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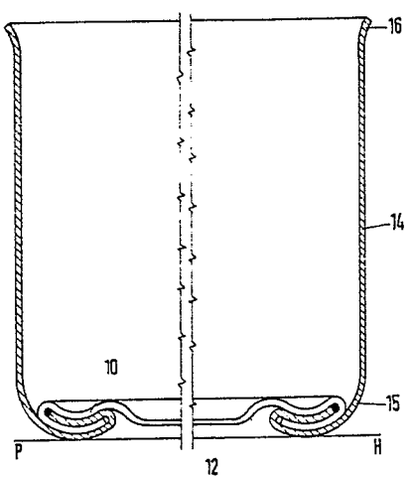
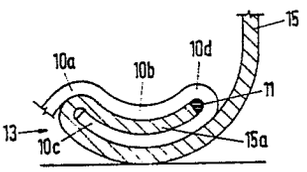
(54) Improvements in metal containers.

(57) The invention relates to metal containers or metal cans. The metal container is having a three piece construction with a welded longitudinal body seam. On the upper part of the container an outward flaring flange (16) is provided to allow the double seaming of an end after filling the container. A bottom end (12) is assembled from the inside over an inward turned body edge (15) to form a labyrinth configuration with adjacent layers of material inside a rim (13). The rim (13) has a substantially toroidal configuration with the lower edge (15) of can body (14) forming convolutions that are alternate and adjacent with the edge (10) of the bottom end (12) and which are not parallel with a base plane (P-H).

Fig.4





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IMPROVEMENTS IN METAL CONTAINERS

The object of the invention is to introduce certain improvements in the forming of one end of a cylindrical metal container, said end being called "bottom", in opposition to the "top" end, that is normally opened to empty the container.

It is well known to the technical people in the metal packaging business that the manufacturing process and design of metal containers (generally known as "metal cans") is continually envolving in order to achieve technical and economical objectives, such as the increase of production speed, increased resistance and tightness assurance of the container (considering that food and beverage products are packed under pressure or vacuum), all this in conjunction with an effort to reduce material costs while improving design and shelf appeal of the container, since packaging is more and more important for the marketing of products.

One important evolution was to replace the soldered side seam, formed by hooking together the ends of tinplate flat sheets, with the electric resistance weld widely used at present, permitting the coplanar joining of the edges without the use of a solder, generally made with a lead alloy, that is harmful to human health.

The fastening of can ends on the top and bottom of the cylindrical body, by the present state of the art, is obtained by the "double seaming" process, in which a suitably shaped end is placed over the flanged edge of a cylindrical body, as illustrated in the upper part of Fig. 1, the by roller action the end and body edges are shaped together forming a "double seam" (Fig. 1, bottom). This operation is performed on both sides of the cylindrical body, resulting in the well known food can shown in Fig. 2. Packers generally receive containers as shown in Fig. 1, that is with a double seamed bottom and an open top to allow the can to be filled, and then closed by double seaming the top end, obtaining an equal finish on both ends.

This widely used process has several drawbacks, such as:

- The double seaming process requires that the central panel of the end be offset by approximately 1/8 inch in relation to the most protruding part of the double seam. This configuration makes it easier to deform when submitted to internal pressure (as happens with food cans during retorting, or with carbonated beverage cans) and requires a considerable increase of the end thickness as compared to the body thickness.
- The peripheral area of the end forming the double seam uses up a considerable amount of material.
- On the aesthetic and practical point of view, the salient rims are inconvenient.

As a recent improvement of the above mentioned art, the authors of the present invention have introduced several improvements of the product and of its manufacturing processes.

In Brazilian patent application 804.5613 of November 1, 1984, corresponding to UK Application 85.26843 of October 31, 1985, a first substantial improvement in the container construction and end seaming process was described, whereby instead of an outside seam, an inside seam was obtained, by introducing an end inside the cylindrical body, using special double seaming tools to interact with an inside curled body edge, forming a seam by peripheral rolling action (Figs. 4 to 8 of said patent application).

