United States Patent

Humphrey

[15] **3,648,902**

[45] **Mar. 14, 1972**

[54] **BLOW-MOLDED PUMP-TYPE DISPENSER**

[72] Inventor: **Frederick Harold Humphrey,** 7 Orchard Street, Markham, Ontario, Canada

[22] Filed: **Oct. 2, 1970**

[21] Appl. No.: **77,415**

Related U.S. Application Data

[62] Division of Ser. No. 821,829, May 5, 1969, Pat. No. 3,575,949.

[52] **U.S. Cl.** 222/207
[51] **Int. Cl.** **B65d 37/00**
[58] **Field of Search** 222/209, 372, 383, 207

[56] **References Cited**

UNITED STATES PATENTS

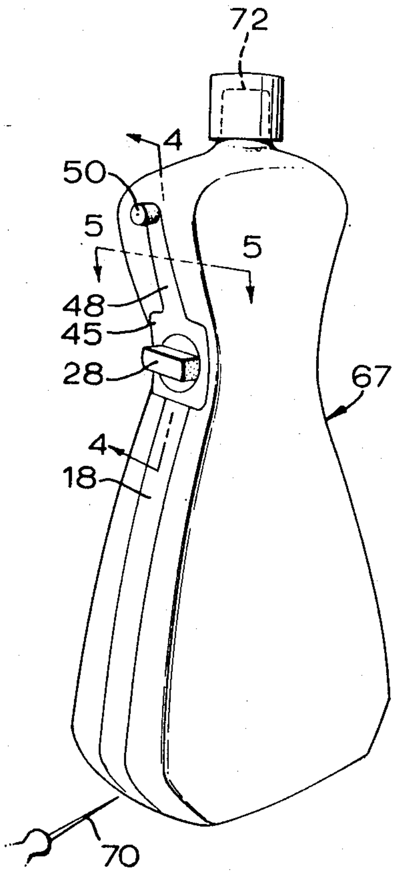
3,486,663	12/1969	Humphrey	222/207
3,561,648	2/1971	Humphrey	222/207

Primary Examiner—Robert B. Reeves
Assistant Examiner—John P. Shannon, Jr.
Attorney—Sim & McBurney

[57] **ABSTRACT**

An element that can be incorporated into the side of a blow-molded bottle when the latter is blow molded, the element defining with the bottle a tube through which fluid in the bottle can be pumped to the exterior. The element includes a plate portion having two apertures, and two channel portions extending from the plate portion. The walls of each channel portion extend over the plate portion to enclose the apertures, respectively. A pump is included and is positioned against the plate portion to pump the fluid from one aperture to another and thus from one channel portion to another.

