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METHOD OF MAKING DOUBLE WALL ARTICLES

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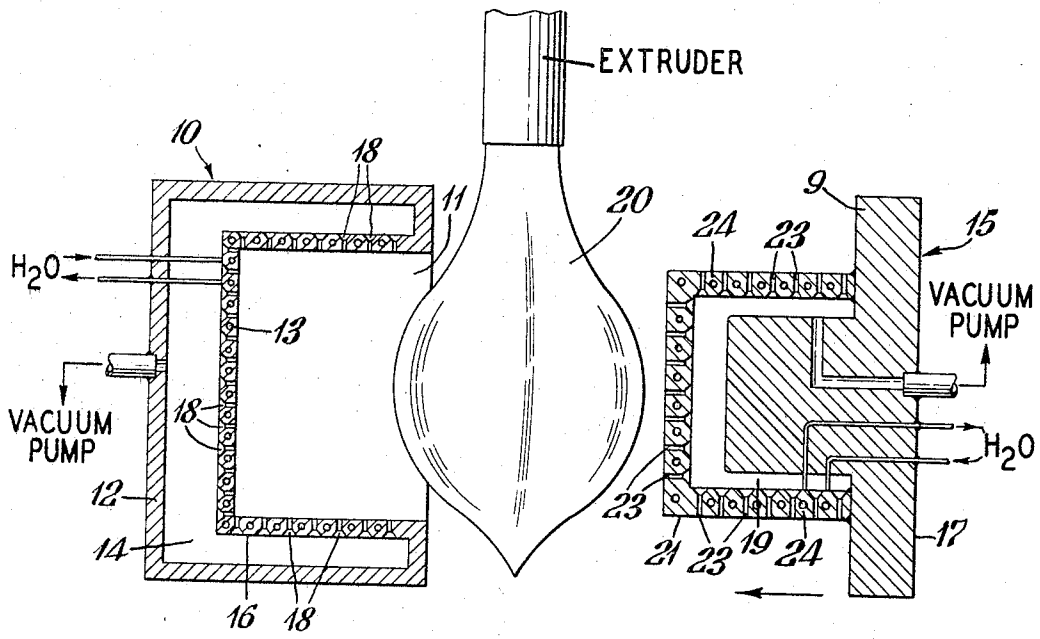


Fig. 1.

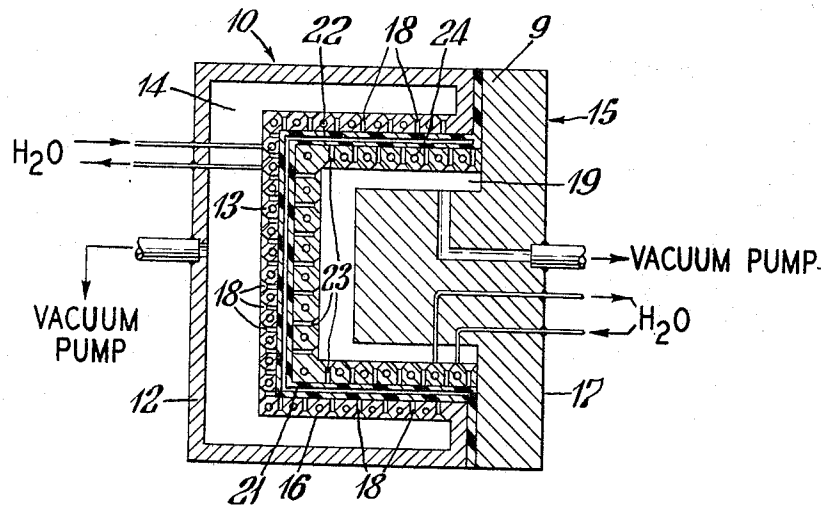


Fig. 2.

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METHOD OF MAKING DOUBLE WALL ARTICLES

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This invention relates to a method of making double wall articles and more particularly to a method of making a double wall plastic article with air space between the walls.

Double wall articles have become increasingly useful because they require a minimum amount of material for high rigidity and strength. Several techniques are currently employed for making articles of this kind, especially double wall containers. A typical method, for example, involves forming a hollow container by the well known blow molding technique, then forming a larger hollow container in parts, and finally heat sealing the parts of the larger container together around the smaller container. Such a method and all other heretofore known methods require several different steps in producing such double wall articles.

Accordingly, it is an object of this invention to provide a method of making a double wall article with air space between the walls in one continuous, integral operation.

The present invention provides a simple method of making a double wall article with air between the walls. In accordance with the method a vacuum is applied substantially along the periphery of a sealed hollow body in the plastic formative state and simultaneously with the application of the vacuum, the hollow body is compressed thereby forming a double wall plastic article with air space between the walls.

While the aforementioned method may be carried out in various conventional core-cavity equipment, it is preferred in the process of this convention to use an apparatus as shown in the accompanying drawing in which:

In the drawing:

FIG. 1 is a vertical section of a preferred apparatus for carrying out the process of the invention showing the initial step of the process.

FIG. 2 is a similar view of the apparatus of FIG. 1 showing a second step of the process.