The can had as a basic feature the fact that its bottom rim was flush with the outside body surface, and that the overlapping surfaces of end and body were flat and laying in parallel plans, perpendicular to the axis x-x' of the can (Fig. 3).

As subsequent technological advance the same author realized the invention described in Brazilian patent application PI 860.5741 of November 21, 1986, corresponding to UK 87.27284 of November 20, 1987, and to US 072513 of July 13, 1987, in which important novelties in the process and equipment to manufacture the cans described above were introduced, consisting of a process using axial forming forces instead of roller action, by the use of special tools that, when mounted on a multi station rotary device, result in an automatic machine for high volume productions of cans with seamed bottom ends and flanged top side.

The subject of the present invention is a further improvement of the can structure described in Brazilian patent application PI 840.5613. In the present invention the inside curled rim resulting from the seam has a non-planar shape, forming a toroidal surface on the bottom of the can (Figs. 4 and 5).

The technical advantages resulting from this special conformation may be resumed thus:

- Better assurance of tightness, in comparison to the previous art shown in Fig. 3, because the larger development of the overlaying surfaces of body and end increases the labyrinth effect that insures tightness.
- Sliding movements of overlaying surfaces forming the labyrinth 10 in relation to each other are not possible: they may occur when the contact area is flat, as in Fig. 3, (7).
- The toroidal formations of the rim will maximize the sealing function of the sealing compound 11. Due to the toroidal deformation process elastic reactions are originated inside the adjacent layers

of body and end material, that increase the pressure between adjoining surfaces, improving resistance to leakage.

- From the appearance point of view, the can will become similar to a two piece can, with a lower production cost.
- The formation of non-planar labyrinth surfaces gives the assembly a higher resistance to denting by outside shocks, which allows the use of thinner materials, with important money savings when applied to mass production such as can making.

The invention is here described by the annexed drawings, in which:

- Fig. 1 shows, in a non-proporational cross sections, a prior art metal container (can),
- Fig. 2 shows a perspective view of a can of Fig. 1,
- Fig. 3 shows schematically a non-proportional cross section of the improved can described in Brazilian Patent Application PI 840.5613 (previous art.), with an enlarged detail showing the can bottom seam,
- Fig. 4 shows schematically a non-proportional cross section of the improved can in the present invention, with an enlarged detail of the labyrinth on system on the can bottom, and
- Fig. 5 shows a schematic, non-proportional cross section of a preferred shape of the present invention, with an enlarged detail of the labyrinth on the can bottom.

The drawings (Figs. 1 and 2) show that prior art containers (metal cans) such as manufactured at present by can producers and delivered to packers for filling and sealing with their products (such as food preserves or others) consist of a cylindrical body 1 with the top side flared outwards in a flange 2 in order to permit the final double seaming of the top end 3 after filling in the product.

On the other side, or bottom 4, of the can, where a similar flange is made, the bottom end 5 is double seamed, resulting in a labyrinth configuration commonly called "double seam" 8 in which adjacent layers of body and end materials lay concentrically along substantially cylindrical surfaces, said surfaces having axes x-x′ that are parallel to the body's cylindrical surface generatrix.

The can in Fig. 3 has a flange 2 on the top side 9 of the can body normally turned outward and the bottom part 6 of said body turned inward 4 in such a way that a can end 5 applied to the body from the inside, as shown by the dotted line drawing at "t", is engaged by its outer rim 7 with a resulting seam being obtained, said seam having a labyrinth configuration in which adjacent layers of can body and can end material lay in substantially parallel planes, said planes being parallel to the plate P-H of the can base and perpendicular to the can axis x-x′.

