

SPECIFICATION

Improvements in and relating to the manufacture of packaging containers

5 The present invention relates to the manufacture of a packaging container from plastics material. The container may consist of an inner container body of plastics material and an outer rigid casing of a material of only slight extensibility.

10 It has long been a desirable object to replace glass bottles by lighter and cheaper containers of plastics material, and this has been attempted on a large scale. One of the problems, especially in the packaging of pressurized liquids, e.g. beer and refreshing beverages, is that the packaging material should be so gas-tight that gas, such as carbon dioxide dissolved in the liquid, e.g. the beer, cannot diffuse out through the package wall, or for it to be possible for atmospheric oxygen to diffuse in through the package wall, since oxygen gas generally has an oxidising effect, and causes a deterioration of the flavour e.g. of beer. A further demand on a container for pressurized liquids is that the container should be able to absorb any stresses originating from the contents while at the same time the plastics wall of the containers should be thin so as to allow the container to be light and cheap.

To solve this problem a thin plastics container has been formed of a cylindrical shell part and two conical or dished end portions, manufactured from a thin plastics material and the cylindrical shell part is surrounded by a relatively rigid pressure-absorbing casing e.g. of paper which extends beyond one of the end parts, while the other end part projects from the casing and is provided with an emptying opening. These containers have been manufactured from a relatively gas-tight packaging substance such as acrylonitrile material which is marketed under the trade name BAREX, (Registered Trade Mark) and the inner body has been manufactured from two separate deep-drawn parts which are welded together along a joint flange. It is also known that bottle-shaped packages can be blow moulded from a seamless tube which is first extruded and enclosed in a moulding cavity wherein the extruded plastics tube is then blown out to make contact with the inside of the moulding cavity.

The abovementioned methods for the manufacture of containers of plastics material for pressurized contents have proved relatively expensive and slow, so that the method, and a container produced thereby in accordance with this invention in certain cases are to be preferred.

55 The invention consists in a blank for a packaging container comprising a length of plastics tubing closed at one end by an affixed rigid closure member, and its other end having an annular ferrule affixed to the tube edge, the material of which the tube is formed being of such selected characteristics that the tube can be moulded and stretched under heat and pressure to a prearranged shape of increased internal volume.

The invention further consists in a method for the manufacture of a packaging container from plastics

material characterized in that a seamless tube blank of the said plastics material with a wall thickness which is greater than the wall thickness of the final container is manufactured; that one end of the said tube blank is provided with an end wall covering the tube end, the edge region of which end wall is joined to the edge region of the said tube end; that the other end of the said tube blank is provided with an annular edge ferrule which is joined to the edge region of the other tube end; and that the tube blank is heated to softening and is expanded in a moulding space by means of a pressure gas through the tube end provided with the edge ferrule in such a manner, that the outside of the expanded tube blank wall will make contact with the inside of the moulding space. The container body formed through expansion of the tube blank may comprise a middle, preferably cylindrical, portion and two dished end parts located one at each end of the said cylindrical portion, which end parts terminate in an end wall and in an edge ferrule respectively, the said cylindrical part being surrounded by a pressure-absorbing outer casing which extends beyond the end part provided with end wall.

90 An embodiment of the invention will now be described with reference to the accompanying schematic drawing, wherein in accordance with the invention,

Figure 2 shows a tubular blank for the manufacture of the inner plastics part of the container,

Figure 3 shows an enlarged section of the upper and lower parts respectively of the said tube blank, and

Figure 4 shows an enlarged section of the upper and lower parts respectively of the plastics container body manufactured from the tube blank to form a container in accordance with the invention.

The packaging container 2 shown in Figure 1 consists of an inner body 3 of plastics material comprising a middle cylindrical shell part which is joined at each end to a substantially dished end part 5 or 6. The said dished end parts 5, 6 comprise openings 7, 9, the opening 9 being closed permanently by an end plate 10 which may be, and preferably is, made of metal but alternatively may be of a plastics material which is inherently more stable and has a higher melting point than the material of the container body 3. The end plate 10 is fixed to the end part 6 of the container body 3 along the edge region of the opening 9, the edge region of the end wall 10 being joined by means of folding to the edge region of the end part 6.

