Title: INJECTION MOULDING DEVICE AND METHOD

Abstract: An injection moulding device comprises an internal tool (2) and a partible external tool (3) which is transformable from an open state to a closed state and vice versa. The tools are capable of fastening an edge of a sleeve (6), of a packaging material, between them when the external tool (3) is closed, in order to injection mould a plastic part onto said sleeve (6) between said internal tool (2) and said external tool (3). At least one gripping portion (4) of the inside of the external tool (3) is reciprocatingly slidable from a first position to a second position. The gripping portion (4) is in the first position arranged to effect a circumferential enclosure of the sleeve (6), leaving a radial clearance (8) around the sleeve (6), and in the second position arranged to effect an essentially complete enclosure of the sleeve (6), eliminating said clearance (8).
INJECTION MOULDING DEVICE AND METHOD

Technical Field of the Invention

The present invention relates to an injection moulding device for use when manufacturing packaging containers and parts thereof.

Background Art

A variety of different packaging solutions are currently used for different types of liquids. The packages, or containers, can be made of e.g. aluminium, plastic or laminated paper. Different packaging materials and different container designs could be appropriate for different types of liquids.

The choice of packaging material is also based on the container design. One type of container which is particularly suitable for non-carbonated beverages consists of a sleeve, a bottom and a top, where the different parts are not necessarily made of the same material. For instance, the sleeve and the bottom can be integrally manufactured of laminated paper and the top be injection moulded in plastic. Such a container is disclosed in EP-B1-0 960 014 and WO 98/32666. A similar design is disclosed in EP-A1-0 862 980. Such a container can be used for beverages that are meant to be drunk directly from the container. Today these container are, due to manufacturing limitations, formed with a top which is almost flat, rising only about 15 mm from the sleeve. In the top there is an opening which, for instance, is covered by a screw cap. To make it comfortable for the consumer to drink directly from such a container, it would be preferable to have a frusto-conical tapering in cross-section towards the container opening. This would make the container bottle-like and easy to drink from.

In packaging solutions where a plastic top is injection moulded onto a sleeve of packaging material such as laminated paper, the edge of the sleeve, onto
which the plastic top is moulded, is first clamped between an external partible tool and an internal tool. The plastic top is then injection moulded between the external and the internal tool. The overlap between the injection moulded plastic top and the sleeve is about 2-3 mm. The fit between the sleeve and the external and internal tool, respectively, must be very tight to be able to withstand and seal against the high pressure (about 1000 bar) exerted during injection moulding. Otherwise, undesirable plastic leaks might develop, compromising the quality of the container. For adequate centring of the internal tool, it is also desirable that the external tool be pressed tightly against the internal tool through the sleeve.

A problem which might occur during the clamping of the edge of the sleeve between the outer and inner tools, is that the edge of the sleeve is crinkled. This is due to the fact that, to achieve the required tight sealing and the proper centring of the internal tool, the outer partible tool parts are moved in a sliding motion very closely along the edge of the sleeve during their closing. The crinkles lead to a weakening of the container and to an unattractive finish. This problem is accentuated when trying to mould a higher top. In fact, when injection moulding a higher top, a higher pressure is exerted on the sleeve and the tools, and therefore it is necessary to hold the sleeve along a broader area in the axial direction. This leads to more frequent development of crinkles during the closing of the external tool, since the contact area is larger. Thus, more containers must be discarded leading to a non-cost-efficient procedure. Due to the above problems, there is a need for a new injection moulding device which allows tapering tops and which avoids the problem of crinkling the edge of the sleeve.
Summary of the Invention

The object of the present invention is to find a solution to the above problems. This and further objects are achieved by a device according to claim 1. Thus, an injection moulding device according to the invention comprises gripping portions which together with the partly closed external tool enclose the edge of the sleeve with a clearance between the edge of the sleeve and the enclosing parts. As the external tool is completely closed, the gripping portions are arranged to enclose, together with the external tool, the edge of the sleeve without any clearance between them. Thus, during the closing of the external tool, no crinkles can develop on the sleeve, since there is no sliding relative movement between the sleeve and the parts of the external tool in contact with the sleeve during closing. The movement occurs between the gripping portions and the external tool. It is then possible to press the external tool more tightly against the internal tool through the sleeve and thereby achieve improved centring of the internal tool and a tighter seal between the sleeve and the internal and external tools, respectively.

