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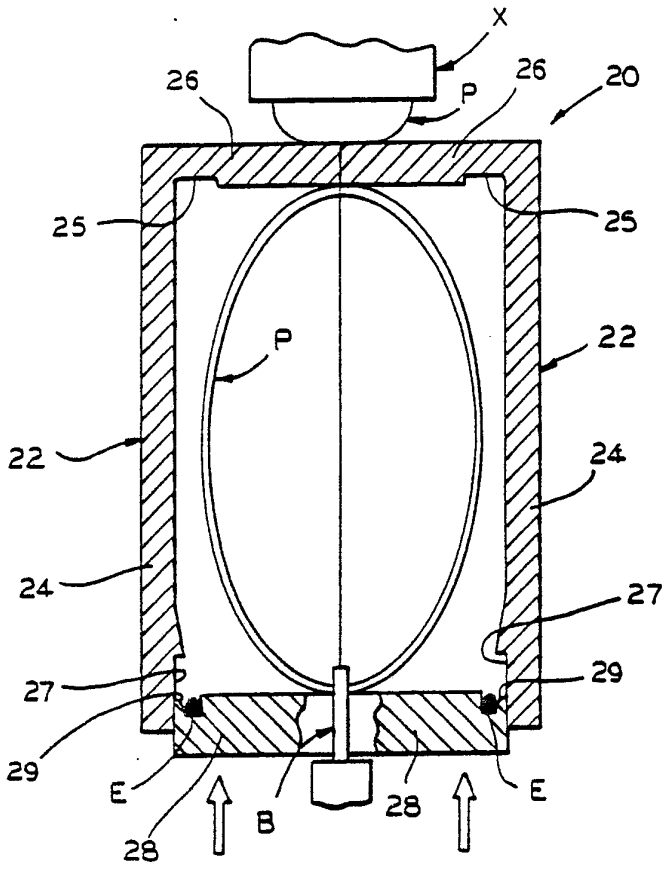
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(54) Title: CONTAINER AND METHOD OF FORMING SAME

(57) Abstract

A plastic container with an integral handling ring is formed in a mold (22) having a pair of side sections (24) movable toward each other and a pair of co-planar end sections (26, 28) movable toward each other and toward said side sections, by placing molten extrudate (E) in a mold between the side and end sections, so that a handling ring can be formed and compression joined to the container at the same time the container is being formed by blow-molding.



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CONTAINER AND METHOD OF FORMING SAME

The present invention is directed to a container and to a method for manufacturing from thermoplastic material a hollow container having an integral lifting handle.

In fabricating large hollow bodies, such as, for example, 55 gallon drums, from thermoplastic materials, it is common practice to blow-mold such bodies from an extruded, hollow, tubular shaped preform or parison. The parison is placed within an open blow-mold apparatus, the apparatus is closed and air blown into the parison to force it to expand outward against walls of the mold apparatus. Generally, it is desirable to provide lifting handles or roller chimes about the formed body for ease of handling. The lifting handles may comprise rings encircling the body which also serve as roller chimes.

Various methods have been utilized to attach lifting surfaces or handles to thermoplastic blow-molded hollow bodies. For large bodies such as drums, it is known to place prefabricated roller hoops into a blow-mold so that the hoops are welded to the drum when the parison is inflated. Such construction has resulted in separation of the hoops from the drums during handling. In order to avoid such separation problems, some processes employ channels formed in the mold cavity into which a portion of the thermoplastic material of

the parison is forced. The channels are defined by movable components of the mold. After the plastic material has been forced into the channel, the movable components compress the material into a desired shape of a chime or handle. The latter method is disclosed, for example, in U. S. Patents 4,228,911 and 4,529,570. It is believed that a disadvantage of this type of construction is a weakened area at the point at which the chime joins the drum. Although it has been proposed to increase the volume of material and therefore the wall thickness in the area of the protrusion, such extra material also has a tendency to undesirably increase wall thickness over a broad area. Accordingly, the thickness and location of rings are limited in this type process. Furthermore, in order to minimize stress cracks, these compression molded rings are formed of very low melt index materials (approximately 2 HLMI) resulting in processing difficulties requiring non-conventional extrusion equipment.