The opening 7 of the end part 5 has along its edge region an edge ferrule 8 which preferably is made of the same material as the end plate 10 and which is joined to the edge region of the opening 7 by folding in such a manner that the edge ferrule will form the emptying opening 7 of the container part 3.

The container body 3 of plastics material is surrounded by an outer casing 18, preferably made of a non-extensible material, e.g. paper, which surrounds the cylindrical portion 4 of the container 3 in a tight fit and accommodates within it the end part 6, while the end part 5 which comprises the emptying

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opening 7 projects from the casing 18. The container body 3 comprises a "step" 12 where the container body 3 is provided with a sudden widening, which means that the cylindrical part 4 has an outside diameter which is smaller than the diameter of the adjoining part of the outer end part 5. The said "step" 12 forms an edge against which the top cut edge is protectively covered by the projecting edge formed by the step 12 and that the said projecting edge helps to fix the position of the casing 18. The projecting edge formed by the step 12 preferably is of the same width as the thickness of the casing 18. The casing 18 which is most frequently made of paper, cardboard or some other liquid-absorbing material, preferably is provided with an outer plastics coating which protects it against liquid absorption, and with an edge roll 11 at the bottom which is intended to prevent the casing from making direct contact with liquid if the container 2 is placed on a moist base. The casing 18, whose purpose it is to absorb stresses originating from the contents, also acts as a supporting surface for the container.

In the manufacture of the packaging container in accordance with the invention as shown in Figure 1, in the first place a tube blank (Figure 2) is made. The said tube blank is preferably produced by extrusion, and if it is desired to manufacture the container body of the container from a laminate comprising a number of layers of different plastics materials, the tube blank shown in Figure 2 can be produced by means of co-extrusion, that is to say, simultaneous extrusion of several plastics materials, so that the tube blank will comprise concentric layers of plastics materials. The extruded tube blank 1 has a thickness which exceeds the thickness of the container body of the finished container, and, as can be seen from Figure 2, may be made considerably shorter than the container body so as to be stretched subsequently to obtain molecular orientation, which substantially improves the mechanical properties and strength characteristics in the direction of orientation of the material. It is alternatively possible, however, in the manufacture of the container to start from the tube blanks which have been stretched and orientated in conjunction with the extrusion and which then have a length which coincides with the height or the length of the container body 3. Irrespectively of whether the tube blank 1 has been stretched in conjunction with the extrusion process or in a separate operation after the extrusion, the tube blank is provided on the one hand with an end plate 10 which closes one end of the tube blank, and an edge ferrule which embraces and covers in a protective manner the corresponding open end of the tube blank 1.

In Figure 3a an enlargement of the upper part of the tube blank illustrated in Figure 2, is shown in section, and, as can be seen from Figure 3a, the packaging material in the case here described consists of three layers of material namely an inner layer consisting of polyvinyl alcohol, or ethylvinyl alcohol of the type which is marketed under the trade name EVAL. This inner layer 14, which have very favourable gas barrier properties, is covered on each side by other plastics material, since it has been found

that the gas barrier properties of the said material drastically deteriorate if the material comes into contact with water or with a moist medium. To protect the inner layer 14 from coming into contact with water or moisture it is surrounded therefore on each face by plastics layers 15, 16 which may consist of polypropylene, polyvinyl chloride, polyester or similar material. The abovementioned materials cannot be laminated directly with polyvinyl alcohol or EVAL, but special binder layers are introduced between the plastics layers which ensure adhesion with the inner layer 14 as well as with the outer layers 15 and 16. In the case here described the said binder layers may be used if desired, but, since this makes the material more expensive, it may be dispensed with in the present case, since the material layers in the tube blank 1 are effectively held together by means of the end plate 10 and the edge ferrule 8, so that it is not absolutely essential for the layers 14, 15 and 16 to be adhering to each other. In Figure 3a is shown how the edge ferrule 8 is bent over the upper end edge region of the tube blank 1 and is anchored in the plastics material by folding, the folding edges 17 being pressed into the plastics material. The edge ferrule 8 comprises moreover an arrangement 18 for the fixing of a cap over the emptying opening 7 of the container 2. The arrangement 18 for the application of the cap may alternatively be in the form of a screw thread, which fits a corresponding screw thread provided in the cap.