The improved metal container (metal can) that is the subject of the present invention, Figs. 4 and 5, has a new configuration of the bottom rim 13 in which the outer rim 10 of a can end 12 that engages the lower part 15 of the can body 14 has to convey protrusions 10a - 10d and a concave surface 10b in between, that, together with adjacent layers formed by the can body-bottom part 15-15a and the outer edge 10c of said can end 12, provide a labyrinth configuration with a substantially toroidal outside surface.

The can body edge 15a is in contact and applies pressure against a sealing compound deposit applied to can end 12 on its outside surface before the seaming operation. Said can end is of a type described in Brazilian patent application PI 860.5741 and consists of a central panel defined by an annular wall depending from the periphery thereof to define a concave recess; an annular portion extending radially outward from the periphery of the annular wall, and a down turned edge portion so arranged that the down turned edge, annular portion and annular wall define a channel in which is placed a gasket in the form of a lining compound, the lining compound being placed in a corner defined by the down turned edge and the annular portion, on the side of said end that is opposite to the side which, after assembly, constitutes the inside of the can.

The toroidal rim basis, that is the plan where the convex protrusions 10a and 10d lie, may be parallel to plan PM (Fig. 4) that is tangent to the outside rim surface, as shown in Figs. 4 and 5, but it may also lay at an angle, forming a conical surface, without changing the basic characteristic of the curved labyrinth configuration.

A preferred configuration of the container is shown in Fig. 5, where the lower part of the can body 15, adjacent to the seam area, is shaped into a conical surface 17 allowing this part to fit into the double seamed top of another can, making it "stackable", that is, making it easier to stack for display or handling purposes.

Said conical surface must be such that distance d, measured from the beginning of the seam to the cylindrical surface, will be at least equal to the thickness of the plate used for making the can body plus thickness of the can top end.

Claims

1. Improvements in metal containers of three piece construction with a welded longitudinal body seam, having on its upper part an outward flaring flange (16) to allow the double seaming of an end after filling the container, with a bottom end (12) assembled from the inside over an inward turned

body edge (15) to form a labyrinth configuration with adjacent layers of material inside a rim (13), in which said rim (13) has a substantially toroidal configuration with the lower edge (15) of can body (14) forming convolutions that are alternate and adjacent with the edge (10) of end (12), and are not parallel with base plane(P-H).

2. Improvement in metal containers as claimed in claim 1, in which the bottom end (12) is preferentially of the type shown in Brazilian patent application PI 860.5741 of November 21, 1986, said end after the seaming operation showing a substantially flat central part and an outer part (10), said outer part having two convex protrusions (10a - 10d) and a concave surface in between (10), and an outer edge (10c) having a concave shape radially directed toward the geometrical axis of can body (14), said outer edge being continuously envolved by the convolutions of the body (14) lower edge.

3. Improvement in metal containers as claimed in claims 1 and 2, in which the container bottom has two parts (12-15) hermetically engaged by means of a resilient layer of a suitable sealing material (11), said resilient layer being applied to a place in the can end (12) on the opposite side of protrusion (10d), and being forcibly engaged to can body edge (15a).

4. Improvement in metal containers as shown in claims 1, 2 and 3, in which a preferred configuration has a conical surface (17) adjoining the cylindrical bottom part of can body (14) and the toroidal rim on can bottom (13), said conical surface (17) forming an angle "α" with the cylindrical body (14), said angle being such that the difference (d) between the radius of the conical surface at the point where it joins the toroidal rim of the can and the radius of the cylindrical surface of the can body is at least equal to the can body thickness plus the thickness of the upper can end.

