

IN-MOULD HANDLE MOVEMENT MECHANISM

[0001] The present invention relates to injection stretch blow-moulded containers and, more particularly, to such containers formed of bi-axially oriented thermoplastic polymer.

BACKGROUND

[0002] The process of injection stretch blow-moulding of thermoplastic polymer, in which an injection moulded perform is stretched both axially and radially in a blow moulding operation, results in a biaxial orientation of the polymer with increased tensile strength, less permeation due to tighter alignment of the molecular structure, high impact strength and transparency. As well, a container formed of polyethylene terephthalate (PET) is light in weight and lends itself to recycling.

[0003] Attempts have been made to incorporate integral handles in PET and like injection stretch blow moulding containers. A successful process developed by the present applicant is disclosed in for example WO1999/030883. While this process produces a satisfactory handle, the process employed cannot biaxially stretch the material of the handle nor consequently to any degree the region between the

connection points of the handle to the preform. To achieve the required strength of the handle requires a form which is less pleasing aesthetically and is expensive in the amount of polymer required in its formation.

[0004] It is an object of the present invention to address or at least ameliorate some of the above disadvantages.

NOTES

[0005] The term "comprising" (and grammatical variations thereof) is used in this specification in the inclusive sense of "having" or "including", and not in the exclusive sense of "consisting only of".

[0006] The above discussion of the prior art in the Background of the invention, is not an admission that any information discussed therein is citable prior art or part of the common general knowledge of persons skilled in the art in any country.

[0007] In this specification, the term "perform" refers to an injection moulded article, also known in the industry as a "parison", from which a container is formed by the process of stretch blow-moulding.

BRIEF DESCRIPTION OF INVENTION

[0008] Accordingly, in a first broad form of the invention, there is provided an in-mould, handle movement mechanism for repositioning a handle of a stretch blow-moulded container from its initial, as injected moulded location on a body of an injection moulded preform, to a desired integrally attached position on said stretch blow-moulded container.

[0009] Preferably, said mechanism comprises two mirror reversed insert portions, each insert portion inserted into one half of a stretch blow-moulding die.

[0010] Preferably, each said insert portion is provided with a channel; said handle portion of said preform nesting in said channel when a said preform is introduced into said stretch blow-moulding die.

[0011] Preferably, said channel comprises a first fixed section located in a main block of said insert portion, and a second pivoting section formed in a pivoting block of said insert portion.

[0012] Preferably, said handle portion of said injection moulded preform comprises a central section having a generally flattened elliptical cross section and thickened sections

adjacent each first and second junction point of said handle portion with a tubular body portion of said preform.

[0013] Preferably, said thickened sections are bifurcated sections of said handle portion.

[0014] Preferably, outer ends of each of said first fixed section and said second pivoting section are formed as bifurcated channels; said thickened bifurcated sections of said handle portion adapted to nest in said bifurcated channels.

[0015] Preferably, said second pivoting section is rotated between a first initial position conforming to said handle as injection moulded with said preform, and a second position; rotation of said pivoting block effected by a linkage connection to a linear actuator.

[0016] Preferably, rotation of said pivoting block is monitored by a sensor.

[0017] Preferably, each said insert portion is further provided with a forming block; said forming block moveable between a retracted nested position below said second pivoting block and an extended position at which an outer surface of

said forming block is flush with outer surfaces of said main block of said insert portion and of said pivoting block.

[0018] Preferably, said forming block when in said extended position completes a contour surface of the container forming cavity of said stretch blow-moulding die.

[0019] Preferably, said pivot block commences rotation from said initial position as axial stretching of said preform occurs in said stretch blow-moulding die; said second junction point moving from its initial preform position towards its position on said container.

[0020] Preferably, said channel is formed so that substantially all sections of said handle portion experience movement as said pivot block rotates from said first initial position towards said position on said container; said movement inducing biaxial orientation of polymer material forming said handle portion.

[0021] In another broad form of the invention, there is provided a method of moving a handle portion from a disposition relative an injection moulded preform to a desired disposition relative to a container; said container stretch blow-moulded from said preform; said steps including:

- (a) inserting one half of a handle moving mechanism into each half of a stretch blow-moulding die,
- (b) inserting a pre-heated injection moulded preform comprising a tubular body portion and handle portion into said stretch blow-moulding die such that said handle portion is nested in channels provided in each half of said mechanism when said die is closed for a mould cycle,
- (c) stretching said preform axially while rotating a pivot block in each said mechanism from an initial position conforming to said injection moulded handle portion, to move a junction point of said handle portion with said preform, to a junction point of said handle portion and said container.