5 Claims, 6 Drawing Figures



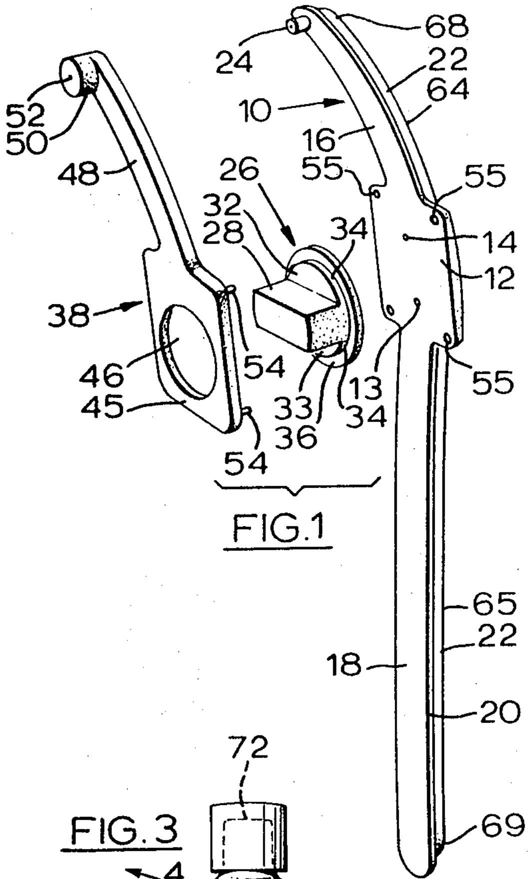


FIG.1

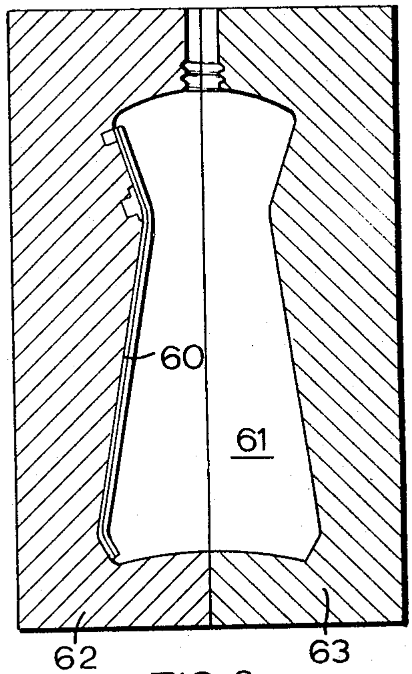


FIG.2

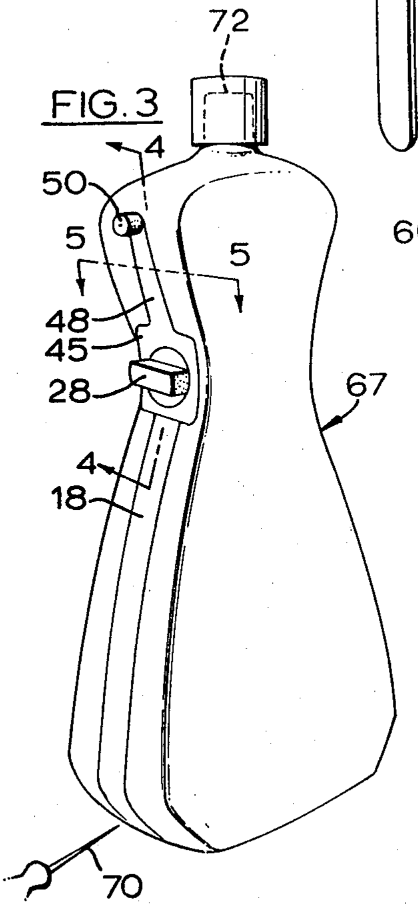


FIG. 3

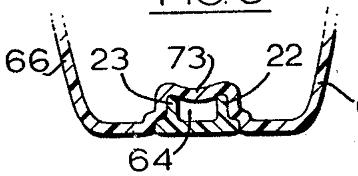


FIG. 5

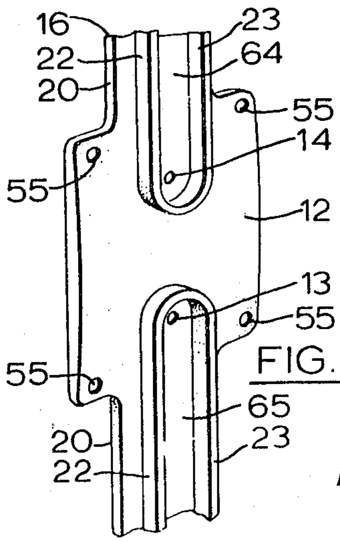


FIG. 6

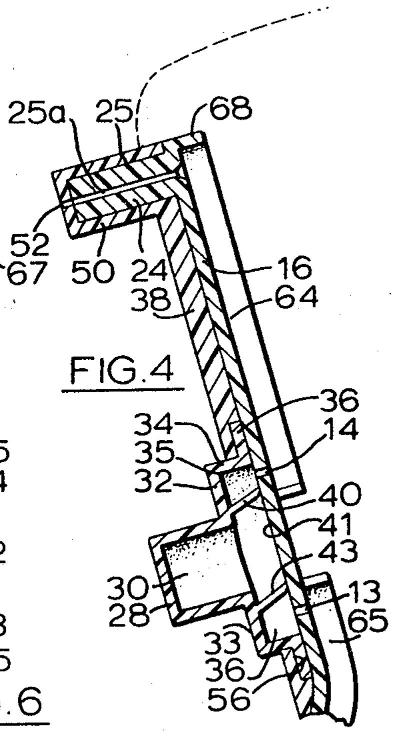


FIG. 4

INVENTOR.
FREDERICK H. HUMPHREY

BY Sim & M'Burney

Agent

BLOW-MOLDED PUMP-TYPE DISPENSER

This application is a division of application Ser. No. 821,829,146 filed May 5, 1969 now U.S. Pat. No. 3,575,949.