An example of a process for welding or bonding roller chimes to a plastic drum is set forth in U. S. Patent 3,960,474. In that patent, the preformed chimes or hoops are placed in a blow-mold and a parison inflated such that the soft thermoplastic material of the parison adheres to the preformed chimes. The bond between the chimes and drum thus depends on the ability of the plastic material to adhere to the chime material, and such bonds have been known to separate under stress, such as by lifting of a filled drum by the chime.

It is an object of the present invention to overcome the above mentioned disadvantages of the prior art processes of forming a drum with a chime or lifting handle.

In particular the invention provides a method of forming in a single mold a plastic container having an integral lifting surface, comprising the steps of:

(a) blow-molding a container body from a parison of first plastic material under a controlled temperature such that the plastic material conforms to a desired shape for the container;

(b) inserting into a recess of said mold a second plastic material having sufficient solid mass to form the lifting surface; and

(c) compression molding the second plastic material against an adjacent area of the container during blow-molding of the container such that the second material fuses to the first material while both materials are relatively molten.

The invention further provides a plastic container formed by blow-molding a parison of thermoplastic material within a blow-mold, the container being formed with an integral lifting handle, the handle being joined to the container during the blow-molding process by compression molding thermoplastic material into a handle of a desired configuration within an area connected to the blow-mold, the thermoplastic material being compressed against the material of the parison while both materials are relatively molten such that the material of the formed handle fuses to the material of the container to form a fused integral joint.

In the drawings:

Figure 1 is a schematic side elevational view, partly in vertical cross-section, of molding apparatus to form the container illustrated in Figure 6;

Figure 2 is a view similar to Figure 1, but illustrating the introduction of a soft tube of plastic material (parison) into the space between sections of the open mold and also the insertion of the molten extrudate into the mold;

Figure 3 is a view similar to Figure 2, but illustrating the mold in a closed position after the

start but prior to the completion of the blowing step in the molding process;

Figure 4 is a view similar to Figure 3, but illustrating the position of the mold and container after the container has been completely formed;

Figure 5 is a view similar to Figure 4, but with the mold sections shown in an open position after formation of the container;

Figure 6 is a perspective view of a container formed by the disclosed process; and

Figure 7 is an enlarged fragmentary sectional view of an integral joint formed by the process.

Referring now to the drawings, and particularly to Figures 6 and 7, it will be seen that a drum, indicated generally at 8, is shown as having a generally cylindrical side wall 10 and top and bottom end walls 12 and 12a, respectively, (only top end wall 12 being shown in Figure 6). Top end wall 12 may be provided with one or more dispensing or venting openings 11.

Container 8 has at its upper corner an integral solid handling ring, indicated generally at 14, which includes a main section 16 with a narrow flange section 18 joined to the body of drum 8. The ring 14 is sometimes referred to as a roller chime. Ring 14 may be used either for lifting the drum or for supporting the drum for rolling. Although the ring 14 is shown at a top surface of drum 8, it will be appreciated that ring 14 could be placed at other positions and that multiple rings could be employed.

Referring to Figure 7, there is shown a partial cross-sectional view of a joint between ring 14 and drum 8 formed by the disclosed method. The ring 14 and flange section 18 are compression molded into the shape illustrated. During the compression molding process, the section 18 extrudes from the closing portion of the mold, as will be described with respect to Figures 1-5,

and infuses into the thermoplastic material of the drum 8. By selecting the material of both the ring 14 and drum 8 from a common family of thermoplastics, the resulting joint will be essentially a molecular bond or joint, i.e., the joint will be indistinguishable from the surrounding material and will have the strength of the material. In one form, for example, the ring 14 and drum 8 may be formed from the same type of thermoplastic material.

