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C. W. LANG

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DOMED CONTAINER END

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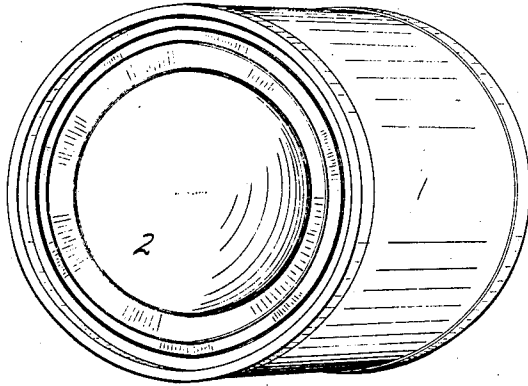


Fig. 1.

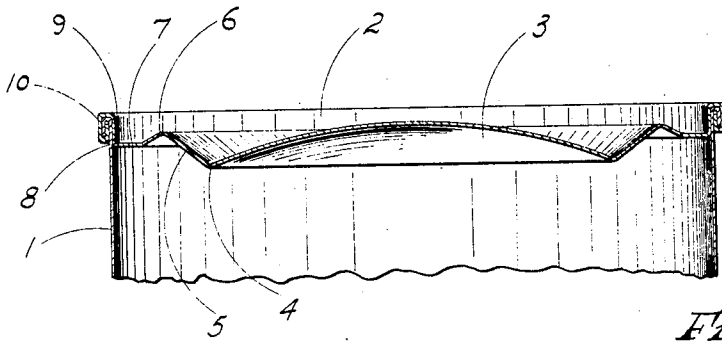


Fig. 2.

Fig. 4.

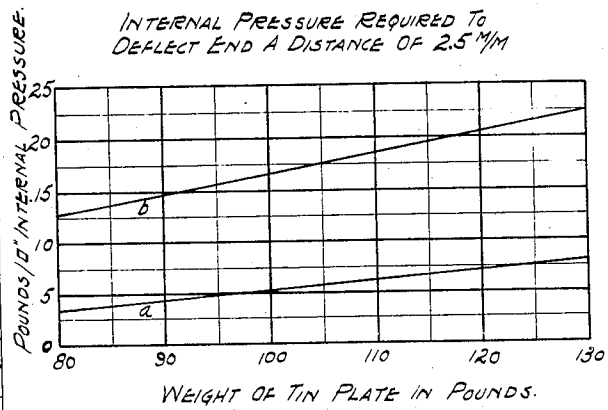
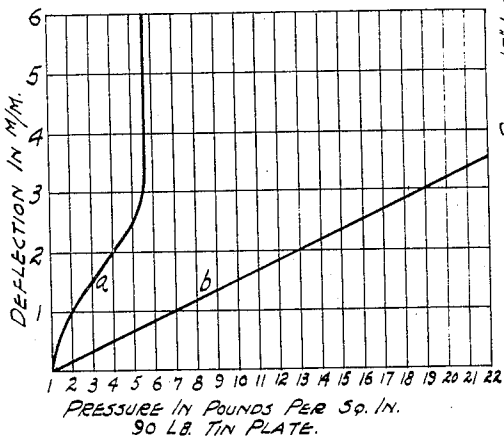


Fig. 3

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# UNITED STATES PATENT OFFICE

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## DOMED CONTAINER END

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5 Claims. (Cl. 220-66)

This invention relates to cans or containers composed of thin gauge metal and more particularly to such containers which are adapted to withstand considerable differential pressure on opposite sides of the container without noticeable or excessive distortion of the ends.

Efforts have been made heretofore to increase the rigidity of container ends and thus to resist greater differential pressures on opposite sides of the container end, certain of such efforts having taken the form of progressively stepping down the container end from its periphery toward its center. Such container ends are known in the trade as standard ends. However, such shaping of these ends increases the rigidity of the material but little and has a tendency to give the ends a diaphragm-like action when subjected to differential pressures.

The present invention solves this problem while permitting use of metal for the can ends which is of the same thickness as the metal of the can body. Moreover, this solution results in can ends which not only will resist much greater differential pressures with minimum deflection than can ends of the prior art composed of the same thickness of metal but which will also resist increasing pressures with slow progressive uniform deflection in contrast with the prior art can ends which deflect non-uniformly at first and then suddenly deflect more or less uniformly but in large amount with a slight increase in pressure beyond the amount necessary for a small amount of deflection. These results are based on new and improved shaping and disposition of the portions of the can ends, as will more fully appear and be pointed out hereinafter.

In the drawing accompanying and forming a part of this specification,

Figures 1 and 2 show, respectively, a perspective and a fragmentary central cross-sectional view of a can embodying the present invention.

Figures 3 and 4 are curves showing the superiority of can ends embodying the present invention over present day standard can ends.

A preferred form of can embodying the present invention is shown in the drawing. The cylindrical can body 1 has similar disc-like ends 2 secured thereto. Each end 2 has a central, dome-shaped or convex portion 3 which preferably occupies more than half the diameter of the can body. At the periphery of portion 3 is formed a curve 4 with a small radius and from curve 4 a conical portion 5 inclines upwardly to a point somewhat below the top of dome

3 where a curve 6 with a longer radius than that of curve 4 is disposed. From curve 6 a plane portion 7, disposed between curves 4 and 6 and below the top of dome 3, extends at substantially right angles to the can body 1, and, adjacent to the body, is bent up substantially at 8 at a right angle to form a flange 9, the free end of which extends above the top of the dome 3 and is joined to the body 1, as by being rolled thereinto a bead 10, or in other suitable manner. In the can end shown herein, the center of the dome 3 is about 2.5 mm. below a plane passing across the extremity of the can or the end of bead 10.