This invention relates generally to blow-molding techniques for the manufacture of plastic containers. More specifically, this invention has to do with an improvement in blow-molding techniques, by which it is possible to incorporate a tubular element into a wall of the blow-molded container at the time of blow-molding. This invention is also related to the incorporation of a tubular element and a pumping element into the wall of a blow-molded container, the tube having a nozzle through which the contents of the container can be pumped.

Many containers of different shapes and sizes are presently available, almost all of which are blow molded in the conventional manner. When the contents of the container are intended for certain purposes such as window spraying, liquid waxing, etc., it is desirable for the container to be equipped with a spray-nozzle and a simple pumping mechanism by which the liquid contents can be sprayed through the nozzle. Conventionally, the pumping apparatus and the nozzle have been incorporated into the cap of the container, and most such conventional spray mechanisms involve a large number of separate components, including springs, ball valves, gaskets, etc.

Aside from the obvious disadvantage of the high costs involved in the provision of such a complicated pumping mechanism, there is the further disadvantage, thus far ignored by manufacturers, that a container equipped with a pump and nozzle mechanism incorporated in its cap makes it difficult for the user to merely pour the contents from the mouth of the bottle, should this be desirable. In other words, liquid containers are equipped either with a simple cap-type closure which can be removed to permit the contents to be poured out, or with a complicated pump-nozzle closure which permits the contents to be sprayed but which makes it undesirable to remove the cap for pouring because of the long liquid draw-tube which extends to the bottom of the bottle and which is always incorporated in such closures. It is, of course, possible to remove the pump-nozzle cap, but some of the liquid in the container always clings to, or is contained within, the liquid draw-tube, and as a result the handling of the removed pump-nozzle closure means can be messy.

From a versatility point of view, then, present-day liquid containers suffer from the restrictions imposed by the fact that they have only on opening, and that this opening must be closed either by a simple cap-closure or a closure which incorporates a pump and spray-nozzle.

One object of this invention is to provide a method by which a tubular passageway can be incorporated into the wall of a blow-molded container.

A further object of a particular embodiment of this invention is to provide a method by which a combination member involving a tube, a pump and a nozzle can be incorporated into the wall of a blow-molded container at the time of molding.

Yet a further object of this invention is to provide a manufactured item which can be fitted against the inner wall of a molding cavity, such that a container blow molded against the item will combine with the latter to produce a tubular passageway.

A further object of this invention is to provide a combination of manufactured items which can be fitted together and placed within the cavity of a mold against one wall thereof, the construction of the parts being such that, when a container is blow molded against the wall of the mold, the wall of the ultimate container has incorporated within it a tube, a pump and a nozzle.

Accordingly, this invention provides a method of incorporating a tube into a plastic wall which is blow molded against a mold surface, said method comprising the steps: providing an elongated, channel-defining element of a material fusible with the plastic wall upon contact when the material of the plastic wall is in a state suitable for blow molding, positioning said channel-defining element against said mold surface with the channel opening away from the mold surface, and blow molding said plastic wall against said mold surface over said channel-defining element, such that the plastic wall fuses with and closes in the channel-defining element to form therewith a tube.

This invention also provides, for incorporation into a blow-molded bottle, the combination of: an integral channel-defining portion each extending away from the plate portion and each having a base and two outstanding spaced-apart ridges, the bases of the channel-defining portions joining the plate portion, the ridges of the first channel-defining portion extending across the plate portion to enclose one aperture, the ridges of the second channel-defining portion extending across the plate portion to enclose the other aperture, and a pump adapted to be positioned against the plate portion remote from said ridges and to pump fluid from said other aperture to said one aperture.

One embodiment of this invention is shown in the accompanying drawings, in which like numerals denote like parts throughout the several views, and in which:

FIG. 1 is an exploded perspective view of the three components of an insert adapted to be positioned against the wall of a mold cavity;

FIG. 2 is a cross-sectional view of two halves of a mold adapted for blow molding a container;

FIG. 3 is a perspective view of a container incorporating the elements of this invention;

FIG. 4 is a longitudinal sectional view taken at the line **4—4** in FIG. 3;

FIG. 5 is a cross-sectional view taken at the line **5—5** in FIG. 3; and

FIG. 6 is a perspective view of part of one of the insert components.