While the illustrated embodiment indicates an infusion of the extrudate from the ring 14 into the material of the container 8, it will be appreciated that there may be occasions when it is desirable for the material of the container 8 to fuse to the ring 14 without material of one component being forced into material of the other. Furthermore, it is possible to force the material of container 8 to infuse into the ring 14. A more significant advantage of applicant's invention is that by using two separate material components for the container and ring, the ring 14 may be colored by addition of an additive. Coloring of ring 14 may permit identification of containers by ring color which could advantageously be used for quick identification of contents of a container if such color coding scheme is used.

Since the extrudate from which the ring 14 is formed is separately provided, the ring 14 may be made as thick as is necessary for heavy lading. Additionally, the ring 14 may be placed in any position on the container 8. Having the ring 14 on top provides protection for the vent openings 11. For a better understanding of the forming method, reference is now made to Figures 1-5 which illustrate a blow-molding apparatus 20 of a conventional type, except for portions of the structure described hereinafter which are used for an insert compression molding type operation in

addition to the blow molding operation.

Mold apparatus 20 includes a pair of side sections 22, which are movable toward and away from each other, and a pair of end sections 28, which are movable toward and away from related mold side sections 22. Each of the side sections 22 includes a generally semi-cylindrical side wall 24 and an integral generally semi-circular end wall 26. It will be noted that the end walls 26 are at the top of the drawing, but they actually form the bottom of the container, because the container is formed in an upside down position.

Side section end walls 26 are provided with aligned annular recesses 25 which form an annular boss or flange 17 at the bottom of the container 8. Each of the side section side walls 24 presents at the opposite end thereof, or lower end as shown in the drawings, an annular recess 27 which cooperates with annular recesses 29 in end sections 28 to form a common annular groove, the purpose of which is described hereinafter. End sections 28 of the mold apparatus are generally semi-circular in shape and correspond to and are aligned with end walls 26 of side sections 22.

Each of the end sections 28, as previously mentioned, presents at its outer periphery an axially inward facing recess 29 which cooperates with related recess 27 in the side wall 24 of side section 22 to provide a common annular groove for the purpose of which is to receive material necessary to provide the container handling ring 14 in a manner hereinafter described. It will be understood that the shape and dimensions of the recesses 27 and 29 may be varied as desired.

Positioned above the mold is a conventional extruding apparatus, indicated generally at X, from which is extruded a generally cylindrical tube or parison P of plastic material. Positioned at the lower end of the

molding apparatus is a blowing mechanism including a blow pipe indicated generally at B. The details of the extruder and the blow pipe mechanism are not shown in detail since their structures may be of the type found in conventional blow molding equipment.

Preferably the mold apparatus 20 is first placed in the open position shown in Figures 1-2. A molten plastic extrudate, indicated generally at E, is inserted into the related recesses 27 and 29 of the mold 20.

At approximately the time the extrudate E has been placed in the mold, the parison P is extruded from the extruder X, as shown in Figure 2, with the lower end of the parison being disposed to extend over the blow pipe B. The side sections 22 are then moved toward each other to pinch off the ends of the parison. Air under pressure is introduced into the center of the parison through the blow pipe B to start formation of the container body by a conventional blow molding process, as illustrated in Figure 3.

As the container body is being formed, the end sections 28 of the mold are moved toward each other and toward the related side sections 22, so that the molten plastic extrudate E is compressed between the end sections 28 and the side sections 22 of the mold to form handling ring 14, as shown in Figure 4, while air is continued to be introduced to complete formation of the container body.

Thus, it will be understood that, at the same time the container body is being formed by a blow molding process, the handling ring 14 is not only being formed by the compression molding process, but also ring 14 is being joined to the adjacent portion of the body of drum 8. Ring 14 therefore becomes an integral portion of drum 8. Thus, it will be seen that the present invention contemplates an improved method for forming

a hollow body container which represents an improvement over and eliminates many of the disadvantages of the prior processes in forming a hollow container with an attached drum handling ring. The final stage of the operation is the opening of the mold sections to remove a completed container as best seen in Figure 5.