In Figure 3b representing the corresponding opposite end of the tube blank 1 is shown the bottom opening of the tube blank 1 completely covered by an end plate 10 which together with the bottom part of the tube blank has been folded by means of the end plate 10 having been provided with a U-shaped groove which accommodates the bottom part of the tube blank 1. When the end plate 10 and the bottom part of the tube blank 1 are folded together the end plate 10 is anchored in the plastics material of the tube blank by anchoring elements 17.

The manufacture of the container body 3 of the container 2 starts with the tube blank 1 provided with the edge ferrule 8 and end plate 10 shown in Figure 2 which is first stretched so that its length corresponds to the desired length of the container body 3 at the same time as the plastics material is molecular-orientated so as to obtain improved mechanical properties. As mentioned earlier, the orientation process may alternatively be carried out in the course of extrusion, and in this case the end plate 10 and the edge ferrule 8 are applied to the already molecular-orientated tube blank 1.

The so-prepared tube blank 1 is heated to such an extent that the plastics material softens and can be subjected to a moulding process. When the tube blank 1 has been heated to the required extent it is enclosed in a mould (not shown) consisting of two or more parts which together represent a moulding cavity, the inner contour of which corresponds to the outer contour of the desired container body 3. The heated tube blank 1 introduced into the cavity so formed is fixed at its ends and a pressure gas is fed through the opening 7, whereupon the walls of the tube blank expand and are extended with simul-

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taneous reduction in thickness. The expansion of the tube blank is continued until the container body 3 formed from the tube blank has been forced into complete contact with the inner surface of the moulding cavity, whereupon the mould portions forming the said moulding cavity are separated again and the container body 3 formed is allowed to stabilize through cooling. It is possible to enhance the moulding action in that not only pressure gas, preferable compressed air, is fed through the opening 7 of the tube blank, but by connecting in addition the walls of the moulding cavity of a vacuum source in order to improve the contact of the plastics material with the walls of the moulding cavity.

The container body 3 obtained by blow moulding is then combined with an outer casing 18 produced in a separate manufacturing operation, which may be made for example by winding a paper material around a mandrel, the overlapping layers of paper being bonded, e.g. glued to one another by means of a suitable adhesive.

By the method in accordance with the invention the normal mould blowing process for the manufacture of packaging containers is made substantially more effective and less costly, especially in that the actual moulding operation is separated from the manufacture of the tube blank which may be defined as a semi-finished product from which the finished container body is made. It is possible, therefore, to manufacture tube blanks with their edge ferrules and base plates separately from the container moulding, and this also means that at the place where the container moulding is to take place no extruders for the manufacture of the tube blanks are required and since such extruders on the one hand are expensive and on the other hand require skilled operators for their handling, it is very advantageous to separate the blank production from the container production. Moreover, it has been found to be very important to have full freedom in the design of the edge ferrule 8, since the packaging container can then readily be adapted to different types of closing caps.

CLAIMS

1. A blank for a packaging container comprising a length of plastics tubing closed at one end by an affixed rigid closure member, and its other end having an annular ferrule affixed to the tube edge, the material of which the tube is formed being of such selected characteristics that the tube can be moulded and stretched under heat and pressure to a prearranged shape of increased internal volume.

2. A blank as claimed in Claim 1 wherein the plastics tubing is extruded, seamless tubing.

3. A blank as claimed in Claim 1 or 2 wherein said end closure member is a rigid cover plate attached to the edge of the tubing.

4. A blank as claimed in Claim 1, 2 or 3 wherein the end closure member is of metal.

5. A blank as claimed in Claim 3 or 4 wherein the end closure plate is attached to the tube by turned-over clamping edges.

6. A blank as claimed in any preceding claim wherein said annular ferrule is of channel

cross-section fitted on, and clamped to, the edge of the tube.

7. A blank as claimed in any preceding claim wherein said annular ferrule is of metal.

8. A blank as claimed in any preceding claim wherein the plastics tube is stretched longitudinally to effect molecular orientation of the plastics material.

9. A container body formed by locating in a mould a blank as claimed in any preceding claim, softened by heat, and extending the blank to the internal shape of the mould by fluid pressure.

10. A container comprising a container body as claimed in Claim 9 fitted into an outer stiffening sleeve which extends beyond the closed end of the body.

