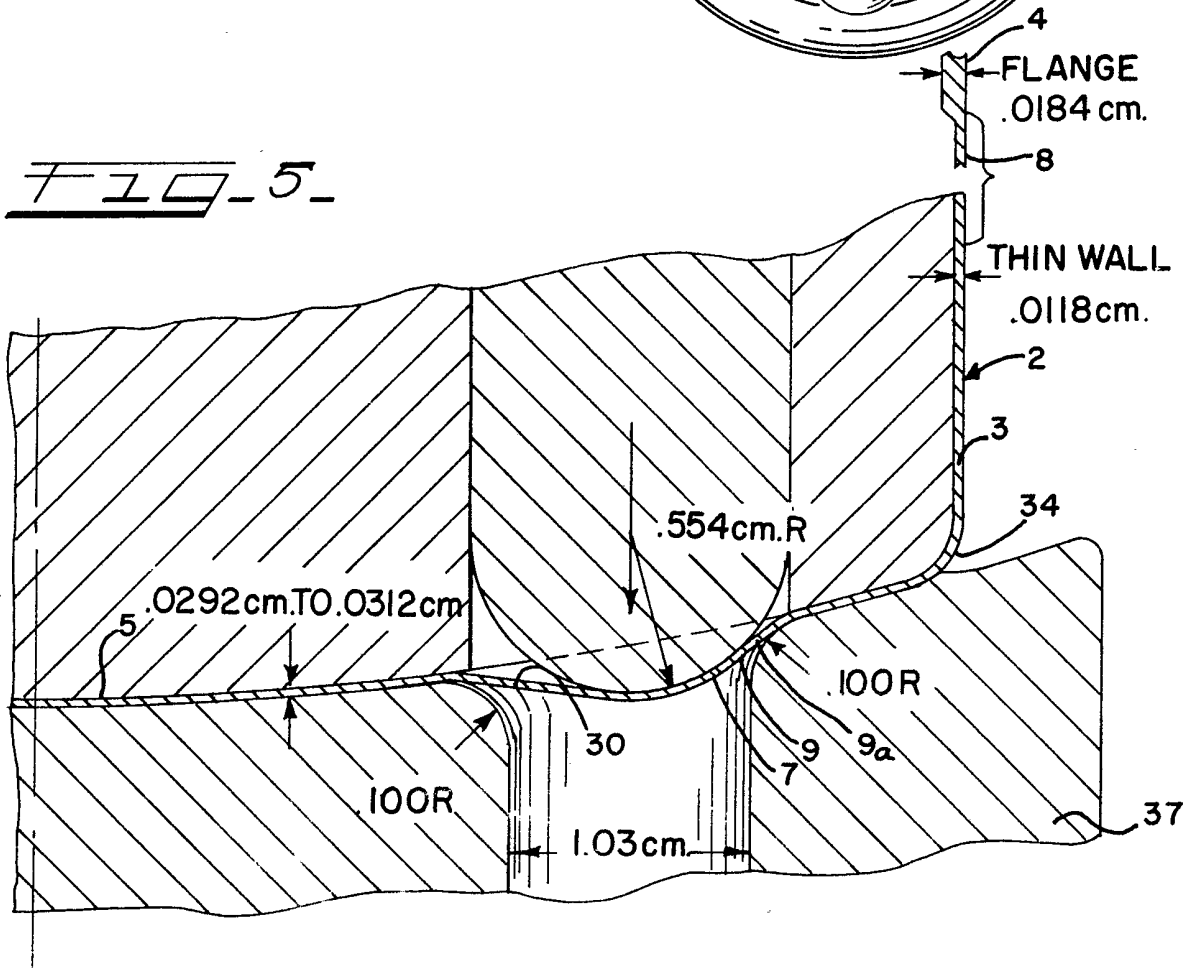


FIG. 5



## SPECIFICATION

**Convex bottom two-piece container**

This invention relates to thin metal containers.