Although the container described above is provided with only one ring which is located at the upper corner of the container body, it should be understood that, if desired, the same process can be employed to form a pair of rings, with one ring at each end of the container. Also, if desired, the process may be used to join a ring to a container body at a location other than at a corner. In addition, while the ring 14 has been shown as continuous, it will be appreciated that for some applications it may be desirable to provide a discontinuous handle arrangement. By limiting the extent of recesses 27 and 29 in a circumferential direction, the drum 8 may be formed with spaced handles for lifting. Furthermore, while the preferred method has been disclosed in conjunction with an illustrative shaped lifting surface or roller chime, other shapes of chimes or lifting surfaces may be achieved by variation of the configuration, position and size of the components defining the recesses 27 and 29.

CLAIMS

1. A method of forming in a single mold a plastic container having an integral lifting surface, comprising the steps of:

(a) blow-molding a container body from a parison of first plastic material under a controlled temperature such that the plastic material conforms to a desired shape for the container;

(b) inserting into a recess of said mold a second plastic material having sufficient solid mass to form the lifting surface; and

(c) compression molding the second plastic material against an adjacent area of the container during blow-molding of the container such that the second material fuses to the first material while both materials are relatively molten.

2. A method of forming, in a mold having a pair of side sections movable toward and away from each other and a pair of generally co-planar end sections movable toward and away from each other and toward and away from said side sections, a plastic container having a hollow body with an integral, solid flange extending outwardly therefrom, said method comprising the steps of:

(a) while said mold is in an open position, inserting molten plastic extrudate between said mold end and side sections in grooves formed by adjacent recesses of respective mold sections;

(b) extruding a plastic parison between said mold sections;

(c) closing said mold by moving said side sections toward each other and said end sections toward said side sections to close off the opposite ends of said

parison and to compress extrudate between said mold end and side sections to form said flange;

(d) introducing air under pressure into the interior of the parison in said mold to force the material of said parison against said mold sections to form said hollow container body and, at the same time, weld said flange to said body.

3. A method according to claim 2, wherein said container body is tubular, and said flange is a peripheral flange extending normal thereto.

4. A method of forming, in a mold having a pair of side sections movable toward and away from each other and a pair of generally co-planar end sections movable toward and away from each other and toward and away from said side sections, a plastic container having a generally cylindrical, hollow body with an integral, solid ring extending radially outward therefrom, said method comprising the steps of:

(a) while said mold is in an open position, inserting molten plastic extrudate between said mold end and side sections in grooves formed by adjacent recesses of respective mold sections;

(b) extruding a plastic parison between said mold sections;

(c) closing said mold by moving said side sections toward each other and said end sections toward said side sections to close off the opposite ends of said parison and to compress extrudate between said mold end and said sections to form said ring;

(d) introducing air under pressure into the interior of the parison in said mold to force the material of said parison against said mold sections to form said hollow container body and, at the same time, weld said ring to said body.

5. A plastic container formed by blow-molding a parison of thermoplastic material within a blow-mold,

the container being formed with an integral lifting handle, the handle being joined to the container during the blow-molding process by compression molding thermoplastic material into a handle of a desired configuration within an area connected to the blow-mold, the thermoplastic material being compressed against the material of the parison while both materials are relatively molten such that the material of the formed handle fuses to the material of the container to form a fused integral joint.