Further, said at least one gripping portion preferably comprises a wedge-shaped surface. This is a simple and efficient way of obtaining a clearance or a play between the edge of the sleeve and the external tool which disappears when the external tool is completely closed.

The injection moulding device preferably comprises at least one resilient element which is arranged to hold said at least one gripping portion in said first position when said external tool is open, and is arranged to allow said at least one gripping portion to slide into said second position when said external tool is closed. This ensures that the clearance or gap between the edge of the sleeve and the external tool does not vanish until the
external tool is completely closed against the biasing force of the resilient element.

Preferably, four of said gripping portions are arranged on the inside of said external tool. This easily and efficiently effects the enclosure of the edge of the sleeve when the gripping portions in the first position abut against each other in pairs and also results in a symmetrical load between the parts forming the mould.

The above mentioned advantages are also obtained by using a method according to the invention.

Brief Description of the Drawings

The invention will be described below with reference to the accompanying drawings, in which

Fig. 1 is a plan view of an injection moulding device according to the invention,

Fig. 2 is a perspective view of the device according to Fig. 1,

Fig. 3 is a detailed view of the gripping portions according to the invention in a first position, and

Fig. 4 is a detailed view of the same gripping portions in a second position.

Detailed Description of Preferred Embodiments of the Invention.

An injection moulding device 1 according to Fig. 1 has an internal tool 2 and an external tool 3 partible in two halves. The external tool has gripping portions 4 and resilient elements 5. A sleeve 6 of a packaging material such as laminated paper is also indicated in Fig. 1. The edge of the sleeve 6 is clamped between the internal tool 2 and the external tool 3 in Fig. 1. In Fig. 3, the gripping portions 4 are shown in a first position and in Fig. 4 in a second position.

The gripping portions 4 are mounted on the inside of the external tool 3 and extend an appropriate distance in a direction perpendicular to the plane of Fig. 1. The
gripping portions 4 are wedge-shaped and are capable of sliding into and partly out of recesses 7 in the external tool 3, in the direction of the double arrow A when the external tool is open.

In the first position shown in Fig. 3, the gripping portion 4 is not completely received in the recess 7, but a section thereof extends out of the recess 7 due to the resilient element 5 which is arranged in the recess 7 for biasing the gripping portion 4. The resilient element can e.g. be some sort of spring element. The wedge-shape of the gripping portions is such that in this first position a small gap 8 prevails, ensuring a play between the gripping portion and the edge of the sleeve 6. As mentioned above, the external tool 3 is not closed in this first position of the gripping portion 4.

In Fig. 4 the gripping portion 4 has a second position in which it is completely received in the recess 7 and which has been reached by closing the external tool 3 (of which only part of one half is shown) against the biasing force of the resilient element 5.

When injection moulding a plastic top onto a sleeve of a packaging material such as laminated paper, the external tool is initially open. The sleeve is slid onto the internal tool 2 and the external tool 3 is then closed around the internal tool 2, clamping the edge of the sleeve 6 to be joined with the top between the external and the internal tool, thereby also centring the internal tool. Then a plastic top is injection moulded onto the edge of the sleeve. The overlap between the plastic top and the sleeve is about 2-3 mm in the axial direction of the sleeve. The length of the sleeve edge which is clamped between the external and the internal tool is up to about 40 mm in the axial direction of the sleeve.

According to the invention, the closing of the external tool 3 is performed in two steps. First, the external tool 3 is partly closed to such an extent that
the extended gripping portions 4, which are in their first position, meet, whereby the edge of the sleeve 6 is enclosed by the gripping portions 4 and the rest of the external tool 3. The small clearance or gap 8 ensures that no crinkles can arise on the sleeve edge.