Two-piece containers are well known. They  
 5 comprise a body with an integral bottom at one  
 end and a top end seamed to the other end of the  
 body. One of the problems encountered by the  
 industry in forming a thin-walled metal can  
 structure resided in forming a suitable bottom  
 10 which would seat the can in a stable position upon  
 the conveyors. When empty, the cans are carried  
 to the filler and then when the cans are filled, they  
 are carried away to the packing stations. The way  
 such cans were made was to form a calotte in the  
 15 can bottom so as to hold the pressure in the can  
 without deforming and to provide an annular  
 seating rim about the edge of the can body to  
 stabilize the can as it was being transported. An  
 example of such can is shown in U.S. Patent  
 20 3,029,507. Other cans provide flexible bottoms  
 which are concaved toward the interior of the can  
 when unpressurized and expand into convex  
 shape when pressurized. An example of such can  
 is shown in U.S. Patent 1,788,261.

25 The object of this invention is to provide a can  
 which meets accepted standards of stability of a  
 flat bottom can such that it will not easily tip and  
 will withstand normal abuse of transport and  
 stacking.

30 The present invention provides a thin metal  
 container comprising a body providing a side wall,  
 an outwardly convexed bottom wall integrally  
 formed with said body, a plurality of outwardly  
 projecting seating dimples formed in said bottom  
 35 wall having lower end portion extending below  
 said bottom wall and providing seating surfaces  
 for said container offset outwardly of the axes of  
 respective dimples, said dimples being formed to  
 provide transition areas with said bottom wall of  
 40 relatively shallow angles.

These and other features and advantages  
 inherent in and encompassed in the invention will  
 become more apparent from the specification and  
 drawings, wherein:

45 Figure 1 is a perspective view of a can

- embodying one form of the invention;

Figure 2 is a side, elevation thereof;

Figure 3 is a top plan view thereof;

Figure 4 is a bottom plan view thereof;

50 Figure 5 is a fragmentary axial section taken on  
 line 5—5 of Figure 4;

Figure 6 is a fragmentary side elevation of a can  
 embodying another form of the invention;

55 Figure 7 is a bottom plan view of the can  
 shown in Figure 6;

Figure 8 is a bottom plan view of another  
 embodiment of the invention;

Figure 9 is a bottom plan view of still another  
 embodiment;

60 Figure 10 is a bottom plan view of still another  
 embodiment, and

Figure 11 is an enlarged fragmentary cross  
 section taken substantially on line 11—11 of  
 Figure 10.

65 In Figures 1—5 there is shown a metal can  
 made of H19—3004 aluminium or the like, which  
 is drawn and wall-ironed. It comprises a thin wall  
 body portion 3 of the order of .0118 cm. (about  
 .0047 inches) which at its upper end 4 is about  
 70 .0184 cm. (about .0073 inches thick.) The bottom  
 5 has an outwardly convexed generally spherical  
 contour of about 12.38 cm. (about 4-7/8 inch)  
 radius and has a thickness of about .0292 cm to  
 .0312 cm. (about .0115 inches to .0123 inches)  
 75 and about its periphery merges in a .0327 cm.  
 (about a 1/8 inch) radius with the lower edge of  
 the side wall of the body.

The bottom 5 is formed with a plurality of  
 hollow outwardly bulged generally oval shaped  
 80 lopsided dimples or feet 6 which project below the  
 bottom surface 11. In the container illustrated, six  
 feet are provided spaced diametrically from each  
 other center to center about 4.44 cm (about 1.75  
 inches). Each dimple has a cusp 7 of about 5.54  
 85 cm. (about .218 inch) radius and merges on its  
 internal side in a steep sided wall portion 9a with  
 the bottom wall surface 9 in a radius of about  
 .254 cm (about .100 inches).

The upper flange portion 8 of the container  
 90 body wall with the flange portion 4 is triple-  
 necked to reduce the diameter of the top end of  
 the container. An end member 10 is double  
 seamed at 12 to the portion 4 of the body.

The end panel comprises an openable segment  
 95 14 which is defined by a score 15 adapted to be  
 ruptured by lifting a lever tab 16 which has a  
 hinge lug secured by a rivet 17 to the end panel as  
 is well known in the art.

A steeped arrangement is provided by three  
 100 necked in annular portions 18, 19 and 20 and the  
 provision of the intervening frusto-conical  
 juncture bands 24, 25 and 26, which are of  
 relatively shallow conical angle not exceeding  
 substantially 30° axial. The positioning of the  
 105 necked in regions adjacent to the end of the body  
 obtains axial loading strength in the can body  
 within require parameters.