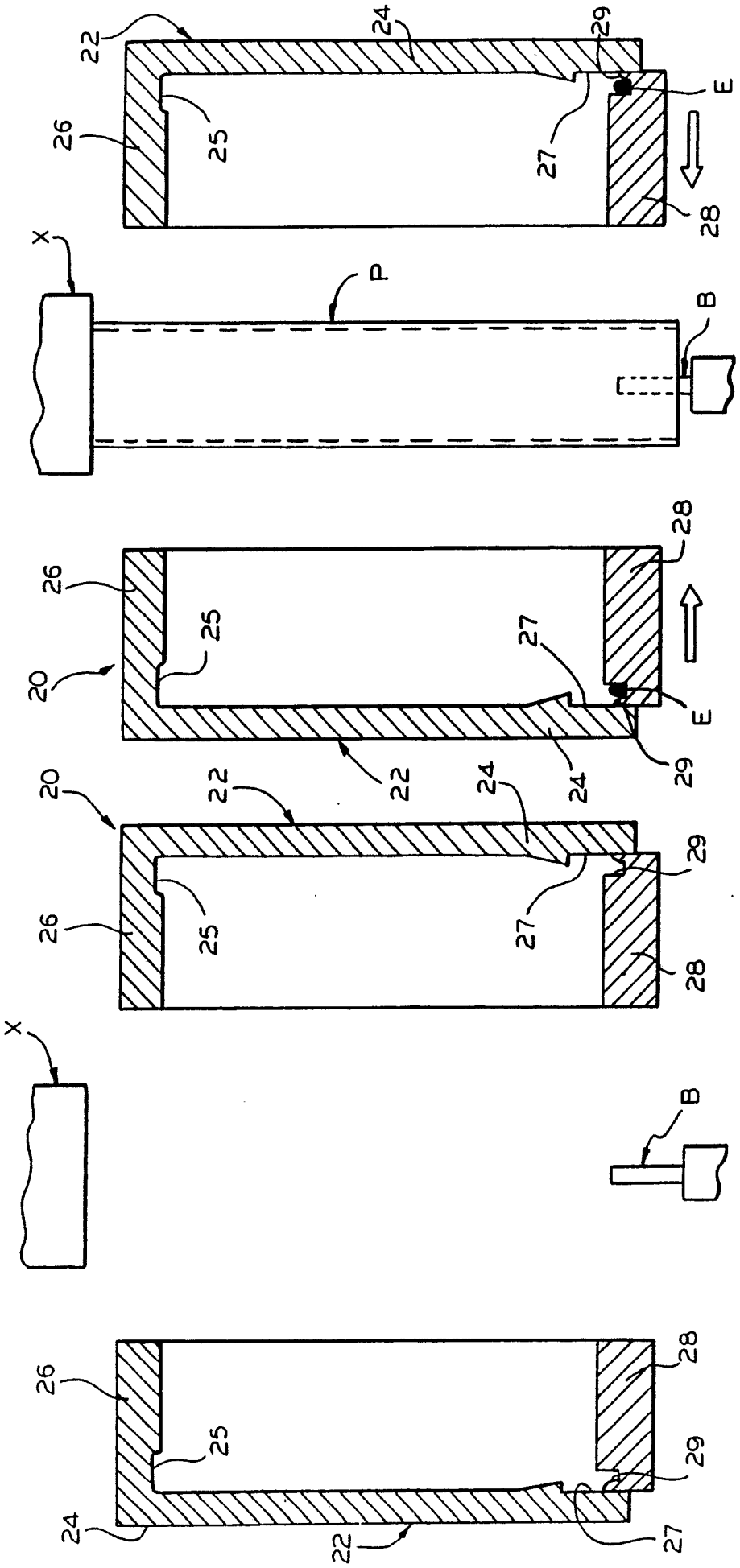
6. The container of claim 5, wherein the plastic material comprises, a high density polyethylene resin having a high load melt index, preferably between about 5 to 10.

7. The container of claim 5, wherein the container is substantially cylindrical and the lifting handle extends circumferentially about a top corner of the container.