Referring now to the drawings as shown in FIG. 1, the preferred apparatus for carrying out the process of the invention includes a core cavity mold **10** and **15**, the cavity **11** of which is the desired shape of the outer wall of the article to be formed which is shown as container shaped. The mold **10** is divided into three sections, all of which are integrally combined. These sections comprise namely a solid outer section **12**, a hollow middle section **14** connected to a vacuum pump via a channel passing between the hollow section **14** and out through the outer section **12**, and an inner section **16**, the inner section being adjacent to the outer wall of the article to be formed. The inner section **16** has a plurality of apertures **18** which provide communication between the hollow middle section **14** and the cavity **11** of the mold **10**. These apertures have a diameter of about .025 inch at their adjacent end to the hollow section **14** and a diameter in the range from about .013–.015 inch at their opposite end. Also included in the inner section **16** and surrounding the apertures **18** is a cooling coil **13** which is supplied with water via channels passing between the inner section **16** and out through the outer section **12**. Disposed concentrically and opposite to the cavity **11** and adapted to be received slidably therein is a core **15**. The core **15** has an outwardly projecting shoulder **9** at one end and is divided into three

sections corresponding to those of the mold **10**, wherei **17**, **19**, and **21** of the core **15** corresponds to **12**, **14**, an **16** of the mold **10** respectively, wherein the inner sectio **21** of the core **15** is adjacent to and of the desired shap of the inner wall of the article to be formed. Also, th inner section **21** has a plurality of apertures **23** sur rounded by a cooling coil **24** duplicating those of the inne section **16**.

In the process of this invention a sealed hollow body **2** in the plastic formative state, as shown in FIG. 1, is ex truded using the well known blow molding technique. Th hollow body is preblown to a size such that it will resis bursting when compressed as will be described. The pre blown size will of course depend on the particular articl to be formed. However, once this is decided the optimun preblown size can be readily determined by those skilled i the art through the use of a few simple empirical tests The hollow body **20** is suspended from the extruder o the blow molding apparatus and in the area lying betwee the cavity **11** of the mold **10** and the core **15**. Thereupon while the hollow sections **14** and **19** are being evacuate via the vacuum pump the mold **10** and the core **15** ar actuated and close around the hollow body **20** thereb compressing the hollow body wherein by the inward ac tions of the cavity and the core and the opposite actio of the vacuum created in the middle sections **14** and **1** a portion of the outer wall of the hollow body **20** whic will constitute the inner wall of the article to be forme comes into intimate contact with the surface of the inne section **21** of the core **15** and takes the shape thereof an a portion of the outer wall of the hollow body **20** oppo site to that outer portion of the wall adjacent to the cor **15** and which will constitute the outer wall of the articl to be formed, comes into intimate contact with the oute surface of the inner section **16** of the mold **10** and take the shape thereof. The compressing of the hollow bod is terminated when the shoulder **9** of the core contacts th end surface of the mold and rests thereon pinching of opposite ends of the hollow body (FIG. 2). As the articl is formed, it is cooled simultaneously. The vacuum in ef fect counteracts the compression force of the core **15** an the mold **10** and causes the air entrapped within the hol low body **20** to push against the peripheral wall of th hollow body thereby preventing the opposite walls of th hollow body **20** from coming into intimate contact, thu a double wall article **22** with air space between the wall is formed. Also, the opposite walls of the hollow body **2** can be prevented from coming into intimate contact by maintaining air pressure therebetween. This is readily accomplished by blowing at the same time as the article is forming.

An important advantage of this invention over known methods is that the method of making the double wall article is done in one continuous, integral operation; therefore cycle time is at a minimum. Furthermore, such added equipment as cutting devices and sealing elements are eliminated. Consequently, the cost of the total operation is greatly reduced. Another advantage of this invention is that a double wall article with smooth, attractive surfaces is simply obtained because the pulling action of the vacuum forces the wall of the hollow body **20** to conform exactly to the shape of the mold.

The proposed process may be employed for making any double wall thermoplastic structure. Furthermore, any blow-moldable material may be used for fabrication of double wall containers in accordance with the invention. While polyethylene is a preferred material, similarly, other polyolefins including polyethylene copolymers, polypropylene, copolymers of ethylene and propylene, and mixtures of such polyolefins may be used, also.

The cavity **11** of the mold **10** may vary both in size and shape, its choice depending on requirements. Although the above-mentioned apparatus is a preferred embodiment, any comparable core-cavity molding equipment would suffice.

The aforementioned process is most suitable for making double wall containers such as beverage cases, tote boxes, and the like. However, the process is equally suitable for making a variety of plastic structures such as toys, housewares, automobile and boat accessories, and the like.

What is claimed is:

1. Method of making a double-walled plastic article with air space between the walls which method comprises the steps of:

(a) placing a hollow body preform in the area lying between the female mold cavity and male core parts of a mold, and

(b) moving said mold parts relative to one another in such a manner so as to compress said preform by movement of said male core part into said female mold cavity while simultaneously applying vacuum substantially around the periphery of said preform thereby forming a double-walled plastic article.

2. Method as defined by claim **1** in which said hollow body comprises thermoplastic polymeric material.

3. Method as defined by claim **2** in which said double-walled plastic article has a single wall thickness in the range from about .090 to .125 inch.

4. Method of making a double-walled plastic article with air space between the walls which method comprises the steps of:

(a) placing a hollow body preform in the area lying between the female mold cavity and male core parts of a mold, and

(b) moving said mold parts relative to one another in such a manner so as to compress said preform into said female mold cavity while simultaneously applying vacuum around the entire periphery of said preform thereby forming a double-walled plastic article.

5. Method of making a double-walled plastic article with air space between the walls which method comprises the steps of:

(a) suspending a hollow body preform in the area between the female mold cavity and male core parts of a mold, and

(b) moving said mold parts relative to one another in such a manner so as to compress said preform into said female mold cavity while simultaneously applying vacuum around the periphery of said preform thereby forming a double-walled receptacle.

6. Method as defined by claim **5** in which said hollow body comprises thermoplastic polymeric material.

7. Method of making a double-walled plastic article with air space between the walls which method comprises the steps of:

(a) suspending a hollow body preform in the area between the female mold cavity and male core parts of a mold, and

(b) moving said mold parts relative to one another in such a manner so as to compress said preform into said female mold cavity while simultaneously applying vacuum around the entire periphery of said preform thereby forming a double-walled receptacle.

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