11. A method for the manufacture of a packaging container from plastics material, characterized in that a seamless tube blank of the said plastics material with a wall thickness which is greater than the wall thickness of the final container is formed, one end of the said tube blank is provided with an end wall, covering the tube end, the edge region of which end wall is joined to the edge region of the said tube end, the other end of the said tube blank is provided with an annular edge ferrule which is joined to the edge region of the other tube end, and the tube blank is heated to softening, and is expanded in a moulding space by means of a pressure gas fed through the tube end provided with the edge ferrule in such a manner that the outside of the expanded tube blank will make contact with the inside of the moulding space.

12. A method in accordance with Claim 11, characterized in that the said container is partly surrounded by outer casing of a rigid, only slightly extensible material, e.g. paper, the end of the moulded tube blank which comprises the said end closure wall being located inside the said casing, while the part of the moulded tube blank which comprises the said annular edge ferrule projects from the casing.

13. A method in accordance with Claim 11 or 12 characterized in that the said end wall and the said edge ferrule are made of a material which is relatively inherently stable compared with the plastic material, e.g. metal, and that the said end wall and edge ferrule are fixed to the end edge regions of the tube blank by folding.

14. A method in accordance with Claim 11, 12 or 13 characterized in that the said tube blank is orientated in its longitudinal direction.

15. A method in accordance with Claim 14, characterized in that the orientation of the tube blank is achieved in that a tube which is shorter than the nominal length of the tube blank intended for the moulding is extruded, whereupon the said extruded tube is stretched so that the desired length orientation is obtained and is provided with end wall and neck ferrule.

16. A method in accordance with any of Claims 11-15, characterized in that the tube blank is manufactured by co-extrusion of several different plastics materials.

17. A packaging container manufactured in



aneous reduction in thickness. The expansion of the tube blank is continued until the container body 3 formed from the tube blank has been forced into complete contact with the inner surface of the moulding cavity, whereupon the mould portions forming the said moulding cavity are separated again and the container body 3 formed is allowed to stabilize through cooling. It is possible to enhance the moulding action in that not only pressure gas, preferable compressed air, is fed through the opening 7 of the tube blank, but by connecting in addition the walls of the moulding cavity of a vacuum source in order to improve the contact of the plastics material with the walls of the moulding cavity.

The container body 3 obtained by blow moulding is then combined with an outer casing 18 produced in a separate manufacturing operation, which may be made for example by winding a paper material around a mandrel, the overlapping layers of paper being bonded, e.g. glued to one another by means of a suitable adhesive.

By the method in accordance with the invention the normal mould blowing process for the manufacture of packaging containers is made substantially more effective and less costly, especially in that the actual moulding operation is separated from the manufacture of the tube blank which may be defined as a semi-finished product from which the finished container body is made. It is possible, therefore, to manufacture tube blanks with their edge ferrules and base plates separately from the container moulding, and this also means that at the place where the container moulding is to take place no extruders for the manufacture of the tube blanks are required and since such extruders on the one hand are expensive and on the other hand require skilled operators for their handling, it is very advantageous to separate the blank production from the container production. Moreover, it has been found to be very important to have full freedom in the design of the edge ferrule 8, since the packaging container can then readily be adapted to different types of closing caps.

CLAIMS

1. A blank for a packaging container comprising a length of plastics tubing closed at one end by an affixed rigid closure member, and its other end having an annular ferrule affixed to the tube edge, the material of which the tube is formed being of such selected characteristics that the tube can be moulded and stretched under heat and pressure to a prearranged shape of increased internal volume.

2. A blank as claimed in Claim 1 wherein the plastics tubing is extruded, seamless tubing.

3. A blank as claimed in Claim 1 or 2 wherein said end closure member is a rigid cover plate attached to the edge of the tubing.

4. A blank as claimed in Claim 1, 2 or 3 wherein the end closure member is of metal.

5. A blank as claimed in Claim 3 or 4 wherein the end closure plate is attached to the tube by turned-over clamping edges.

6. A blank as claimed in any preceding claim wherein said annular ferrule is of channel

cross-section fitted on, and clamped to, the edge of the tube.

7. A blank as claimed in any preceding claim wherein said annular ferrule is of metal.

8. A blank as claimed in any preceding claim wherein the plastics tube is stretched longitudinally to effect molecular orientation of the plastics material.

