US 20140299219A1

(19) **United States**

(12) **Patent Application Publication**

Coleman et al.

(10) **Pub. No.: US 2014/0299219 A1**

(43) **Pub. Date: Oct. 9, 2014**

(54) **ROTO MOLDED SKIFF AND DRAIN**

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(21) Appl. No.: **13/987,318**

(22) Filed: **Nov. 6, 2012**

Publication Classification

(51) **Int. Cl.**

F16L 9/12	(2006.01)
B29C 39/18	(2006.01)
B29C 39/10	(2006.01)

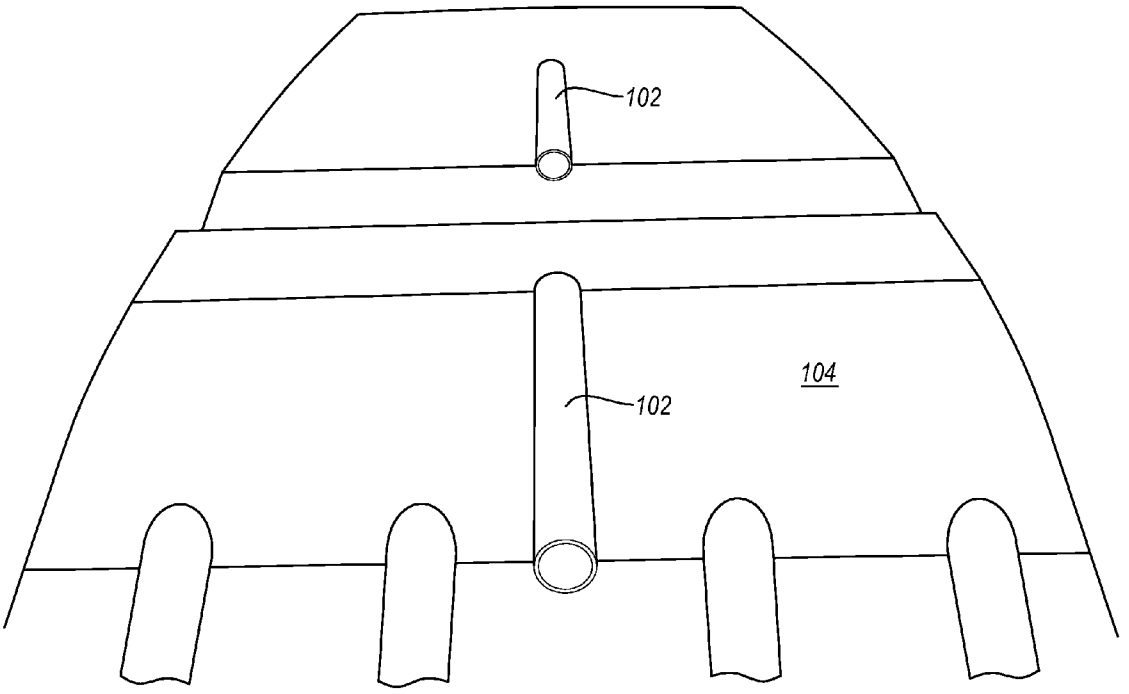
(52) **U.S. Cl.**

CPC . ***F16L 9/12*** (2013.01); ***B29C 39/10*** (2013.01); ***B29C 39/18*** (2013.01)

USPC **138/140**; 264/259; 264/171.29

(57) **ABSTRACT**

An article of manufacture including a through hole. The article of manufacture includes a body, wherein the body is a plastic molded body, and a tube molded into the body. The tube has a melting point higher than the plastic molded body.