8. The container of claim 5, wherein the material of the handle penetrated into the material of the container.

9. The container of claim 5, wherein the handle material forms a molecular bond with the container material.

10. The container of claim 5, wherein the handle material is of a different color than the container material.


22
24
29
E
26
25
27
28
X
P
B
FIG.2
28
26
25
27
20
E
22
22
24
24
29
20
22
24
29
26
25
27
28
X
B
FIG.1
26
28
25
29
24
22
27

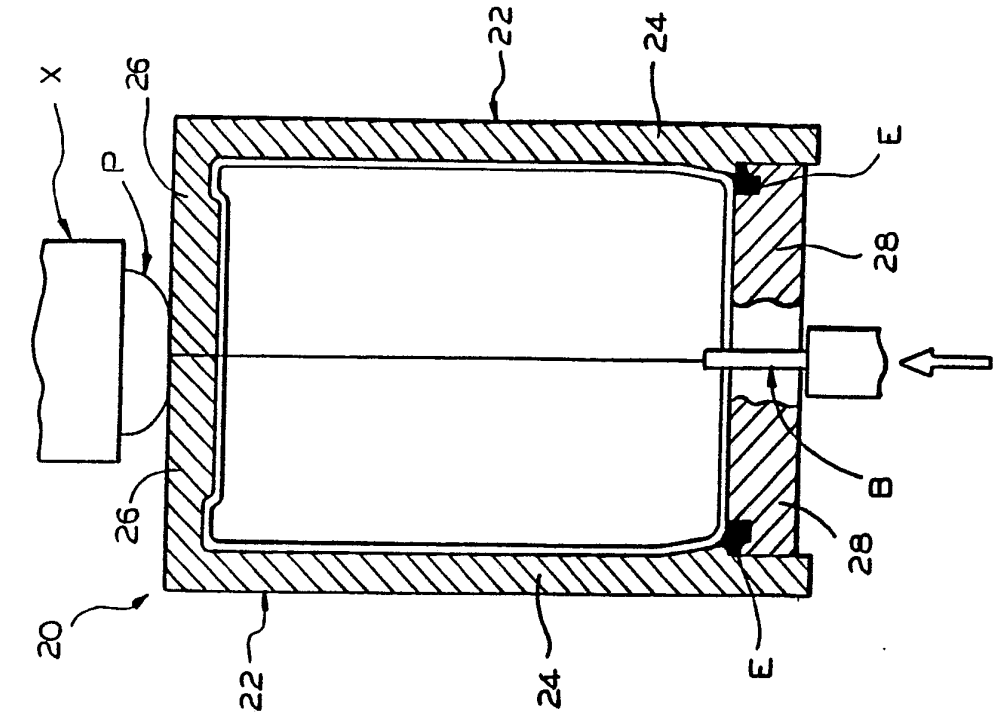

22
24
X
26
P
E
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22
24
E

FIG.4

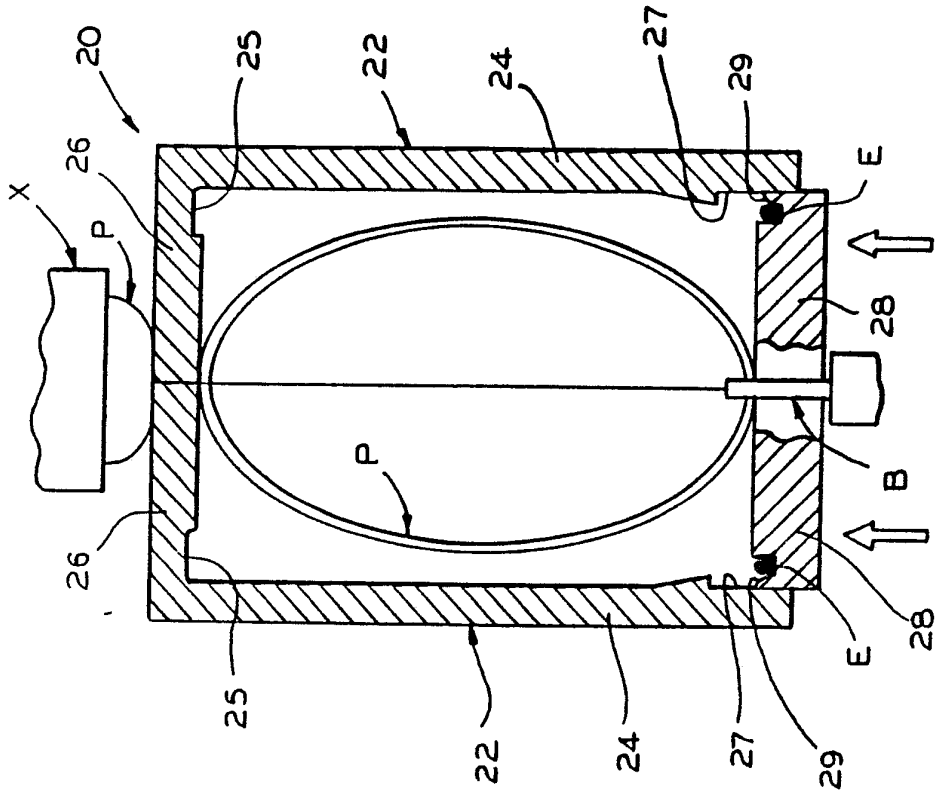

20
25
22
24
27
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26
E
X
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B
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E
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22
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29