Attention is directed first to FIG. **1**, which shows the three components of the pump-tube-nozzle arrangement adapted to be incorporated into the wall of a plastic container. In FIG. 1, an integral channel-defining element **10** comprises a plate portion **12** having two spaced-apart apertures **13** and **14** passing through it. Integral with the plate portion **12** is a first channel-defining portion **16**, and a second channel-defining portion **18**. The first and second channel-defining portions **16** and **18** extend away from the plate portion **12** in opposite directions. Each of the channel-defining portions has a base **20** and two outstanding space-apart ridges **22** and **23**. In FIG. **1**, only the nearer ridge **22** can be seen. In FIG. **5**, however, both ridges **22** and **23** are visible in cross section. At its upper end, the first channel-defining portion **16** integrally incorporates a projection **24** having a groove **25** which communicates with a port **25a** (see FIG. 4) opening through the base **16** to a point located between the two ridges **22** and **23**. As is partly shown in FIG. **1**, the ridges **22** and **23** at the upper end of the first channel-defining portion **16** loop around and join one another to define a closed end channel. The ridges **22** and **23** of the first channel-defining portion **16** extend inwardly across the back of the plate portion **12** and enclose the aperture **14**, as seen in FIG. **6**. Likewise, the ridges **22** and **23** of the second channel-defining portion extend inwardly across the back of the plate portion **12** to enclose the aperture **13**.

The numeral **26** denotes an integral elastomeric pump of the kind shown and described in copending U.S. application No. 764,685, filed July 17, 1968 in the name of Frederick Harold Humphrey and entitled "Elastomeric Pump and Check-Valve". Referring to FIGS. **1** and **4**, the pump **26** includes a upstanding, flexible portion **28** defining in part a compartment **30**. Extending outwardly from the portion **28** are two skirt portions **32** and **33**, the skirt portion **32** in part defining a compartment **35**, and the skirt portion **33** in part defining a compartment **36**. As can be seen particularly in FIG. **4**, the compartment **35** is in communication with aperture **14**, while the compartment **36** is in communication with aperture **13**. The skirt portions **32** and **33**, together with the upstanding portion **28** of the pump **26**, define a generally elliptical outline, although this is not essential to the invention. The skirt portions 32 and 33 include side walls 34, around the periphery of which outwardly extends a rim 36. The rim is adapted to be compressed against the plate portion 12 by the shroud 38, shortly to be described.

Again referring to FIG. 4, it will be seen that compartments 30 and 35 are separated by a partition 40 which defines an acute angle with the surface 41 of the plate portion 12 within the compartment 30. Likewise, the compartments 30 and 36 are separated by a partition 43 which defines an acute angle with the surface 41 of the plate portion 12 within the compartment 36. The partitions 40 and 43 are of resilient material integral with the rest of the pump 26, and each has a substantially rectilinear edge which is adapted to rest resiliently against the surface 41 of the plate portion 12. Because of the oblique relationship between the partitions and the surface 41, it will be appreciated that, for example, fluid is able to pass from the compartment 30 to the compartment 35 beneath the edge of the partition 40 provided the pressure differential i.e., the excess of pressure in compartment 30 over that in compartment 35) is great enough to raise the partition 40 away from the surface 41. However, should the pressure in compartment 35 be in excess of that in compartment 30, the resultant force on the partition 40 will have one component directed toward the surface 41, the effect of which will be to urge the partition 40 more strongly against the surface 41, thereby tightening the seal between the edge of the partition 40 and the surface 41. Thus, it will be appreciated that the oblique partition 40 functions as a one-way valve between compartments 30 and 35.

In an exactly similar way, the partition 43 operates as a one-way valve permitting fluid to pass from compartment 36 into compartment 30, provided the pressure differential is great enough, but preventing passage of fluid in the other direction.

Because the upstanding portion 28, and preferably the entire pump 26, is made of resilient material, it can be deformed in such a way as to decrease the volume of the compartment 30. This decrease of volume can be brought about, for example, by pressing inwardly or sidewardly against the top of the portion 28. As the volume of the compartment 30 decreases, the pressure in the compartment rises, and with a sufficient decrease in volume, the pressure differential across the partition 40 will be great enough to overcome the natural resilient tendency of the partition 40 to maintain its edge against the surface 41. When this happens, fluid passes beneath the edge of the partition 40 from the compartment 30 into the compartment 35. It will be appreciated that, because the pressure differential across the other partition 43 results in pressure on the partition 43 which forces its edge more tightly against the surface 41, no flow will take place from the compartment 30 into the compartment 36.