Fig.1

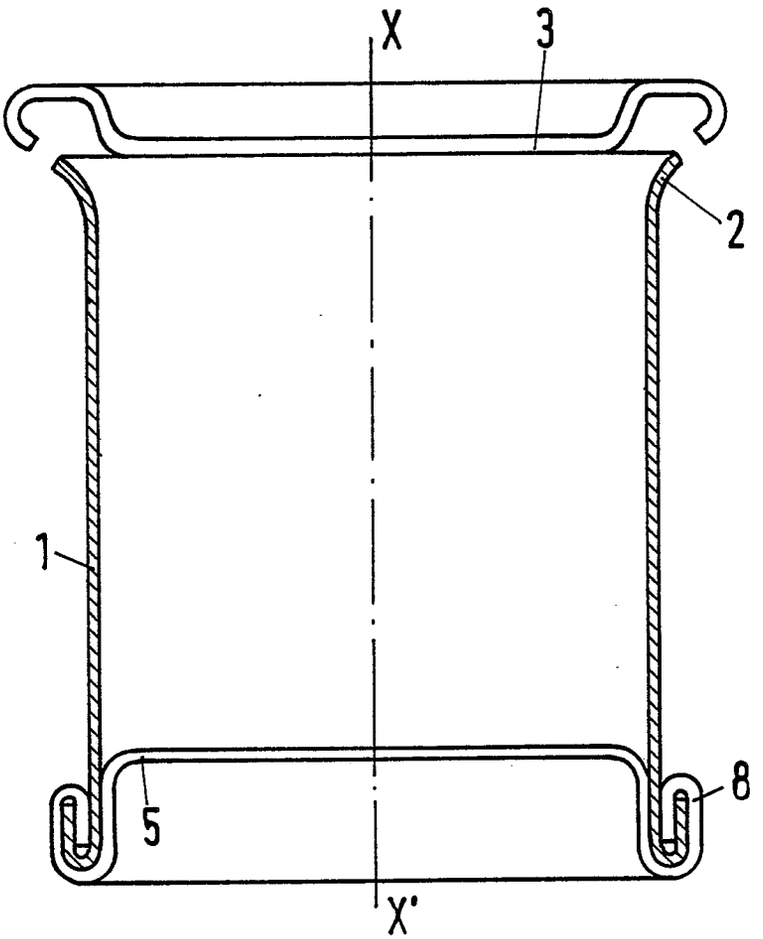


Fig.2

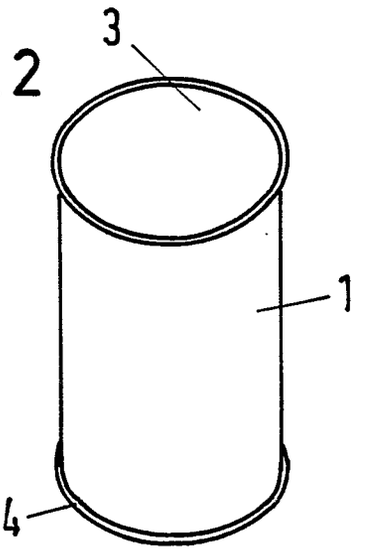
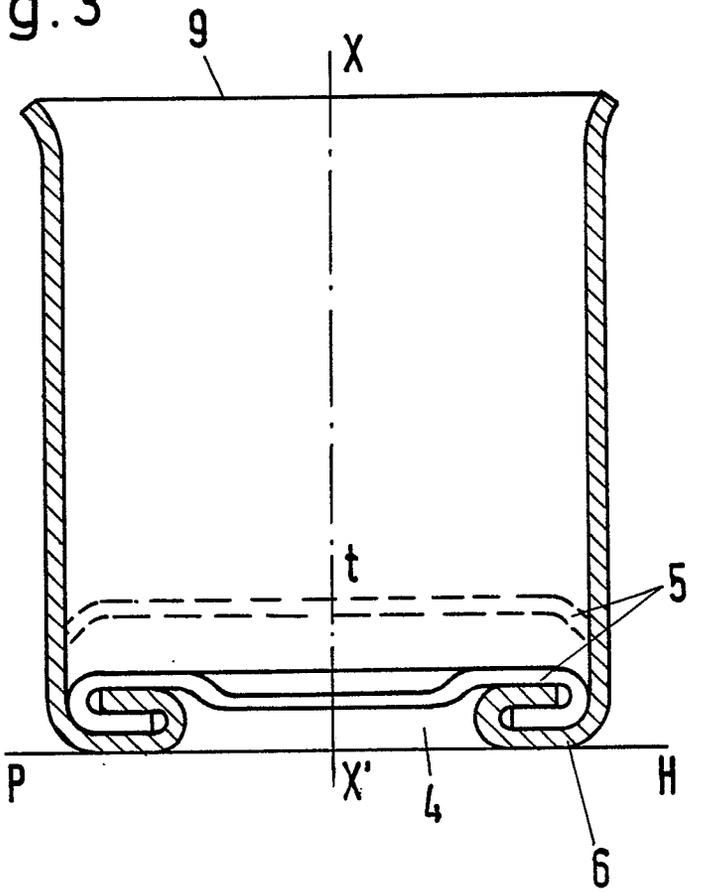