[0022] Preferably, said movement of said handle portion junction point from said initial position to said junction point of said handle portion on said container cause biaxial orientation of polymer material of said handle portion.

[0023] In another broad form of the invention, there is provided an injection stretch blow-moulded container; said container stretch blow-moulded from a preform comprising injection moulded tubular body portion and an integral handle portion homogenous with said tubular body; said handle extending between first and second junction points on said

tubular body portion; said container characterized in that said second junction point is moved by a handle moving mechanism from an initial position on said preform to a final position on said container during a stretch blow-moulding cycle.

[0024] Preferably, polymer material of said tubular body portion and said handle are subjected to movement during said stretch blow-moulding cycle such that substantially all of said container body and said handle are biaxially oriented.

[0025] Preferably, said handle portion comprises a strap portion having a generally flattened elliptical section; said strap portion extending substantially the length of said handle portion.

[0026] Preferably, said strap portion extends between thickened portions adjacent each of said first and second junction points.

[0027] Preferably, said thickened portions are bifurcated such that each junction point comprises two areas of connection between said container and said handle.

[0028] In another broad form of the invention, there is provided a method of producing a container comprising a body

portion and an integral homogenous handle portion extending between a first and a second junction point on said body portion; said container and handle portion characterized in that substantially all of said container body portion and said handle portion are biaxially oriented during a stretch blow-moulding operation forming said container.

BRIEF DESCRIPTION OF DRAWINGS

[0029] Embodiments of the present invention will now be described with reference to the accompanying drawings wherein:

[0030] Figure 1 is a side view of an injection blow-moulded container with integral handle according to prior art.

[0031] Figure 2 is a side view of an injection moulded preform with integral handle portion,

[0032] Figure 3 is a composite side view of the preform of Figure 2 and a container stretch blow moulded from the preform, showing the movement of the handle,

[0033] Figure 4 is a perspective view of one half of the in-mould handle movement mechanism according to a preferred embodiment of the invention, in a first operating position,

[0034] Figure 5 is a perspective view of the one half of the in-mould handle movement mechanism of Figure 4, in a second operating position,

[0035] Figure 6 is a side view of the mechanism of Figures 3 and 4 shown in the position of Figure 4,

[0036] Figure 7 is a side view of the mechanism of Figures 3 and 4 shown in the position of Figure 5,

[0037] Figure 8 is a general view of the preform and blown container of Figures 1 and 2 in the cavity of the blow moulding die and shows the handle movement mechanism insert with the handle in its initial and final positions.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

[0038] Figure 1 shows an injection stretch blow-moulded container 10 with an integral handle 12 attached at a first junction point 14 below the neck portion 16 and at a second junction point 18 to the body 20 of the container. The handle has retained essentially the same shape as it had when injection moulded with the preform from which the container was blown, so that the material of the handle has not been subjected to biaxial orientation. To make the handle

sufficiently strong, it has in this example of the prior art, been formed as an "I" beam in section.

[0039] The preform 100 shown in Figure 2, is conventionally injection moulded in a process well known in the art. The preform 100, for use with the mechanism of the present invention, comprises a tubular body 110 depending from a threaded neck portion 112 and provided with a handle portion 114. Handle portion 114, which has been injection moulded along with the tubular body and is thus integral to, or one of a piece and homogenous with it, is joined to the tubular body 110 at a first junction point 116 just below the neck portion 112, and at a second junction point 118 lower down on the tubular body 110.

[0040] Preferably, the handle portion 114 is in the form of a narrow strap of a generally flattened elliptical section A-A as shown in Figure 2A along most of its length, but is thickened and bifurcated proximate both first junction point 116 and second junction point 118, as shown as section B-B in Figure 2B. Thus preferably each junction point comprises two, slightly spaced apart connections to the preform, and subsequently to the container.

[0041] Typically, an injection stretch blow-moulding process is a two stage process with the injection moulding of the preform being separated both in time and place from the

subsequent stretch blow-moulding phase. In that case the preform must be preheated before it is introduced into the stretch blow-moulding die.