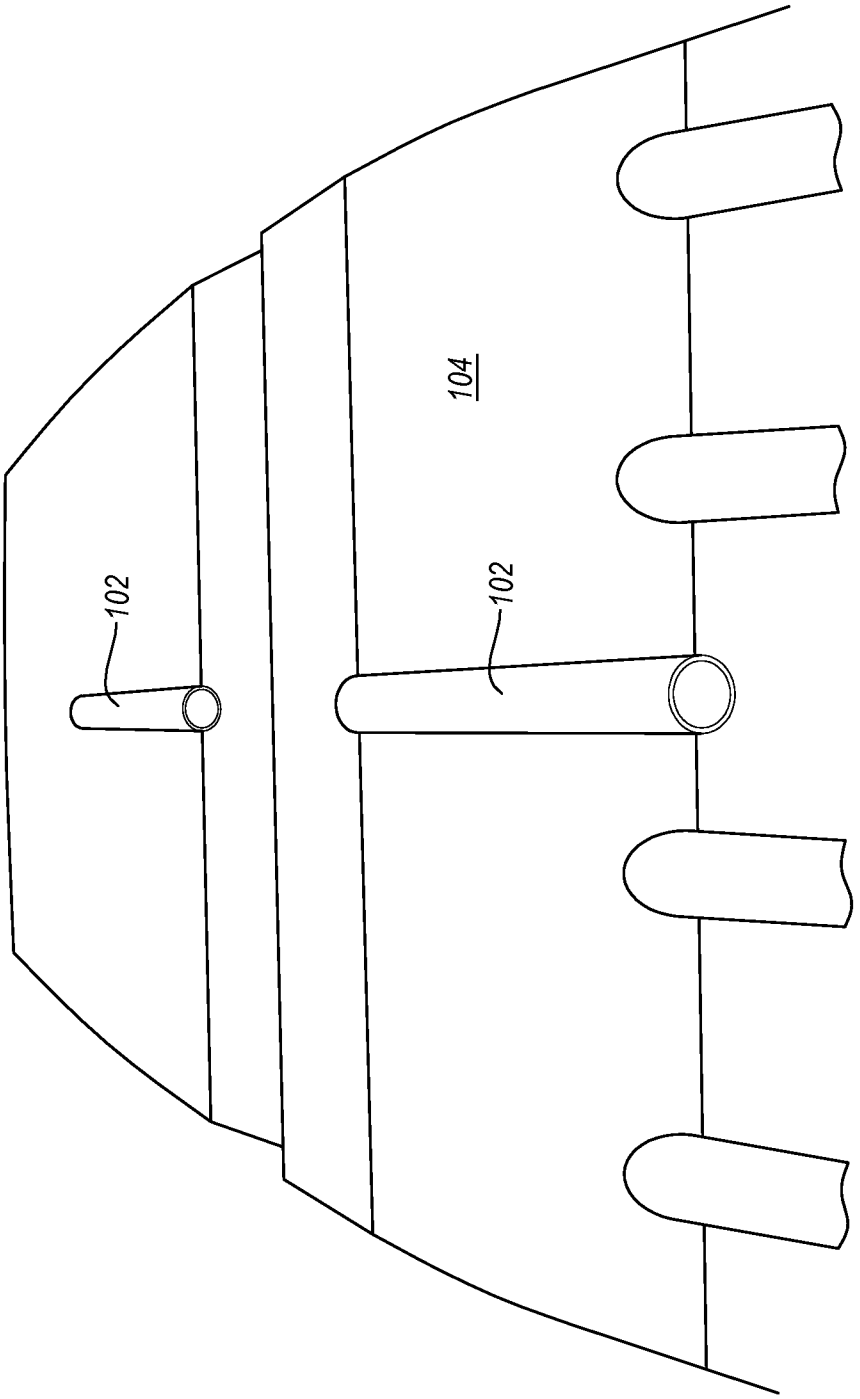


FIG. 1