Fig.3



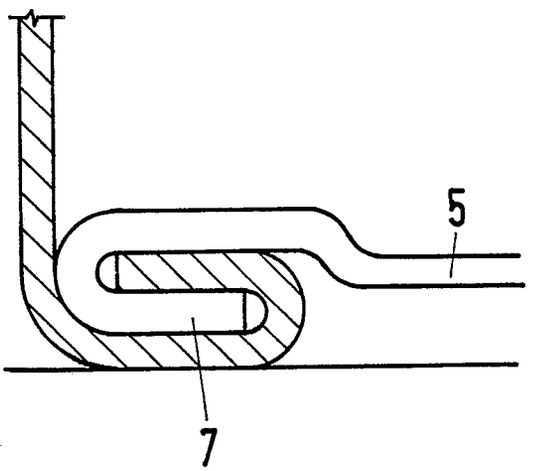
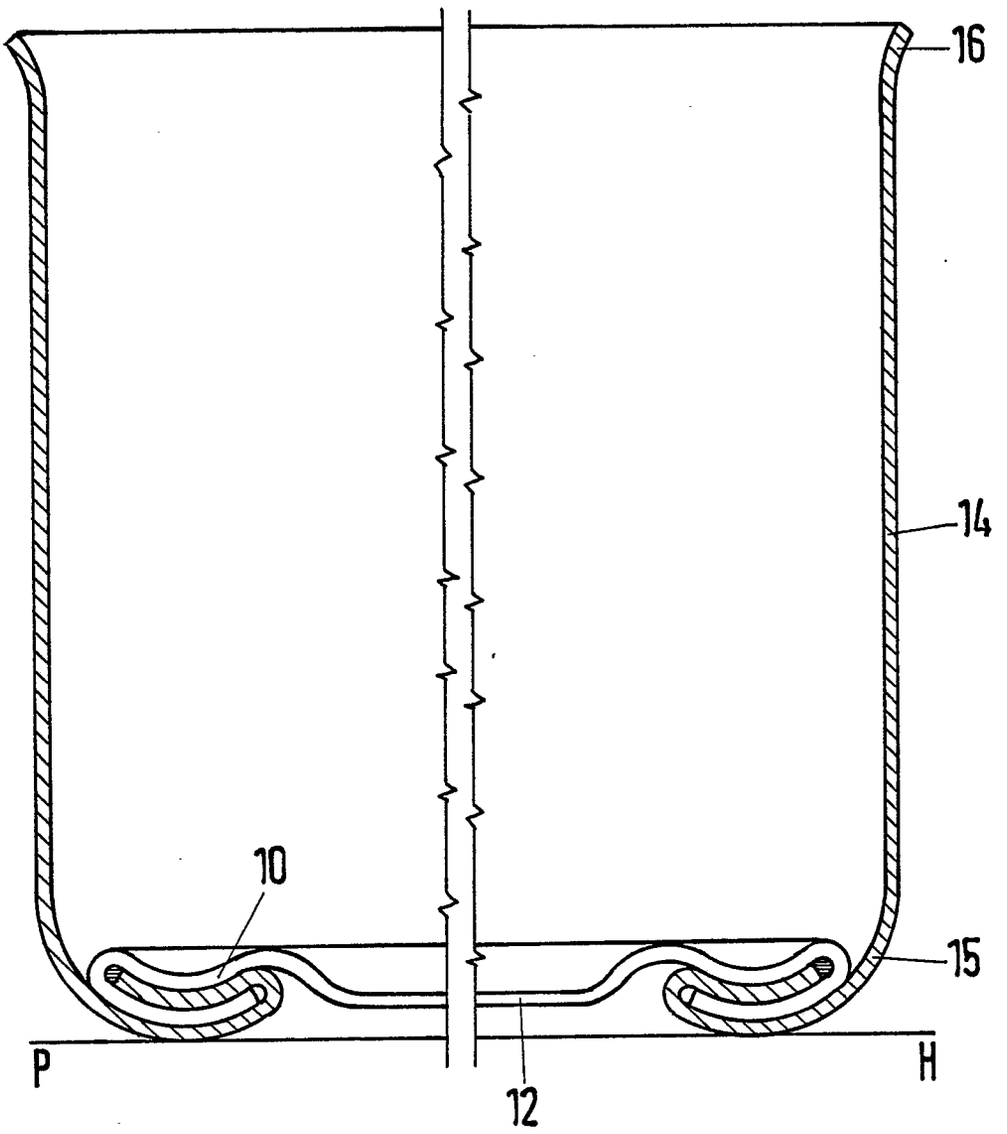