[0042] Only those portions of the preform 100 that are to be stretched and blown are heated, with the neck portion 112 shielded during the heating process. With the preform of Figure 2 for use with the handle moving mechanism of the invention, the preheating of the preform 100 is carefully controlled with shielding and air flow arranged to differentially preheat various areas of the preform. This precision preheating allows expansion of different sections of the preform to proceed at different rates to achieve the particular requirements of the handle moving operation.

[0043] Figure 3 shows the original preform 100 (as it was injection moulded and shown in Figure 2), and the container 120 after the blow-moulding process and handle movement. It can be seen that the position of the second junction point 118 on the preform 100, has moved to a new position 118' on the blown container 120. The flow of the preform material, at and adjacent the second junction point 118, preconditioned by the pre-heating, and as a result of the blowing process and control of the mechanism, ensures the second junction point 118' is located at the desired position on the container 120.

[0044] The mechanism for moving the handle to the position 118' as shown in Figure 3, will now be described with reference to Figures 4 to 7. The object 130, shown in these Figures, is one of two inserts comprising the mechanism, each insert being the mirror reverse of the other so that the corresponding opposing surfaces of the second insert (not shown) matches and is brought into close contact with the outer surfaces (indicated by shading in Figure 4 to 7) of the illustrated insert.

[0045] These halves of the mechanism are inserted into each respective half 140 of the blow moulding die (as shown in Figure 8) with the outer surfaces flush with the facing surfaces the two die halves. The inserts are so placed that the channel 132 is coincident with the handle portion 114 of the preform 100 when this is placed in the blow-moulding die in preparation for the stretch blow-moulding phase. Although the following description is with reference to just one of these inserts of the mechanism of the invention, it will be understood that the two inserts operate in concert during the mould cycle.

[0046] It can be seen that the channel 132 into which the handle portion 114 of the preform 100 is nested, is comprised of a fixed section 132A machined into the main insert block 134 and a pivoting section 132B formed in a pivoting block

136. The bifurcated portions at the first and second junction points 116 and 118 respectively are captured in the corresponding bifurcated sections 138 and 140 at the respective outer ends of fixed section 132A and the pivoting section 132B of the channel 132.

[0047] Lying immediately below the pivoting block 136, is a forming block 142, nested in a recess 144 of the main insert block 134. Forming block 142 is guided in the direction normal to the upper surfaces (shaded surfaces) of the main insert block 134 and pivoting block 136. Once the pivoting block 136 has sufficiently rotated towards its position shown in Figures 5 and 7, the forming block 142 can be driven from its nested retracted position shown in Figure 4 into a position where its upper surface 146 is then flush with the upper surfaces of the main insert and pivoting blocks, as shown in Figure 5. The forming block 142 provide a side surface 143 to complete the contour surface of the container forming cavity of that half of the stretch blow moulding die.

[0048] At the commencement of the stretch blow-moulding cycle, the preform 100 is mechanically stretched axially. Some air is also introduced into the preform at this stage. Simultaneously, the pivot block 136 begins its rotation from the initial position shown in Figure 4 and 5 towards its end of cycle position shown in Figures 5 and 7, drawing the

softened preheated material of the preform around the second junction point along with the captured handle junction point.

[0049] As soon as the pivot block 136 reaches a predetermined point nearing the end of its rotation, as detected by a sensor (not shown), the forming block 142 is driven into the position shown in Figure 5 and the main air injection for the blow moulding takes place to form the container 120 shown in Figures 3 and 8.

[0050] Pivoting block 136 is operated by a linkage 148 and a linear actuator such as a pneumatic cylinder 150 shown in Figures 6 and 7. As well, pivoting block 136 may be urged and locked into its final blow-moulding position shown in Figures 5 and 7 by the sloping shoulder 152 of the out-stroking forming block 142.

[0051] It can be seen from the disposition and shape of the handle portion 114 as injection moulded and shown in position in the channel 132 in Figure 6, and its subsequent disposition and shape 114' as shown in Figure 7, that considerable movement has occurred of the handle portion 114, as well as the region 119 between the handle portion first and second junction points 116 and 118'. Movement is apparent, adjacent to both the thickened and bifurcated ends of the handle portion, as well as of the central strap section. This

movement ensures biaxial orientation of the polymer and provides great strength to the handle, which is integrally attached to the blown container 120 as it was to the preform 100.

[0052] It will thus be apparent that, apart from the neck portion 112 and a small section of the preform just below the location ring 113 of the neck portion, all of the preform 100 is subjected to extensive movement of the polymer material, including the area between the first and second junction points of the handle portion, which now also becomes biaxially oriented. This area was subject to virtually no movement and little or no biaxial orientation in the container of the prior art as disclosed by the applicant in earlier patents. Thus this area was one of relative weakness.