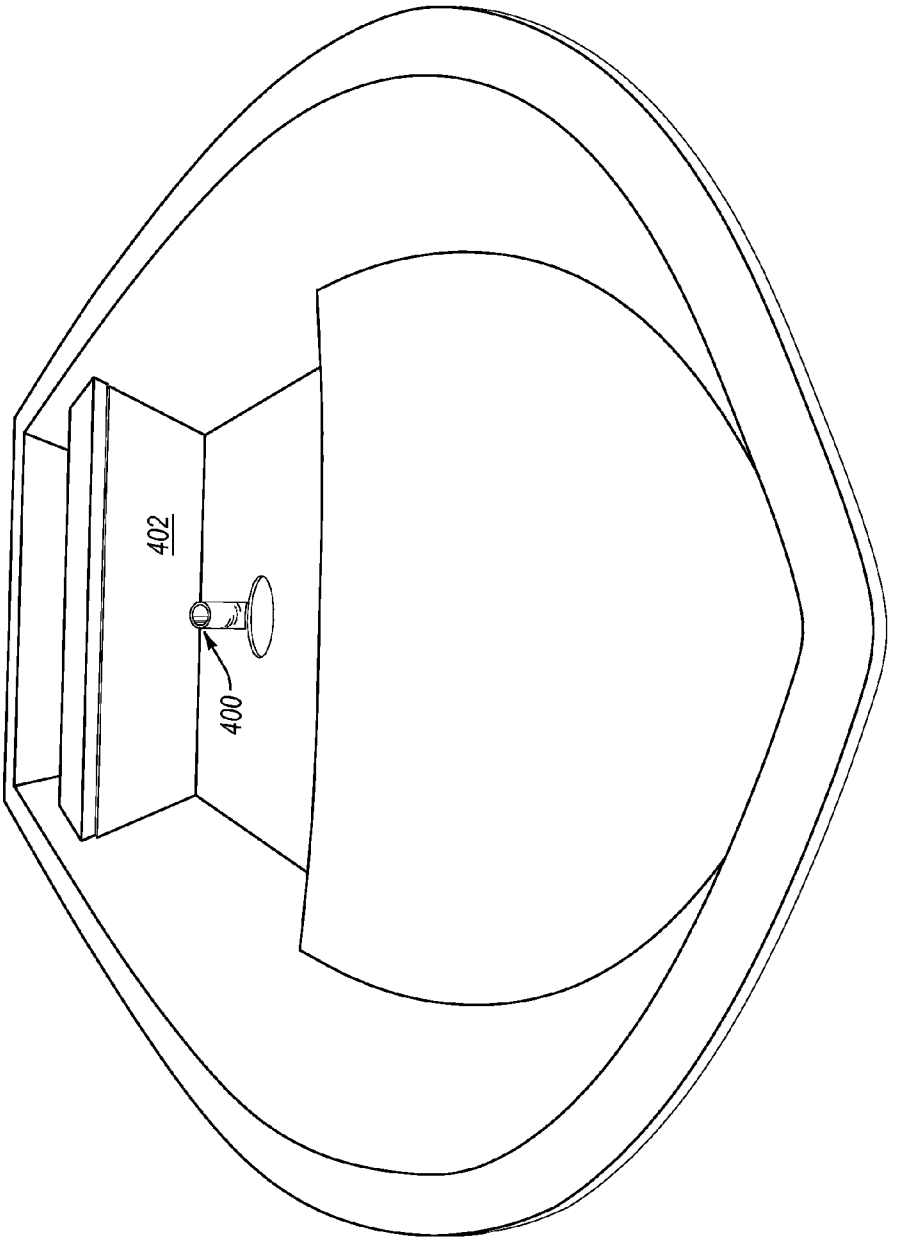


FIG. 2A

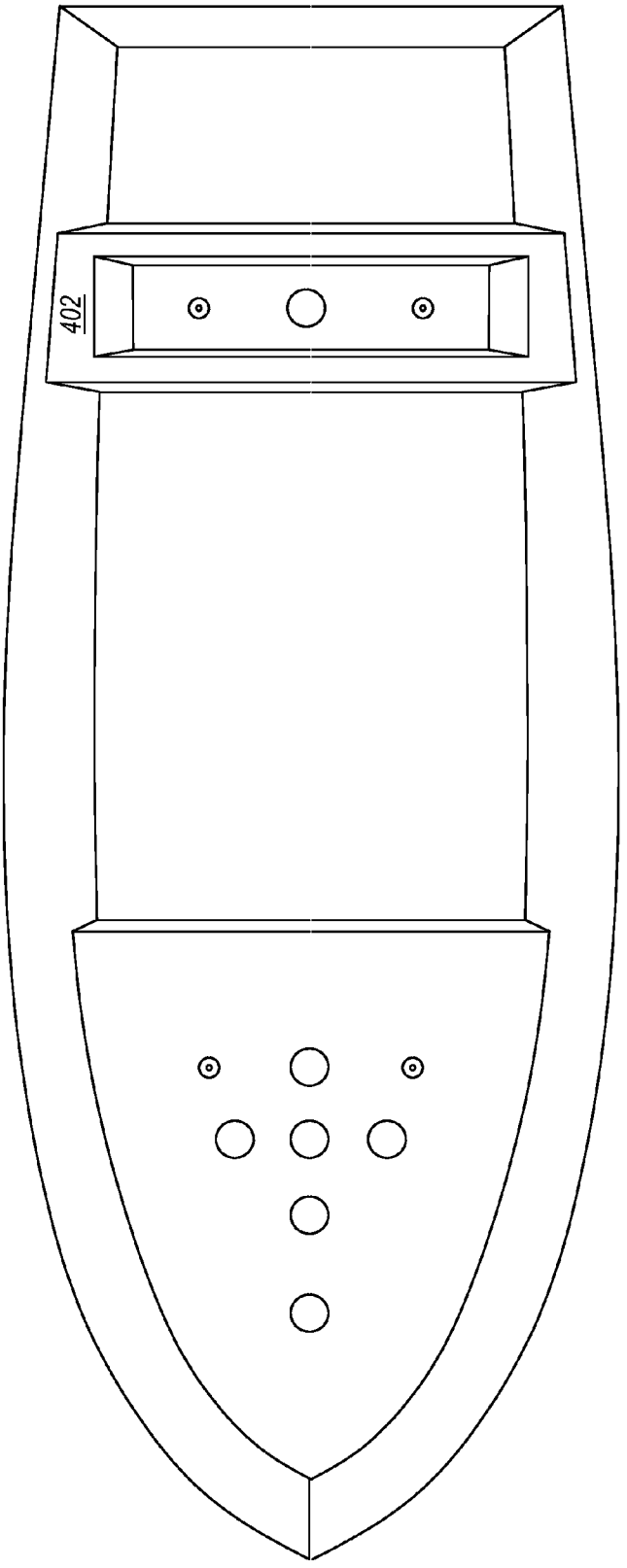