FIG.3

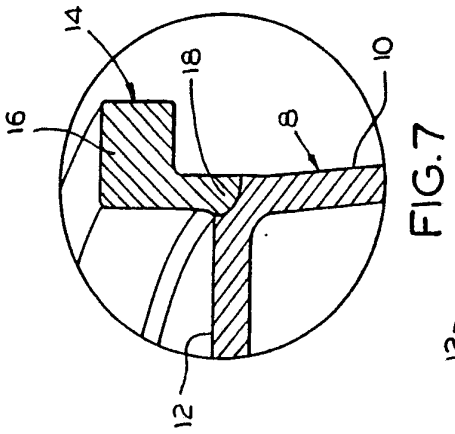


FIG.7

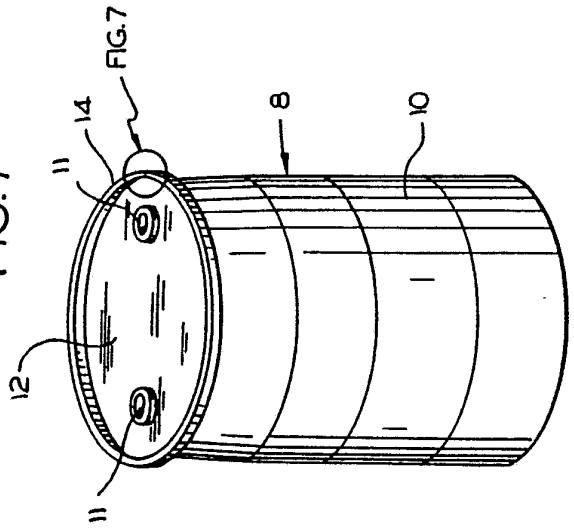


FIG.6

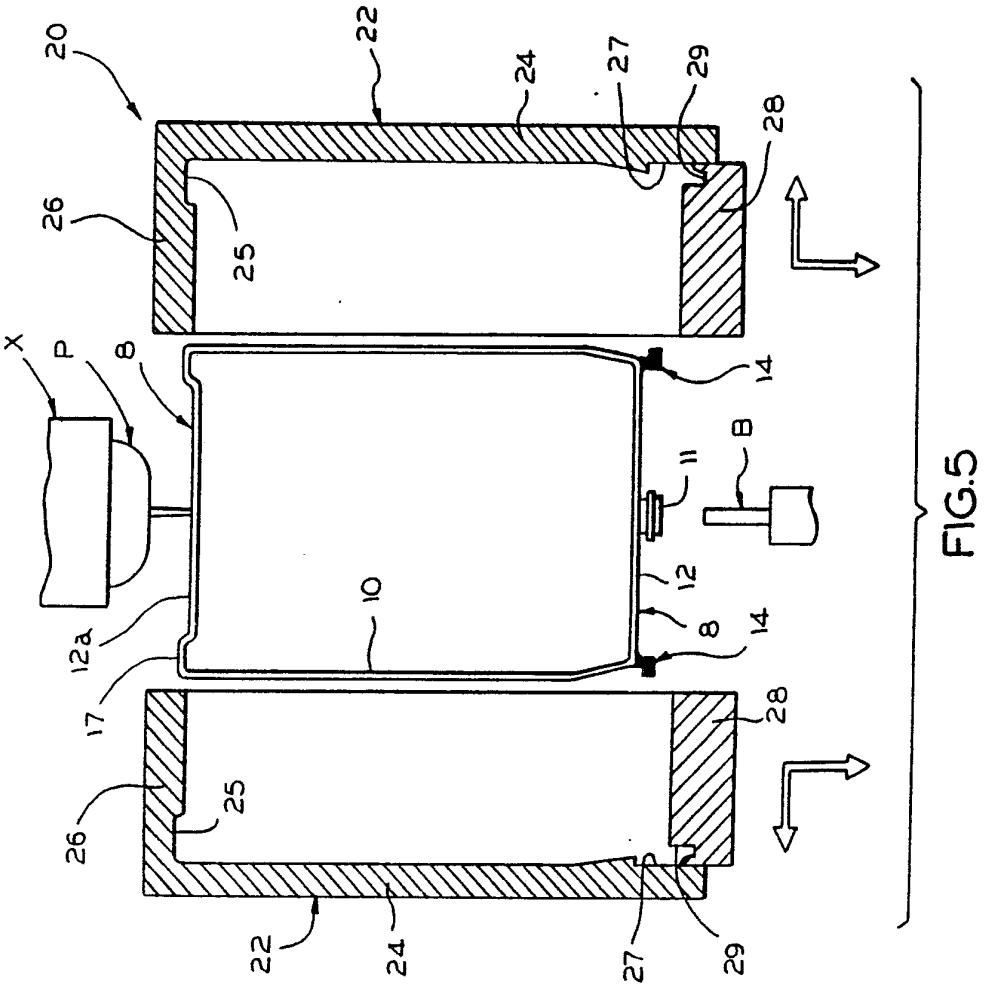


FIG.5

INTERNATIONAL SEARCH REPORT

International Application No PCT/US 87/01434

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [6]

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC[4]: B 29 C 49/20

II. FIELDS SEARCHED

Minimum Documentation Searched [7]

Classification System	Classification Symbols
IPC[4]	B 29 C B 65 D

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT [9]

Category *	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No. [13]
A	US, A, 4170623 (R.A. DUBOIS et al.) 9 October 1979 see the whole document --	1-5
A	FR, A, 2230489 (MAUSER KG) 20 December 1974 see the whole document cited in the application --	1-5
A	DE, A, 3439285 (EXCELL CORP.) 22 August 1985 see page 17, line 7 - page 19, line 17; figures 1-5 --	
A	US, A, 4228122 (T. HAMMES) 14 October 1980 --	
A	DE, A, 2914938 (MAUSER-WERKE) 16 October 1980 --	
A	US, A, 3050773 (N. HAGEN) 28 August 1962 --	
A	US, A, 4209104 (C.A. SPEAS) 24 June 1980 --	

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
6th October 1987	27 OCT 1987
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	E. VAN MOL

International Application No. PCT/US 87/01434

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	US, A, 4215089 (A.R. UHLIG et al.) 29 July 1980 --	
A	GB, A, 987133 (W. ROTH et al.) 24 March 1965	

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/US 87/01434 (SA 17838)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 13/10/87

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		DE-A-	2842257	04/10/79
		JP-A-	54127787	03/10/79
		CA-A-	1088436	28/10/80
		FR-A,B	2429659	25/01/80
		GB-A,B	2026373	06/02/80
		DE-A-	2843542	17/01/80
		JP-A-	55005887	17/01/80
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		CA-A-	1040822	24/10/78
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US-A- 4228122	14/10/80	None		
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US-A- 3050773		None		
US-A- 4209104	24/06/80	US-A-	4207284	10/06/80
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US-A- 4215089	29/07/80	None		
GB-A- 987133		None		