[0053] The biaxial orientation which is inherent in the handle movement provided by the mechanism of the invention, provides a handle which is not only aesthetically pleasing and very strong, but also provides a very significant material saving over the non-biaxially oriented handle of the prior art.

[0054] The above describes only some embodiments of the present invention and modifications, obvious to those skilled

in the art, can be made thereto without departing from the scope of the present invention.

CLAIMS

1. An in-mould, handle movement mechanism for repositioning a lower portion of a handle of a stretch blow-moulded container from its initial, as injected moulded location on a body of an injection moulded preform, to a desired integrally attached position on said stretch blow-moulded container; characterized in that said mechanism comprises an insert portion located in each half of a stretch blow-moulding die; each said insert portion including a first fixed section provided with a channel for location of an upper portion of said handle and a second pivoting section adapted to nest a lower portion of said handle; said second pivoting section rotating said lower portion into said desired integrally attached position; said mechanism further including a forming block moveable between a retracted position and an extended position at which an outer surface of said forming block completes a contour surface of a container forming cavity of said stretch blow-moulding die.
2. The mechanism of claim 1 wherein said mechanism comprises two mirror reversed said insert portions, each insert portion inserted into one half of a stretch blow-moulding die.
3. The mechanism of claims 1 or 2 wherein said handle portion of said injection moulded preform comprises

a central section having a generally flattened elliptical cross section and thickened sections adjacent each first and second junction point of said handle portion with a tubular body portion of said preform.

4. The mechanism of claim 3 wherein said thickened sections are bifurcated sections of said handle portion.
5. The mechanism of claim 4 wherein outer ends of each of said first fixed section and said second pivoting section are formed as bifurcated channels; said thickened bifurcated sections of said handle portion adapted to nest in said bifurcated channels.
6. The mechanism of any one of claims 2 to 5 wherein said second pivoting section is rotated between a first initial position conforming to said handle as injection moulded with said preform, and a second position; rotation of said second pivoting section effected by a linkage connection to a linear actuator.
7. The mechanism of claim 6 wherein rotation of said pivoting block is monitored by a sensor.
8. The mechanism of any one of claims 2 to 7 wherein an outer surface of said forming block is flush with outer surfaces of said first fixed section of said insert portion and of said pivoting block.

9. The mechanism of any one of claims 2 to 8 wherein said pivoting section commences rotation from said initial position as axial stretching of said preform occurs in said stretch blow-moulding die; said second junction point moving from its initial preform position towards its position on said container.
10. The mechanism of claim 9 wherein said channel is formed so that substantially all sections of said handle portion experience movement as said pivoting section rotates from said first initial position towards said position on said container; said movement inducing biaxial orientation of polymer material forming said handle portion.
11. A method of moving a handle portion from a disposition relative an injection moulded preform to a desired disposition relative to a container; said container stretch blow-moulded from said preform; said steps including:
 - (a) inserting one half of a handle moving mechanism into each half of a stretch blow-moulding die,
 - (b) inserting a pre-heated injection moulded preform comprising a tubular body portion and handle portion into said stretch blow-moulding die such that said handle portion is nested in channels provided in each half of said mechanism when said die is closed for a mould cycle,

(c) stretching said preform axially while rotating a pivot block in each said mechanism from an initial position conforming to said injection moulded handle portion, to move a junction point of said handle portion with said preform, to a junction point of said handle portion and said container,

(d) extending a forming block from a retracted position at which an outer surface of said forming block completes a contour surface of a container forming cavity of said stretch blow-moulding die.

12. The method of claim 11 wherein said movement of said handle portion junction point from said initial position to said junction point of said handle portion on said container cause biaxial orientation of polymer material of said handle portion.
13. The container of claim 12 wherein polymer material of said tubular body portion and said handle are subjected to movement during said stretch blow-moulding cycle such that substantially all of said container body and said handle are biaxially oriented.
14. The container of claim 12 or 13 wherein said handle portion comprises a strap portion having a generally flattened elliptical section; said strap portion extending substantially the length of said handle portion.

15. The container of claim 14 wherein said strap portion extends between thickened portions adjacent each of said first and second junction points.
16. The container of claim 15 wherein said thickened portions are bifurcated such that each junction point comprises two areas of connection between said container and said handle.