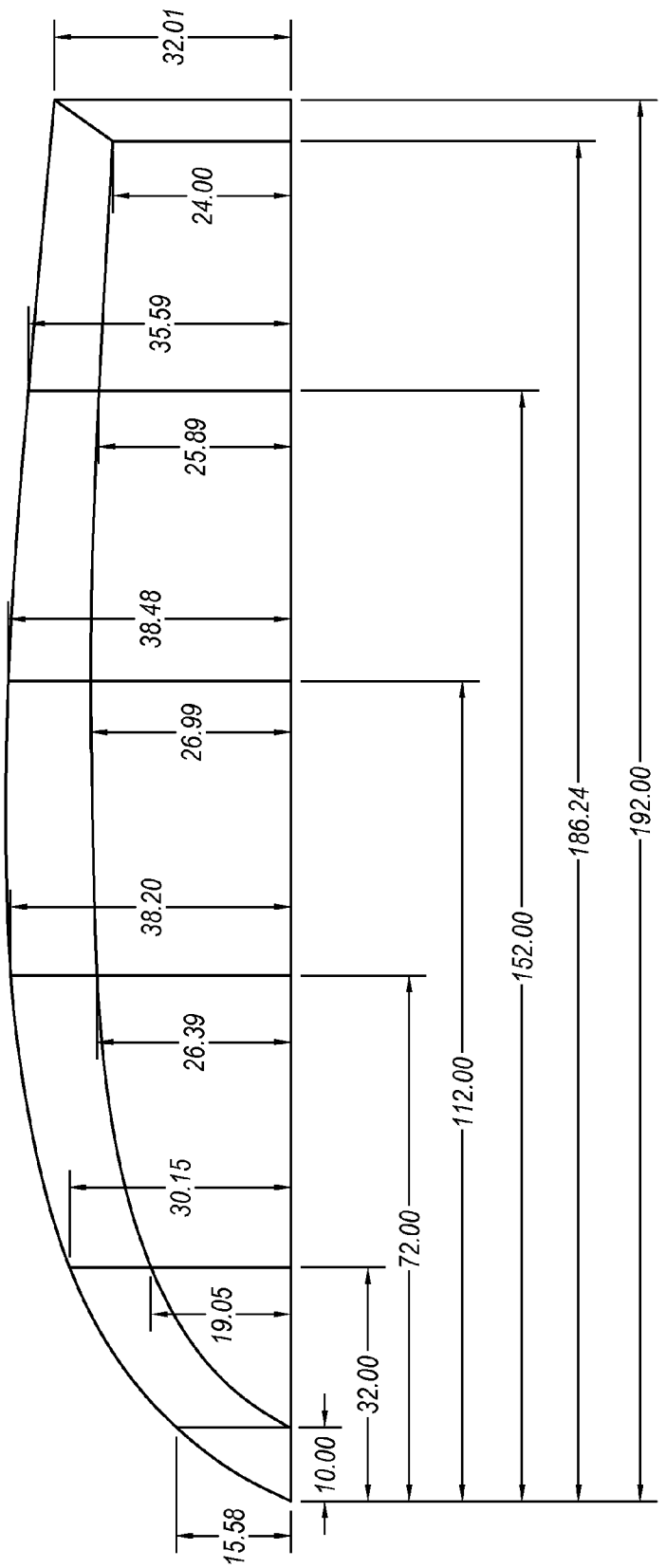