9. A container body formed by locating in a mould a blank as claimed in any preceding claim, softened by heat, and extending the blank to the internal shape of the mould by fluid pressure.

10. A container comprising a container body as claimed in Claim 9 fitted into an outer stiffening sleeve which extends beyond the closed end of the body.

11. A method for the manufacture of a packaging container from plastics material, characterized in that a seamless tube blank of the said plastics material with a wall thickness which is greater than the wall thickness of the final container is formed, one end of the said tube blank is provided with an end wall, covering the tube end, the edge region of which end wall is joined to the edge region of the said tube end, the other end of the said tube blank is provided with an annular edge ferrule which is joined to the edge region of the other tube end, and the tube blank is heated to softening, and is expanded in a moulding space by means of a pressure gas fed through the tube end provided with the edge ferrule in such a manner that the outside of the expanded tube blank will make contact with the inside of the moulding space.

12. A method in accordance with Claim 11, characterized in that the said container is partly surrounded by outer casing of a rigid, only slightly extensible material, e.g. paper, the end of the moulded tube blank which comprises the said end closure wall being located inside the said casing, while the part of the moulded tube blank which comprises the said annular edge ferrule projects from the casing.

13. A method in accordance with Claim 11 or 12 characterized in that the said end wall and the said edge ferrule are made of a material which is relatively inherently stable compared with the plastic material, e.g. metal, and that the said end wall and edge ferrule are fixed to the end edge regions of the tube blank by folding.

14. A method in accordance with Claim 11, 12 or 13 characterized in that the said tube blank is orientated in its longitudinal direction.

15. A method in accordance with Claim 14, characterized in that the orientation of the tube blank is achieved in that a tube which is shorter than the nominal length of the tube blank intended for the moulding is extruded, whereupon the said extruded tube is stretched so that the desired length orientation is obtained and is provided with end wall and neck ferrule.

16. A method in accordance with any of Claims 11-15, characterized in that the tube blank is manufactured by co-extrusion of several different plastics materials.

17. A packaging container manufactured in

accordance with the method specified in any of Claims 11-16 characterized in that the container formed by expansion of the tube blank comprises a middle preferably cylindrical portion and two dished

- 5 end part located one at each end of the said cylindrical portion, which end parts terminate in an end wall and in an edge ferrule respectively, the said cylindrical part being surrounded by a pressure-absorbing outer casing which extends beyond the
- 10 end part which carries the end wall.

18. A container in accordance with Claim 17, characterized in that the container body is orientated in its longitudinal direction and comprises several different plastics materials.

- 15 19. A container in accordance with Claim 17 or 18 characterized in that the said end wall consists of a metal plate provided with a U-shaped edge groove, which metal plate by means of the said edge groove is permanently joined to the container body.

- 20 20. A container in accordance with Claim 17, 18 or 19 characterized in that the said edge ferrule consists of an annular metal part which comprises a U-shaped edge groove, and the said annular part is joined to the container body by folding.

- 25 21. A container in accordance with any of Claims 17-20 characterized in that the transition between the cylindrical part of the container body and the end part which comprises the said neck edge ferrule consists of a steplike portion which is arranged so
- 30 that the end edge of the outer casing which surrounds the cylindrical portion of the container body rests against and is protected by the projecting edge of the container body formed by the said steplike portion.

- 35 22. A container in accordance with any of Claims 17-21, characterized in that the container body consists of a laminate with an inner layer of polyvinyl alcohol or ethylvinyl alcohol, which inner layer is surrounded on each face by one or more plastics
- 40 layers comprising one of several of the materials polypropylene, polyvinyl chloride or polyester.

23. A container in accordance with any of Claims 17-22, characterized in that the said edge ferrule forms the emptying opening of the container and is
- 45 arranged so as to constitute a part of the attachment of a cap which can be placed over the opening of the container.

24. A container in accordance with any of Claims 17-23 characterized in that the edge ferrule is
- 50 provided with a screw thread to engage with a cap provided with a corresponding screw thread.

25. A blank for a container substantially as described herein with reference to the accompanying drawings.

- 55 26. A packaging container substantially as described herein with reference to the accompanying drawings.

27. A method of producing a packaging container substantially as described herein with reference to
- 60 the accompanying drawings.

