CLAIMS

1. A non-incremental, continuously rotating, stretch-blow-moulding machine fed with non-symmetric injection moulded preforms with integral handles and producing stretch-blow-moulding of containers with integral handles from the non-symmetric injection moulded preforms with integral handles; the body portion of the preform and the integral handle constituted from the same material; the machine including a preform orientation system to orient the handle of the preform into a known orientation at arrival at a pick off position; orientation of the handles controlled during transfer of the preforms by a transfer system from the pick off position to a preheating stage of the machine; manipulation of the preforms respectively concurrently aligning axes of the body portions of the preforms with axes of preform supporting mandrels of the preheating stage and aligning the handles of the preforms for controlled preheating of the preforms while the preheating stage is in continuous rotation.

2. The machine of claim 1 wherein preforms are in continuous motion from an initial preform pick off point through stretch-blow-moulding into the containers and ejection from the machine as stretch-blow-moulded containers.

3. The machine of claim 1 wherein the integral handle retains a shape of the handle as injection moulded through all stages of the stretch-blow-moulding machine to forming a handle on the stretch-blow-moulded container.

4. The machine of claim 3 wherein the stages of the stretch-blow-moulding machine include a handle orientation stage; all preforms arriving at the pick off position having the integral handle oriented in a predetermined direction relative to motion of the preform approaching the pick off position.

5. The machine of claim 3 wherein the stages of the stretch-blow-moulding machine include a continuously rotating first transfer system transferring preforms from a continuously rotating preform feeder wheel at the preform pick off position to a transfer to preheating position at a continuously rotating preheating stage.

6. The machine of claim 5 wherein a first pick and place apparatus of the first transfer system includes a preform grasping gripper; reciprocating rotation and linear displacement of the grasping gripper induced by a combination of a rotating carrier of the pick and place apparatus and two cam loci.

7. The machine of claim 6 wherein the rotating carrier is an arm of four radially extending support arms rotating about a common centre of rotation; an outer end of each support arm rotationally supporting a pick and place apparatus.

8. The machine of claim 7 wherein the support arms rotate above a fixed cam plate; the cam plate provided with an inboard cam channel for a first locus of the two cam loci and a periphery of the cam plate providing an outer cam surface for a second locus of the two cam loci.

9. The machine of claim 7 wherein a housing of a linear guide of the pick and place apparatus is rotationally mounted at the outer end of the supporting arm; an outrigger arm extending from the housing provided with a first cam follower locating in the cam channel.

10. The machine of claim 9 wherein a free sliding element of the linear guide is provided with a second cam follower; the second cam follower maintained in contact with the outer cam surface by a spring.

11. A method of controllably heating a pre-form to a die introduction temperature in a non-incrementing, continuously rotating stretch-blow-moulding machine; the pre-form having a neck portion extending from a body portion; said pre-form further having an integral handle portion extending radially from the body portion; said method comprising;

- controllably transferring an integral handle PET pre-form onto a continuously moving conveyor of a preheating stage;
- securing the preform by its neck portion to the conveyor whereby the preform is transported by the conveyor at substantially constant velocity along a reheating path from a pre-form entry location to a pre-form exit location;

- at least portions of the pre-form controllably heated to the die introduction temperature by the time it reaches the pre-form exit location;
- a controllable heater array distributed along the path arranged to direct heat to selected portions of the pre-form;
- the pre-form controllably transferred from the preform exit location into a die for stretch blow moulding of the pre-form thereby to form a blown container, and wherein, at entry into each of preheating stage and the stretch-blow-moulding stage the preform is oriented to control the alignment of the integral handle for controllably heating the portions of the preform and for alignment of the handle with the halves of the stretch-blow-moulding die.

12. The method of claim 11 wherein the handle portion is solid and has a first end and a second end; the first end integrally connected at a first, upper location to the pre-form; the second end integrally connected at a second, lower location to the pre-form.

13. The method of claim 12 wherein the first, upper location is located on the body portion.

14. The method of claim 12 wherein the first, upper location is located on the neck portion.

15. The method of claim 12 wherein the second, lower location is located on the body portion.

16. The method of claim 11 wherein elements are arranged in modules; the modules arrayed around a continuously rotating preform conveyer; the elements controlled as a group based on height wherein the top most elements of the modules are controlled to a predetermined temperature together whilst the next down in height elements are also controlled together to a predetermined temperature – and so on down to elements at the lowest level.

17. The method of claim 11 wherein a processor controls speed of rotation of a motor in order to control the continuous speed of advancement of the preforms.

18. The method of claim 11 wherein a temperature sensor provides environment temperature sensing which is utilised by processor to modulate the degree of heating of all elements by a difference factor delta (Δ).

19. A method of reducing material required to form a container stretch-blow-moulded from a preform in the stretch-blow-moulding machine of claim 1; the preform comprising a neck portion, a collar below the neck portion and a generally cylindrical body below the neck portion; the preform further including a handle extending from a first junction position below the collar to a second junction position along the body of the preform; the method including the steps of:

- Forming the body of the preform in at least two portions of different configuration; a first cylindrical portion and a second conical portion;
- Reducing a base diameter of the conical portion relative to a diameter of the first cylindrical portion.

20. The method of claim 19 wherein wall thickness of the second portion varies from a minimum thickness proximate the base diameter of the conical portion to a maximum thickness proximate a tangent line between the second conical portion and a bottom portion of the preform.

21. A continuously rotating, non-symmetric preform feed, stretch-blow-moulding machine dedicated to the stretch-blow-moulding of containers from non-symmetric injection-moulded preforms; the non-symmetrical preforms including an integral handle; the body of the preform and the integral handle constituted from the same material; the machine including a preform orientation system to orient the handle of the preform into a known orientation at arrival at a continuously rotating preheating stage.

22. The machine of claim 21 wherein preform supporting mandrels of a conveyor of the continuously rotating preheating transport system are provided with heat shields; the shields protecting the handle from excessive heat absorption.

23. The machine of claim 22 wherein a pick and place apparatus of a first transfer system brings a vertical axis of the perform into alignment with a vertical axis of a cylindrical collar of a preform supporting mandrel at the transfer to preheating stage; the gripper of the pick and place apparatus concurrently manoeuvring the handle of the preform between side elements of a channel of the heat shield.

24. The machine of claim 23 wherein a preheated preform is extracted from the supporting mandrel by a pick and place apparatus of a second transfer system at a transfer from the preheating stage to a stretch-blow-moulding stage; the transfer from the supporting mandrel position lying on a line joining respective centres of rotation of a proximate rotating guide wheel of the preheating transport system and the second transfer system.

25. The machine of claim 24 wherein a combination of rotation of an arm of the second transfer system and rotation and linear displacement of a gripper of the second transfer system induced by loci of a first and second cam follower of the pick and place apparatus, brings a vertical axis of the preform into alignment with a vertical axis of a stretch-blow-moulding die as both the pick and place apparatus and an opened stretch-blow-moulding die approach a die loading position; movements of the gripper concurrently bringing the handle of the preform into alignment with a line joining respective centres of rotation of the stretch-blow-moulding die and the second transfer system.