FIG. 2B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24.00
35.59
25.89
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26.99
38.20
26.39
30.15
19.05
15.58
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72.00
112.00
152.00
186.24
192.00

FIG. 2C

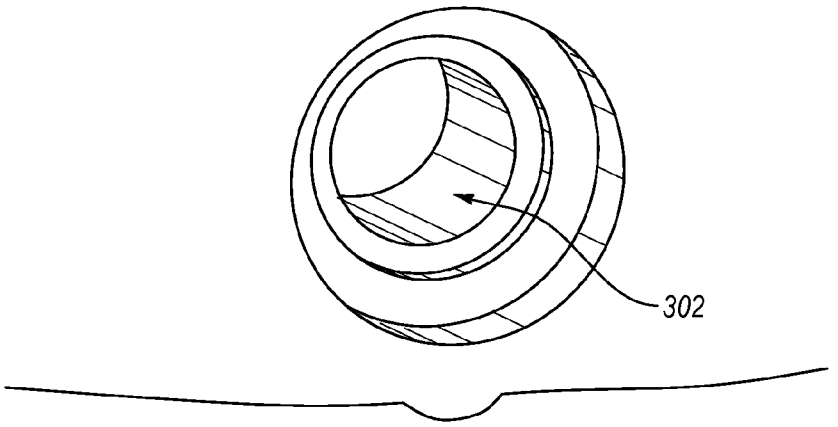

FIG. 3A

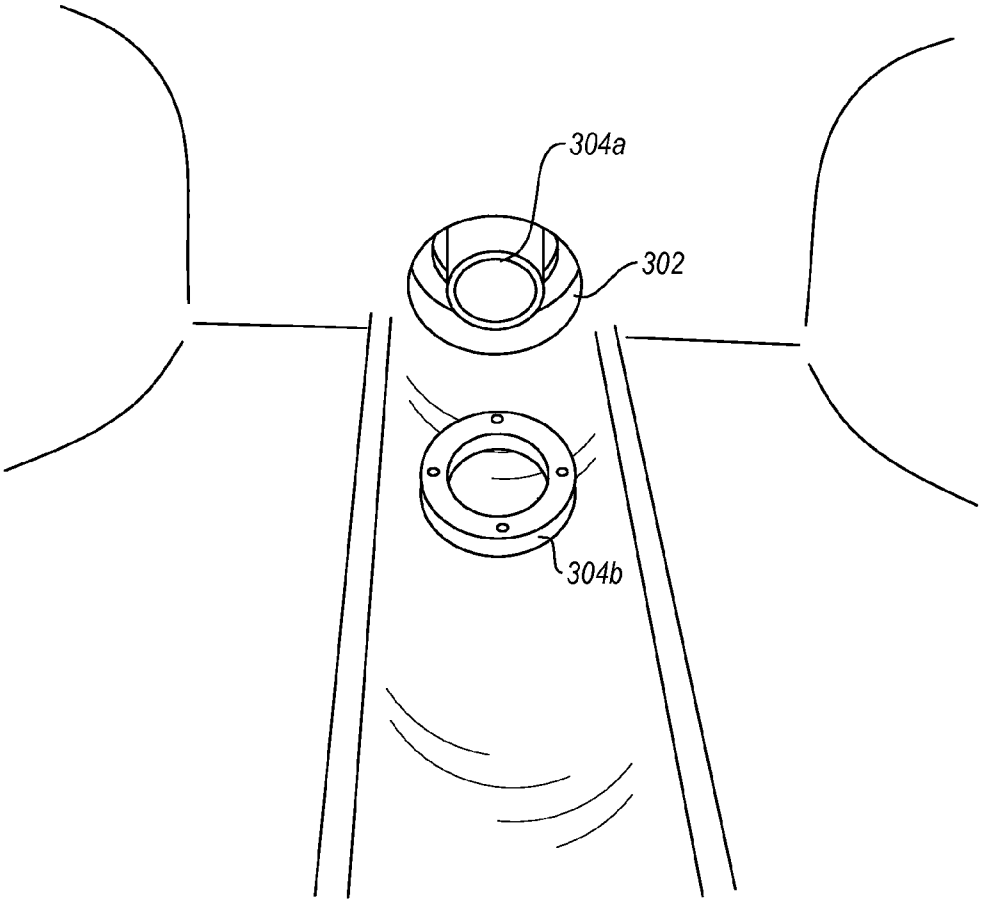

FIG. 3B

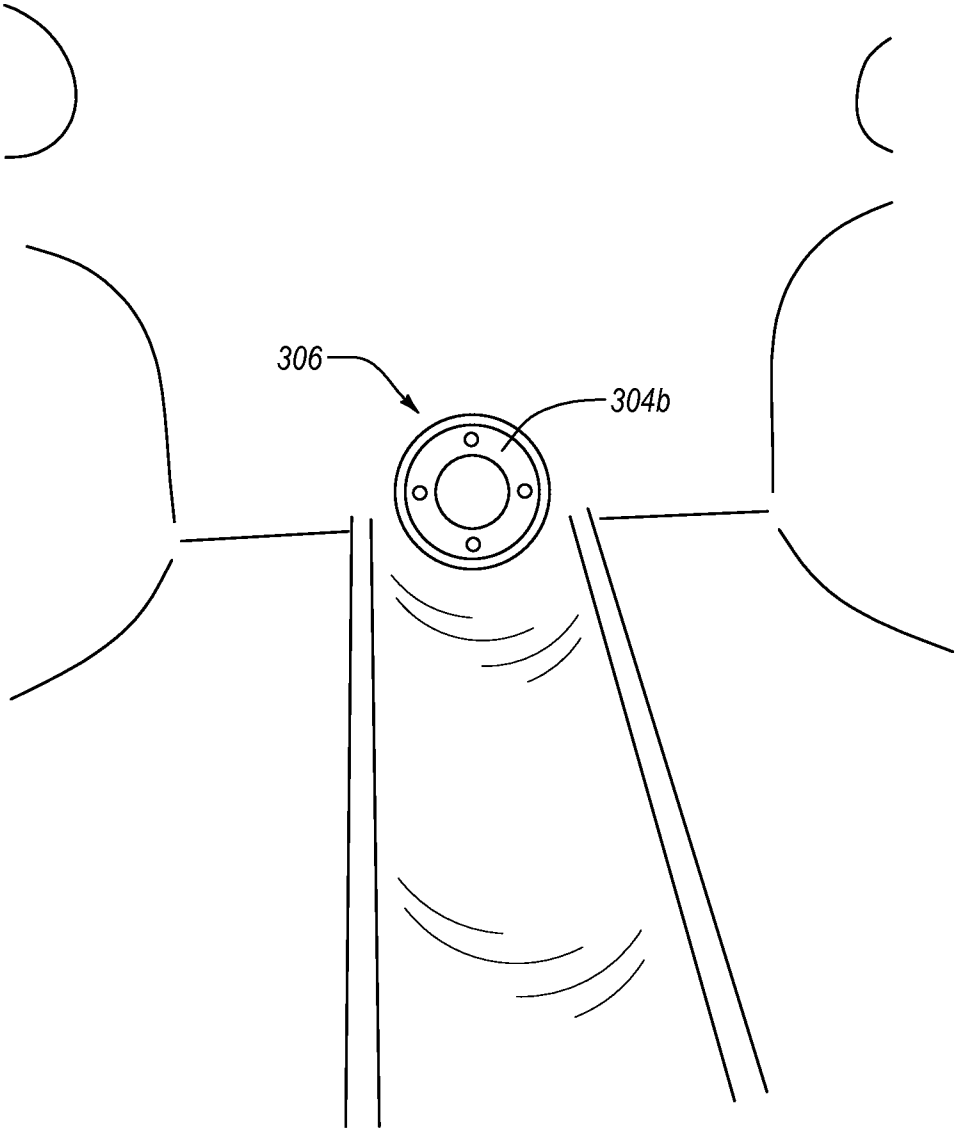

FIG. 3C

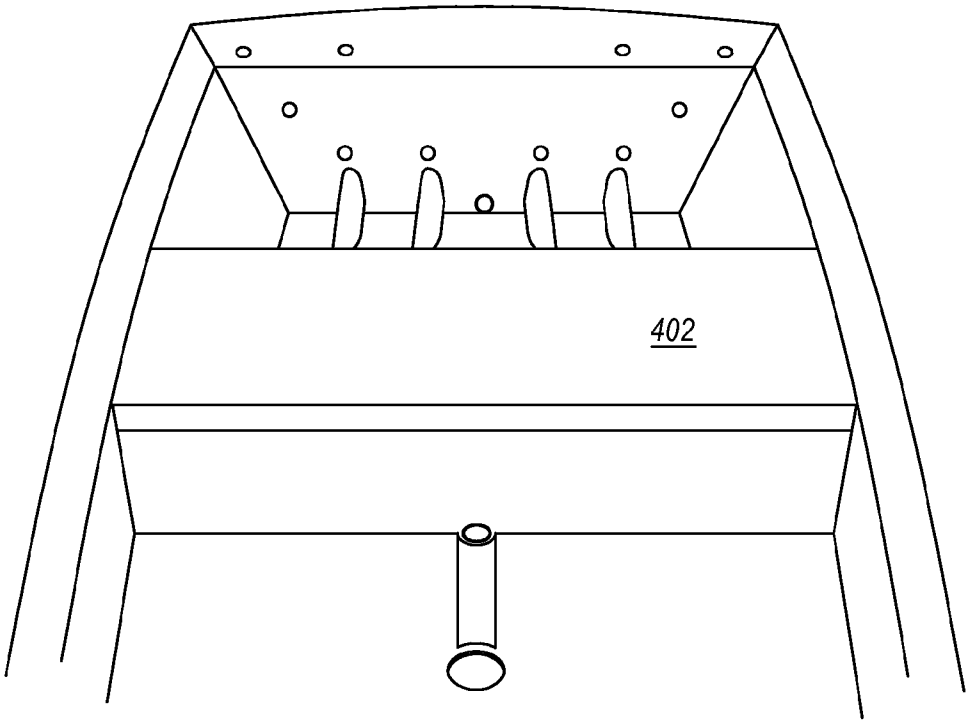

FIG. 4A

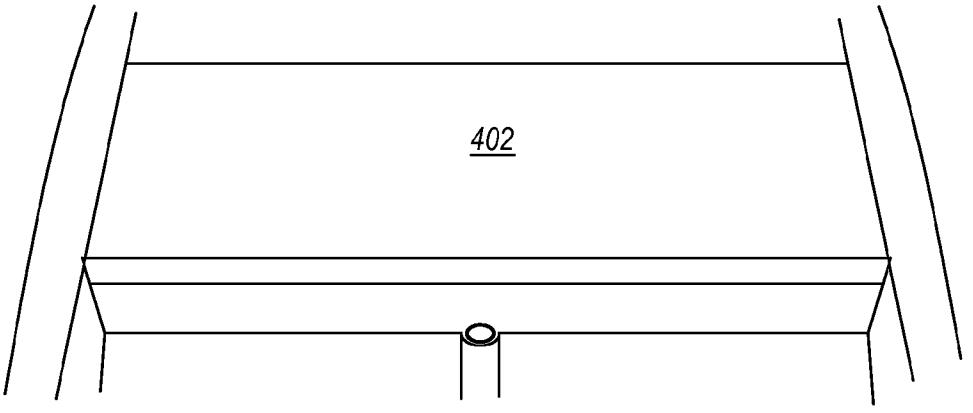

FIG. 4B

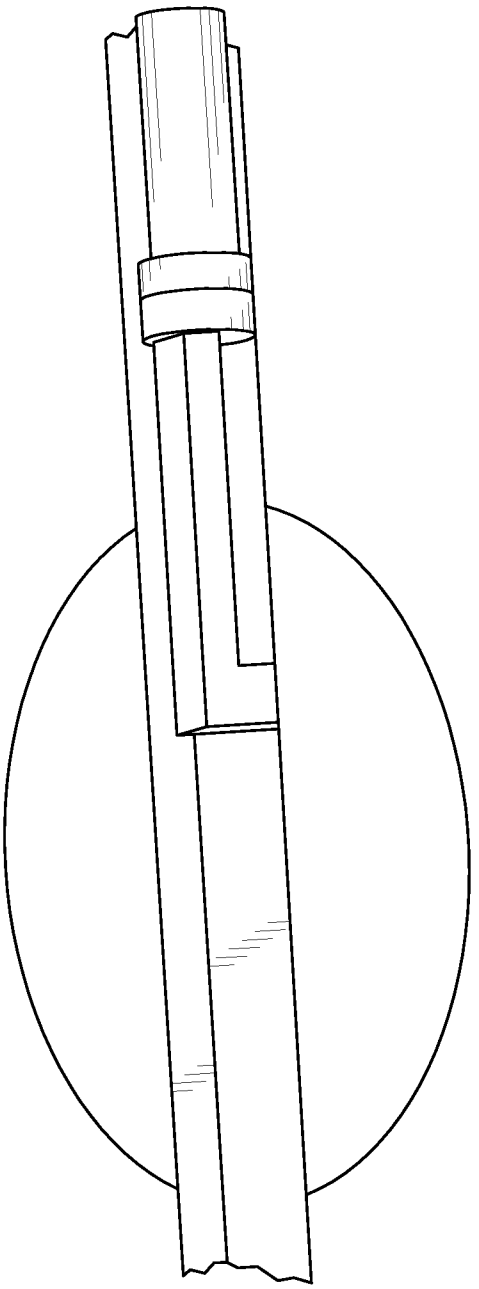

FIG. 5

ROTO MOLDED SKIFF AND DRAIN

BACKGROUND

[0001] 1. Background and Relevant Art

[0002] Blow molding and rotational molding have been used to create various types of products. For boats there is often a desire to have structural support of between deck portions of the boat and hull portions of the boat. This can be done by using a structure known as "skin-foam-skin" where one skin is the hull and the second skin is the deck. Foam is injected between the two skins to provide structural support for the deck, allowing a boater to walk on, or otherwise put weight on the deck without the deck deforming too severely or being damaged. However, adding structural foam adds significant weight to the boat.

[0003] Boats also often have drain structures that pass through the hull of the boat to allow water to drain from the boats. However, when a boat is blow molded or rotationally molded, temperature changes in the molding process, as well as temperature changes when the boat is in use may cause separation between skin elements of the boat. When this skin separation occurs at a drain location, water may leak into the boat structure between skin elements instead of being drained out of the boat.

[0004] Additionally, in general blow molding and rotational molding applications, through holes are limited to thicknesses through the material of about less than one inch. Any longer than this and the through holes distort in undesirable ways during the blow molding process.