Subsequently, the external tool 3 is completely closed, whereby the gripping portions 4 slide into their second position and the gap 8 vanishes. During this second step, the only sliding relative movement occurs between the gripping portions 4 and the rest of the external tool 3, which does not create crinkles on the sleeve edge. As a result, the edge of the sleeve 6 is pressed between the external and internal tool with a sufficiently high pressure to centre the internal tool and to withstand the force exerted during the following injection moulding of the top.

Using the gripping portions 4 of the invention, it is possible to injection mould a higher top than was previously possible. For instance, the top may be about 20 mm high, allowing it to taper.

In the Figures, a solution involving four wedge-shaped gripping portions 4 is shown. Thus, in the above described first position, the gripping portions 4 go against each other in pairs to form the enclosure of the edge of the sleeve 6. It would also be possible to use a different number of gripping portions, as long as the above described gap 8 can exist during a first closing step and then disappear during a second.
CLAIMS

1. An injection moulding device comprising an internal tool (2) and a partible external tool (3) which is transformable from an open state to a closed state and vice versa, said tools being capable of fastening an edge of a sleeve (6), made of a packaging material, between them when the external tool (3) is closed, in order to injection mould a plastic part onto said sleeve (6) between said internal tool (2) and said external tool (3), characterized in that at least one gripping portion (4) of the inside of the external tool (3) is reciprocatingly slideable from a first position to a second position, in which said gripping portion (4) in the first position is arranged to effect a circumferential enclosure of the sleeve (6), leaving a radial clearance (8) around the sleeve (6), and in the second position is arranged to effect an essentially complete enclosure of the sleeve (6), eliminating said clearance (8).

2. An injection moulding device according to claim 1, wherein said at least one gripping portion (4) comprises a wedge-shaped surface.

3. An injection moulding device according to claim 1 or 2, further comprising at least one resilient element (5) which is arranged to hold said at least one gripping portion (4) in said first position when said external tool (3) is open.

4. An injection moulding device according to claim 3, wherein said at least one resilient element (5) is arranged to allow said at least one gripping portion (4) to slide into said second position when said external tool (3) is closed.

5. An injection moulding device according to any of the preceding claims, wherein four of said gripping portions (4) are arranged on the inside of said external tool (3).
6. An injection moulding method, comprising the steps of:
   closing a partible external tool (3) around an internal tool (2),
   clamping an edge of a sleeve (6) of a packaging material between the external tool (3) and the internal tool (2),
   forming by injection moulding a plastic part onto said sleeve (6),
   characterized in that the closing step includes the following substeps:
   partly closing the external tool (3) until at least one gripping portion (4), which is arranged, reciprocatingly slidably from a first position to a second position, at the inside of the external tool (3), is in this first position and effects a circumferential enclosure of the edge of the sleeve (6), leaving a radial clearance (8) around the sleeve (6), and closing the external tool (3), whereby said at least one gripping portion (4) slides into said second position and the external tool (3) essentially completely encloses the edge of the sleeve (6), whereby said radial clearance (8) essentially vanishes.

7. A method according to claim 6, wherein said at least one gripping portion (4) and the edge of the sleeve (6) are essentially circumferentially immovable in relation to each other during the second closing step.
**INTERNATIONAL SEARCH REPORT**

**International application No.**
PCT/SE 03/01606

A. CLASSIFICATION OF SUBJECT MATTER

**IPC7:** B29C 45/64, B29C 33/22, B29C 45/33

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

**IPC7:** B29C, B65D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE, DK, FI, NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**EPO-INTERNAL, WPI DATA, PAJ**

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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<td>US 6303066 B1 (PER GUSTAFSSON ET AL), 16 October 2001 (16.10.01), column 7, line 5 - line 11, figures 1-6B, claims 1-11, abstract</td>
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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Date of the actual completion of the international search: 9 December 2003

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