Since the compartment 35 is in communication with the aperture 14, the fluid entering compartment 35 from compartment 30 will be forced through the aperture 14.

Upon relaxation of inward or sideward pressure against the portion 28, the natural resilience of the portion 28 will tend to restore it to the position shown in FIGS. 1 and 4. In so doing, the volume of the compartment 30 increases, thus lowering the pressure in compartment 30 to the point when the excess of pressure in compartment 36 over that in compartment 30 will cause fluid to be drawn from the former to the latter beneath the edge of the partition 43. Of course, as fluid passes from compartment 36 into compartment 30, replacement fluid will be drawn into compartment 36 through the aperture 13.

Attention is again directed to FIG. 1, in which the shroud 38 is shown to include a rectangular part 45 having a central, elliptical opening 46 adapted to fit snugly around the walls 34 of the pump 26. Integral with the rectangular part 45 is a neck part 48 which is adapted to fir snugly against the visible side of the base of the first channel-defining portion 16 of the channel-defining element 10. At the upper end of the neck part 48 is a closed cylinder 50, integral with the neck part 48, and having a blind recess (not shown) adapted to receive the projection 24 of the channel-defining element 10. The cylinder 50 is pierced to provide a nozzle 52 in communication with the blind recess which receives the projection 24. The groove 25 on the projection 24 thus acts as a channel which communicates the nozzle 52 through the base 20 and into the space between the upstanding ridges 22 and 23 of the first channel-defining portion 16.

The rectangular part 45 has four pins 54 projecting toward the plate portion 12. Each of the pins 54 is adapted to be received in a corresponding opening 55 passing through the plate portion 12. The pins 54 are of a length permitting them to pass through to the far side of the plate portion 12 when the rectangular part 45 of the shroud 38 is placed against the plate portion 12.

To assemble the components of FIG. 1 together, they are merely collapsed in the relative positions in which they are shown. The pump 26 is placed against the visible surface of the plate portion 12 so that the compartments 35 and 36 are in communication, respectively, with apertures 14 and 13. Next, the shroud 38 is fitted snugly around the pump 26 and pressed against the plate portion 12 so that the pins 54 register in the openings 55 of the plate portion 12. As has been indicated, the elliptical opening 46 in the shroud 38 snugly embraces the side walls 34 of the pump 26, which, of course, requires that the rectangular part 45 have a cutaway step 56 (see FIG. 4) adjacent the elliptical opening 46 in the side which is not visible in FIG. 1, in order to accommodate the rim 36 of the pump 26. When this accommodation takes place, the rectangular part 45 of the shroud 38 is enabled to abut firmly the visible side of the plate portion 12. Also at the time of assembly, the projection 24 is received in the blind recess (not shown) in the cylinder 50, and the neck part 48 of the shroud 38 abuts the base 20 of the first channel-defining portion 16.

When the three components shown in FIG. 1 have been assembled in this way, they are placed against an appropriately recessed wall 60 of a mold cavity 61 defined between two halves 62 and 63 of a mold of the kind used for blow-molding containers. Preferably, the recesses are primarily to receive the upstanding portion 20 of the pump 26 and the cylinder 50, and thus the base 20 and the ridges 22 and 23 of both channel-defining portions 16 and 18 project inwardly into the mold cavity 61.

The method of this invention requires that the material of which certain parts of the FIG. 1 assembly are made be fusible with the material from which the container is to be blow molded, when that material is in the state in which it is blow molded. The parts that must be fusible with the material of the container are the ridges 22 and 23 and the pins 54. Most of the plastic containers contemplated by this invention are molded from thermoplastic material which has been raised in temperature to the viscous, plastic state, and for this reason the usual procedure will be to utilize either the same thermoplastic material, or a compatible one, for the ridges 22 and 23 and for the pins 54. It is advantageous, but not essential to this invention, to mold both the channel-defining element 10 and the shroud 38 entirely of the same material as integral pieces, this being preferable from a cost point of view. In particular, the following materials are considered satisfactory for the channel-defining element 10, the shroud 38 and the bottle:

a. all three made of high density polyethylene;

b. all three made of low density polyethylene;

c. all three made of PVC.