[0005] The subject matter claimed herein is not limited to embodiments that solve any disadvantages or that operate only in environments such as those described above. Rather, this background is only provided to illustrate one exemplary technology area where some embodiments described herein may be practiced.

BRIEF SUMMARY

[0006] Embodiments may include an article of manufacture including a through hole. The article of manufacture includes a body, wherein the body is a plastic molded body, and a tube molded into the body. The tube has a melting point higher than the plastic molded body. Embodiments may include methods of manufacturing such articles.

[0007] This Summary is provided to introduce a selection of concepts in a simplified form that are further described below in the Detailed Description. This Summary is not intended to identify key features or essential features of the claimed subject matter, nor is it intended to be used as an aid in determining the scope of the claimed subject matter.

[0008] Additional features and advantages will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by the practice of the teachings herein. Features and advantages of the invention may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims. Features of the present invention will become more fully apparent from the following description and appended claims, or may be learned by the practice of the invention as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In order to describe the manner in which the above-recited and other advantages and features can be obtained, a more particular description of the subject matter briefly described above will be rendered by reference to specific embodiments which are illustrated in the appended drawings. Understanding that these drawings depict only typical embodiments and are not therefore to be considered to be limiting in scope, embodiments will be described and explained with additional specificity and detail through the use of the accompanying drawings in which:

[0010] FIG. **1** illustrates a mold for molding a skiff boat;

[0011] FIG. **2**A-**2**C illustrate various details of the boat of FIG. **1**;

[0012] FIGS. **3**A-**3**C illustrate various details regarding the drain of the boat of FIG. **1** including the use of a PTFE tube and aluminum fitting;

[0013] FIGS. **4**A and **4**B illustrate details of a bench of the boat of FIG. **1**, including implementation of a drain through the bench; and

[0014] FIG. **5** illustrates a retention system for holding a PTFE tube during blow molding of the boat of FIG. **1**.

DETAILED DESCRIPTION

[0015] Embodiments described herein may implement methods of molding partial or through holes into blow molded articles of manufacture. Embodiments are particularly useful when performing blow molding or so-called roto molding whereby the molding takes place in an oven that include provisions for rotating the article of manufacture while the articles of manufacture are being molded and cured. This may be done, for example, to provision drains, inlet valves, output valves, or for other reasons where holes may need to be formed in and/or through blow molded plastic materials. Such embodiments may mold a tube of a high melting point plastic, such as Polytetrafluoroethylene (PTFE), commonly sold under the trade name Teflon® by DuPont, into and/or through the wall of the rotationally or blow molded article of manufacture. The tube can then be used as a passageway through the wall of the rotationally or blow molded article of manufacture.

[0016] Previous processes have been limited to molding holes and through holes that are limited to about less than one inch into or through the wall of the rotationally or blow molded article of manufacture. Holes longer than this tend to melt and deform in undesirable ways. Previously, such holes were formed, in some instances, by pulling a heated metal tube or rod through the plastic walls of the article of manufacture. However, this technique does not work well on walls being more than about 1 inch thick for the reasons stated above.