It will be seen that the outer walls 9a of each  
 dimple is more abrupt or extends axially at an  
 110 abrupt angle to the bottom 5 than the inner wall  
 portion 30 of each dimple which merges with wall  
 5 at a relatively shallow angle of about 11—12°  
 whereas wall 9a is closer between 30—47°.

Thus, the seating area 32 of each dimple is  
 115 disposed as far as possible toward the peripheral  
 edge 34 defined by the juncture of the bottom  
 wall and side wall 3.

In the container illustrated, the inner concave of  
 side of each dimple provides smooth transition  
 120 surface areas allowing the spraying and deposition  
 of coatings onto the entire bottom inside surface  
 area. Sharp angled contours preclude and inhibit  
 good even application of the coating.

Figure 5 illustrates tooling including an anvil 37  
 125 with a concave upper face and an opposing main  
 punch 33 with a convex matching face 40 to form  
 the wall 5 therebetween. Periodically a plurality of  
 concave pockets are formed in the anvil and an  
 opposing punch 44 is slidable within guide bores

45 in the punch 39. The forming face 46 on the punch 44 is convex and opposes a forming face in pocket. The punches 39 and 44 advance and retract with respect to the surfaces 38 and 48 and form the metal of the bottom wall 5 therebetween.

In the embodiment of Figures 6 and 7, the container has hemispherical dimples 50,50 which project from the initially preformed outwardly convexed bottom 5. The dimples are equally spaced in an annular series and are eight in number. They project below the bottom surface 11.

In the embodiment of Figure 8 the container has kidney-shaped dimples 60,60 which are four in number equally spaced along the periphery 34 each is convexed outwardly and presents a seating area 62 offset toward the periphery 54. Outer wall 63 of each dimple is steeper than the inner wall 64.

In the embodiment of Figure 9, the kidney-shaped dimples 70 are longer and are three in number, arranged in an annular series. The seating areas 71 are offset toward periphery 34 and the outer walls 72 are steeper than the inner walls 74. The pronounced arcuate shape of the inner walls obtains added strength which is also true of the inner walls 64 of Figure 8.

In the embodiment of Figures 10 and 11, the container has a toroidal continuous ring 80 provided which in cross section is non-symmetrical and has an outer wall which is steeper than inner wall and presents a seating area 85 offset toward periphery 34.

Thus in each embodiment the feet or dimples extend below the spherical bottom and the seating area is offset within practical limits toward the periphery 34 consistent with the requirements of adequate strength and having non-sharp easy flowing interior surface contours which are easy to spray with coating layers or other materials.

## CLAIMS

1. A thin metal container comprising a body providing a side wall, an outwardly convexed bottom wall integrally formed with said body, a plurality of outwardly projecting seating dimples formed in said bottom wall having lower end portion extending below said bottom wall and providing seating surfaces for said container offset outwardly of the axes of respective dimples, said dimples being formed to provide transition areas with said bottom wall of relatively shallow angles.

2. The container according to Claim 1, wherein said dimples have an outer wall portion adjacent to the periphery of said bottom wall and positioned at an abrupt angle to said bottom wall.

3. The container according to Claim 2, wherein said outer wall portions of said dimples have an inclination to the axis of the containers of 30° or less and said inner wall portions of said dimples have an inclination substantially greater than 30°.

4. The container according to Claim 1, 2 or 3, wherein said dimples are of generally obloid form having their major axes extending circumferentially of the container.

5. The container according to Claim 1, 2 or 3, wherein said dimples in the bottom wall are of generally kidney shape oriented about the axis of the container.

6. The container according to Claim 1, 2 or 3, wherein said dimples comprise a continuous ring which is flatter toward the center of the container and deeper adjacent to the outer periphery of the container.

7. The container according to any of Claims 1 to 6, wherein said dimples are no more than eight in number.

8. A thin metal container substantially as herein described with reference to the embodiment of Figures 1 to 4, the embodiment of Figures 6 and 7, the embodiment of Figure 8, the embodiment of Figure 9 or the embodiment of Figures 10 and 11.