When pressure is exerted on the can end from within the can the greatest bending takes place at the outer edge of portion 7, that is at 8. External pressure will have substantially the same effect but movement will take place in the opposite direction. The portions 3, 4 and 5 and 6 are thus relatively rigid under pressures of considerable magnitude, such as are ordinarily encountered in tin cans, and move together practically as a rigid unit. These portions thus retain their shape almost completely with the result that they strongly resist deflection, and whatever deflection there is, takes place uniformly throughout the whole circumferential extent of portion 7 and does so gradually under increasing pressure. Such deflection is not noticeable until the center of dome 3 is moved beyond the end of the can as defined by the end of bead 10. Even then the deflection is not readily noticeable until the center of dome 3 has been moved far enough beyond bead 10 to permit rocking of the can when standing on end.

Standard or substantially flat can ends deflect locally and under small differential pressure and the deflection becomes general all over the end with increased pressure. After a deflection of 2.5 mm. such a can end deflects at a very rapid rate with slight pressure increases, as is shown in Figure 4.

A comparison of the relative rates and amounts of deflection of such standard can ends and the can ends of this invention is shown in Figures 3 and 4.

The curves *a* and *b* of Figure 3 show, respectively, the pressures required to produce a deflection of 2.5 mm. with standard or substantially flat can ends and with the herein illustrated can ends for various weights or thicknesses of tin plate and of about  $4\frac{1}{4}$  inches in diameter. The curves *a* and *b* of Figure 4 show, respectively, the rate and amount of deflection of the

can ends like those of Figure 3 when composed of 90 pound tin plate and subjected to various pressures. The "weights" of tin plate as the term is used herein is the weight in pounds of a base box of tin plate as the term is used in the trade.

While Figures 3 and 4 refer to tin plate it is to be understood that this invention is not limited to tin plate but, on the contrary, various suitable materials other than tin plate may be used in embodiments of this invention.

Having thus described my invention, what I desire to secure by Letters Patent is defined in what is claimed.

1. A thin metal can including an end disc secured to a cylindrical body, the end disc being substantially symmetrical about its center and bent in cross section, the end having a central dome extending over a major portion of its diameter, an inclined conical portion extending upwardly from the outer margin of the dome to below its top and merging through a curve of considerable radius into a plane portion lying adjacent to and at substantially right angles to the can body, the said plane portion being narrower in radial dimension than the said inclined portion, said plane portion being adapted to deflect gradually and substantially uniformly while said central dome and conical portion remain substantially rigid when the can end is subjected to varying differential pressures.

2. A metal can composed of thin gauge metal and comprising a cylindrical body and disc-like ends secured thereto, each end being highly resistant to deflection due to differential pressures on opposite sides thereof and capable of substantially uniform deflection when subjected to varying amounts of differential pressure, each end having a dome-shaped central portion, reversely curved portions therearound, and a plane portion around the outer curve portion and formed with a flange secured to the can body, the outer curved portion having a greater radius than the inner curved portion, and the center of each dome-shaped portion being normally positioned within the can relative to a plane defining the adjacent extremity of the can.

3. A thin metal can including an end disk secured to a cylindrical body, the end disk having near its outer margin a straight annular portion disposed substantially at right angles to the

cylindrical portion of the can, an inclined annular conical portion disposed radially within the said straight portion and extending from beyond the outer side to and beyond the inner side of the said straight portion, the said conical portion at its inner radial end merging into a disk-shaped dome-like central portion.

4. A metal can composed of thin gauge metal and comprising a cylindrical body and disk-like ends secured thereto, each end being highly resistant to deflection due to differential pressures on opposite sides thereof, and being capable of uniform deflection when subjected to varying amounts of differential pressure, each end having an outer plane annular marginal portion disposed at substantially right angles to the cylindrical body, an annular inclined portion disposed radially inwardly of the said plane portion and extending from beyond the outer side of to beyond the inner side of the said plane portion and connected to the latter by a curve of considerable radius, a disk-like dome-shaped central portion merging into the inner end of the said inclined portion through a curve of relatively small radius as compared with the radius between the plane portion and the inclined portion, each end being secured to the cylindrical body of the can by an annular marginal portion surrounding the said plane portion.

5. A thin metal can including a cylindrical body and a unitary and disk like end permanently secured thereto, said end having a plane outer annular marginal portion disposed at right angles to the cylindrical body of the can, an annular conical portion disposed radially inwardly of the plane portion and merging into the plane portion through an arc of considerable radius disposed entirely on the outer side of the plane portion, the said conical portion extending to the opposite side of the plane portion, a disk-shaped dome-like central portion joined to the inner periphery of the conical portion through an arc of relatively smaller radius, the said can end being resistant to differential pressure on opposite sides thereof and possessing the property of deflecting gradually and substantially uniformly when subjected to differential and varying pressures on opposite sides thereof.

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