After the assembled components shown in FIG. 1 have been fusible against the wall 60 of a mold cavity 61 as shown in FIG. 2, the bottle is blow molded in the usual way. As shown in FIG. 5, the spacing between the ridges 22 and 23 is such that a portion 73 of the blow-molded material 66 of the container closes in the channel defined by the ridges 22 and 23 and results in the formation of an upper tube 64 and a lower tube 65. The ridges 22 and 23 are not spaced so far apart that the portion 73 of the blow-molded material 66 enters and occupied the space between the ridges. Where only the ridges 22 and 23 are made of a material fusible with the material 66 of the container 67, bonding will take place only along the areas of contact between the ridges 22 and 23 and the container 67. Where the entire channel-defining element 10 is formed from the same fusible material, of course, bonding between the container 67 and the channel-defining element 10 will take place at all areas of contact. The pins 54 registering with the holes 55 will have their ends bonded to the material of the container 67 at the time of blow molding. Again, where the shroud 38 is entirely made of the same fusible material, bonding will take place at all areas of contact.

The ridges 22 and 23 merge with each other not only at the top end 68, but at the bottom end 69 of the channel-defining element 10, and because of this, the tubes 64 and 65 defined between the bases 16 and 18, the ridges 22 and 23, and the material of the container 67 will closed at their extreme ends. The construction of the projection 24, however, is such that the tube 64 formed along the first channel-defining portion 16 will be in communication with the cylinder 50 and the nozzle 52.

Subsequent to the blow-molding step, it is necessary to pierce the container wall (inside wall) of the lower portion of the tube 65, so that the liquid for which the container 67 is intended can have access, along the lower tube 65 to the aperture 13, and thence into the pump 26. The piercing step is preferably made by a heat-piercing tool 70 (shown in FIG. 3), which creates two aligned holes, one in the base 18 and one in the portion 73 of the container material 66 which forms a part of the tube 65. Next, the outer hole is closed by heat fusing in the conventional way. The the container which results from these steps is shown in FIG. 3, and it will be seen that the outer surfaces of the base 18, of the rectangular parts 45 of the shroud 38, and of the neck 48 of the shroud 38, are flush with the wall of the container 67. Projecting outwardly from the container wall is the upstanding portion 28 and the cylinder 50.

It will now be appreciated that the method of this invention provides a blow-molded container with a spraying accessory which includes a pump adapted to be finger operated, a spraying nozzle and the appropriate feed tubes.

The container resulting from the method of this invention is thus capable both of spraying its contents from the cylinder 50 and of pouring the contents from the mouth 72 in the usual way.

What I claim is:

1. For incorporation into a blow-molded bottle, the combination of:

an integral channel-defining element comprising a plate portion having two spaced-apart apertures therethrough, a first and a second channel-defining portion each extending away from the plate portion and each having a base and two outstanding spaced-apart ridges, the bases of the channel-defining portions joining the plate portion, the ridges of the first channel-defining portion extending across the plate portion to enclose one aperture, the ridges of the second channel-defining portion extending across the plate portion to enclose the other aperture,

and a pump adapted to be positioned against the plate portion remote from said ridges and to pump fluid from said other aperture to said one aperture.

2. The invention claimed in claim 1, in which the pump is an integral resilient body forming a recess which is adapted to be placed against the plate portion to define therewith a chamber into which both apertures open, the integral resilient body having a first and a second partition each extending toward the plate portion and each having an edge adapted to rest resiliently against the plate portion between the two apertures, thereby to divide the chamber into a first compartment communicating with said one aperture, a second compartment communicating with said other aperture, and a third compartment communicating with said other aperture, and a third compartment between the two partitions, the first partition defining an acute angle with the surface of said plate portion in said third compartment, the second partition defining an acute angle with the surface of said plate portion in said second compartment, whereby resilient deformation of the integral resilient body to increase and decrease the volume of said third compartment pumps fluid from said second compartment through said third compartment to said first compartment.

3. The invention claimed in claim 2, which further includes a shroud adapted to maintain the pump against the plate portion, the plate portion having holes outwardly adjacent the outline of the pump, the shroud having integral pins adapted to register in said holes, the pins being of a material fusible with the plastic wall upon contact when the material of the plastic wall is in a state suitable for blow molding.

4. The invention claimed in claim 3, in which the first channel-defining portion has at its end remote from the plate portion a nozzle extending away from the base remotely from the ridges, the base having a port between the ridges communicating with the nozzle.

5. The invention claimed in claim 4, in which the ends of the ridges of the first channel-defining portion remote from the plate portion are joined and enclose said port, and in which the ends of the ridges of the second channel-defining portion remote from the plate portion are joined.

* * * * *