Fig.4



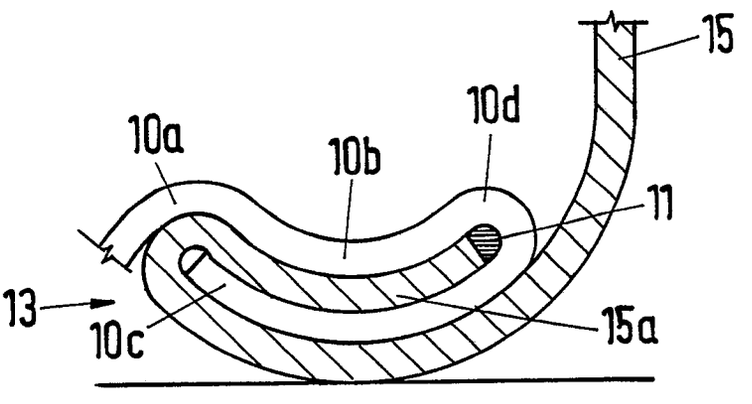
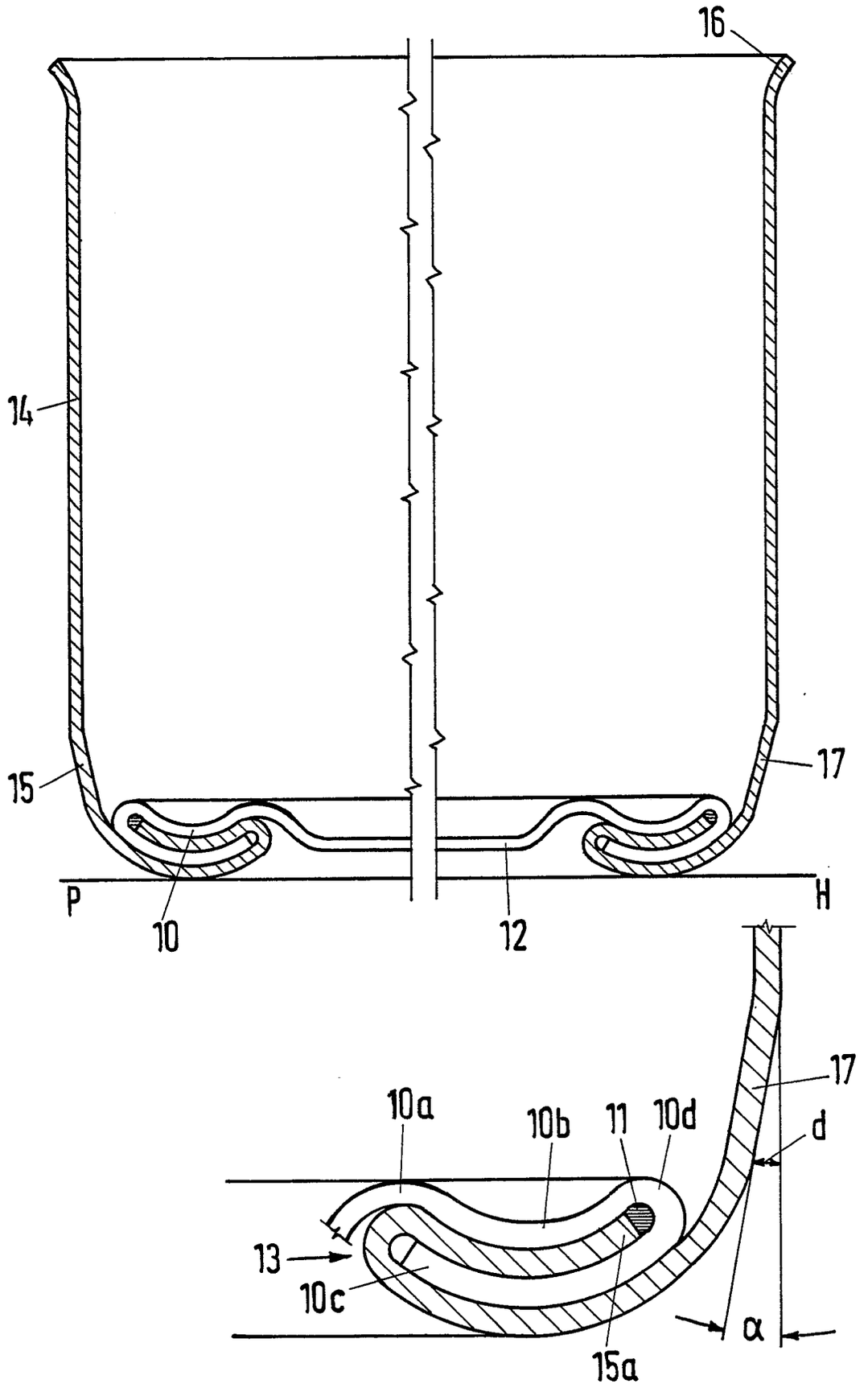


Fig.5



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EUROPEAN SEARCH REPORT

Application Number

EP 89 11 5429

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	FR-A- 410 543 (COMINGS) * Page 1, lines 1-7; page 2, lines 5-21; figures 4-7 *	1,2	B 65 D 8/20
Y		3,4	
X	FR-A-2 585 332 (CARNAUD EMBALLAGE) * Page 6, lines 20-34; figures 4-6 *	1	
Y,D	GB-A-2 166 410 (RHEEM METALURGICA SA) * Page 1, line 101 - page 2, line 6; figures 4-8 *	3	
A		1	
Y	GB-A-1 572 031 (METAL BOX LTD) * Figures 2,3 *	4	
A	GB-A-2 031 768 (METAL BOX LTD) * Page 2, lines 41-54; figures 2,6-8 *	1	
A,D	GB-A-2 197 606 (RHEEM EMPREENDIMENTOS) * Figures 1-7 *	1,3	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

B 65 D
B 21 D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	10-11-1989	BERRINGTON N.M.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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E : earlier patent document, but published on, or after the filing date
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