[0017] Using a plastic tube with a high melting point, longer holes and through holes can be realized in rotationally or blow molded articles of manufacture. For example, holes can be formed in rotationally or blow molded articles of manufacture that are greater than one inch in length. That is, holes can be formed partially or completely through rotationally or blow molded articles of manufacture that have walls or members that are greater than one inch thick. In some embodiments, holes may be formed that are greater than two inches. Using the above process, holes may be formed that are about 25 feet or less, but greater than 2 inches. This would allow for holes to be made in some of the largest roto molding ovens in the United States and the world.

[0018] Some embodiments may allow for tubes to be used for holes to be molded that are about 20 feet long so as to allow for molding passageways into tanks and other large

items. Some embodiments may allow for using tubes in the range of about 6 to 10 feet for creating passageways in molded materials. Some such holes may be used for liquid or air movement, passageways for running wiring or cabling, or for other purposes.

[0019] The following now illustrates an example of a process of providing drainage for a boat using the above principles. In particular, FIG. **1** illustrates a drain cavity **102** in a mold **104** to form a unique two part drain system for a 16 foot rotationally molded skiff designed by Hog Island Boat Works of Steamboat Springs Colo. Various details of the skiff are illustrated in FIG. **2**A, **2**B, and **2**C. The two part drain comprises a molded-in PTFE tube **302** (see FIG. **3**A and **3**B) that acts as a guide and housing for a unique aluminum tube thru-hull fitting **304**A and **304**B (see FIG. **3**B and **3**C) that is bolted together after molding the hull. This two part system ensures that there is no leakage or water penetration of the system into the body of the boat. A drain hole **400** (see FIG. **2**A) is also formed through a bench **402** (see FIGS. **4**A and **4**B) in the boat, inasmuch as the bench is a solid bench that would ordinarily block water from moving from the front portion of the boat to the rear portion of the boat where the drain **306** (see FIG. **3**C) is located. The drain hole formed in the bench of the boat allows water to flow to the rear of the boat where the outlet drain is located to allow water to be drained from inside the boat.

[0020] The location and length of the drains through the molded-in bench, and in the transom of the boat hull would not allow for drilling a hole after molding. Referring now to FIG. **1**, FIG. **1** illustrates that a drain cavity **102** has been formed into the mold **104**, and in effect mold in the drain cavity ion our boat hull. The drain cavity is lined with a molded-in PTFE tube that acts as a guide for a more durable aluminum, stainless steel, or other material thru-hull drain.

[0021] The molded-in bench in the skiff is 22" wide. The PTFE tube that is molded-in to the hull under the bench is 19.8" long, and the aluminum tube is 20" long. The transom is 2½" wide. The PTFE tube used is 1.8" long, and the aluminum tube is 2" long. The PTFE used may have about a ¼" sidewall, and retains its shape enough for insertion and assembly of the aluminum drain.

[0022] Embodiments may be such that the boat hull mold includes a unique retention system that holds the PTFE pipe in place while the boat is molded in the rotational molding oven. An example of the retention system is illustrated in FIG. **5**. This is unique in and of itself to mold tube this length in place while a mold is loaded with polyethylene resin, and is turning in the 500 degree oven.

[0023] The process for implementing a secure and functional drain in a boat hull, or other article of manufacture, involves molding in place a PTFE tube that is a pass-thru for a post molding assembled aluminum drain. This system was designed inasmuch as nothing exists in the rotational molding industry for a secure drain longer than 1". The drains that exist to date are 1" thru-wall fittings for water/storage tanks. The transom and drain would not work with this type drain, nor would any other rotationally molded boat hull, or other rotationally molded part that required a secure drain over 1".

[0024] The present invention may be embodied in other specific forms without departing from its spirit or characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be embraced within their scope.

What is claimed is:

1. A method of forming a hole in a molded article of manufacture, the method comprising:

molding a tube with a high melting point into a rotationally molded article, wherein the tube is greater than one inch long.

2. The method of claim **1**, wherein the tube is between 2 inches to 25 feet.

3. The method of claim **1**, wherein the tube is between 6 to 10 feet.

4. The method of claim **1**, wherein the tube is between 2 inches to 12 inches.

5. The method of claim **1**, wherein the tube is between 1 foot to 10 feet.

6. The method of claim **1**, wherein the tube is between 8 feet to 25 feet.

7. The method of claim **1**, wherein the tube is between 2 inches to 20 feet.

8. An article of manufacture, the article comprising:

a body, wherein the body is a plastic molded body; and

a tube molded into the body, the tube having a melting point higher than the plastic molded body.

9. The article of claim **8**, wherein the article is a roto molded boat.

10. The article of claim **8**, wherein the tube is longer than 1 inch.

11. The article of claim **8**, wherein the tube is longer than 2 inches.

12. The article of claim **8**, wherein the tube is PTFE.

13. The article of claim **8**, wherein the tube is between 2 inches to 25 feet.

14. The article of claim **8**, wherein the tube is between 6 to 10 feet.

15. The article of claim **8**, wherein the tube is between 2 inches to 12 inches.

16. The article of claim **8**, wherein the tube is between 1 foot to 10 feet.

17. The article of claim **8**, wherein the tube is between 8 feet to 25 feet.

18. The article of claim **8**, wherein the tube is between 2 inches to 20 feet.

* * * * *