

MOULD FOR INJECTION MOULDING

The invention relates to a mould disposed for the injection moulding of cans or other objects made from thermoplastic material, and comprises two mutually reciprocally movable mould halves in an injection moulder, between them forming at least one mould cavity, for the production of one of the objects during a working cycle. The cavity is adapted to receive a film, foil or plane or planar piece of material, hereinafter called a "blank" for attaching to the object formed between the mould halves during each work cycle. One mould half is disposed to keep the blank located in the mould during a sequence in each work cycle, using vacuum created via at least one orifice in the mould half, this orifice opening out into the cavity and also being in communication with an vacuum source.

Such a mould is already known, e.g. from the British patent specification 1 456 036, which inter alia illustrates how a can may be provided with a label during injection moulding. It should be noted here how a label resting against the male half of the mould during insertion into the female half can be subjected to considerable asymmetrically acting frictional forces as the mould is closed, and must therefore be kept centred on the male half by considerable suction forces. This results in that a rather large portion of the blank surface needs to be exposed to one or more suction orifices. Such an orifice is usually formed as a slit, of which the width must be very small, so that the molten moulding composition does not penetrate into the slit and the ducts behind it. This requirement makes it difficult to provide the necessary, large suction area on the blank.

The object of the invention is accordingly to provide a mould where one half affords secure retention of a blank with the aid of suction, by exposing a

considerable suction orifice area to the blank without the risk of moulding composition penetrating into the orifice or orifices.

The desired result is obtained by the orifice mentioned being implemented as a gap between a valve body and its seating situated in the same mould half, the valve body being adapted such that it resiliently and yieldingly assumes an open position for retaining the blank in position by vacuum, when the mould is closed and until the moulding composition is injected, and that on injection of the composition it is closed immediately by the composition pressing it against its seating, thus releasing the blank and preventing the composition from penetrating into the gap.

One embodiment of the invention is described in detail in the following, and with reference to the accompanying drawing, on which a small portion of either mould half is schematically illustrated in a position where they have not quite been moved completely together by the injection moulder (unillustrated) in which they are assumed to be mounted. In one mould half, suitably the male half, there is situated the inventive valve body, and it is partially sectioned in the Figure. In the opposing or female half, forming the mould cavity in coaction with the plunger, there is an inlet for the moulding composition. Only a small portion of this half showing the sprue bush is illustrated. The unillustrated parts of the mould may be of essentially conventional implementation.

The mould, which is disposed for the injection moulding of cans and like objects from thermoplastic material, comprises two halves 1 and 2, which are mutually, conventionally reciprocal in an injection moulding machine (unillustrated). In a closed condition they form between them at least one mould cavity for producing one of the objects in each cavity per work

cycle. The mould may thus exhibit one or more mould cavities, each provided with means in accordance with the accompanying drawing. In every work cycle a blank 3, is fed to each cavity, the blank being retained by suction against one mould half 1 as the mould is closed. The blank 3 is schematically illustrated in the Figure by a line drawn spaced from the mould half 1, against which the blank rests in reality. The line is interrupted to indicate a hole 4 in the blank. Such a blank may be supplied to the cavity or cavities as described in the mentioned British patent specification 1 456 036, the Australian patent specification 535 895 or the Swedish patent specification 8103608-9 (publication number 426 668).

During a sequence of the work cycle, after supplying the blank to the cavity, the blank is retained correctly located on the half 1 by suction via an orifice 5 in the half. The orifice opens out into the cavity and is under vacuum via one or more ducts 6 in communication with an unillustrated vacuum source.

The half 1 is normally the male half and the half 2 the female half. In the present case, there is a sprue bush 7 with a gate 8 in the half 2, for allowing the moulding composition to come into the cavity.

The orifice 5 is situated immediately opposite the sprue bush 7 and is formed as an annular gap between a mushroom valve head 9 in the mould half 1 and a valve seating 10 in the same half 1.

The mushroom valve head 9 is adapted for resiliently and yieldingly assuming the illustrated open valve state. More specifically, the shank 11 of the valve is axially movable in a complementary bore in the body of the male half. At the end of the shank 11 away from the mushroom head the shank has a valve base 12 fastened to it, e.g. by a threaded joint. The base 12 has limited axial movement in a space 13 in a fasten-

ing plate 14 associated with the male half 1. Helical compression springs 15 are arranged between the valve base 12 and the bottom of the space 13 and are situated in holes in the valve base. These springs urge the valve base against a stop 16 formed by the body of the male half 1. In the illustrated position against this stop the valve fastening 12 keeps the mushroom head 9 open, with the outermost face of the mushroom head substantially flush with the front surface of the half 7. The combined bias of the springs 15 is selected such that the pressure of the moulding composition against the mushroom head on injection through the gate 8 is so great that it immediately presses the mushroom head 9 against its seating 10, so that the composition cannot penetrate into the inner parts of the gap 5 and the vacuum ducts 6. On the other hand, the springs keep the valve open before injection, thus maintaining the blank 3 effectively urged against the male half 1 by suction via the orifice 5, which can be given a large gap and a correspondingly large suction area as a result of this inventive arrangement.

In the illustrated embodiment the blank has a hole 4, so that with the aid of the flow of the composition passing through the hole 4, the blank is taken from the male half 1 to the female half 2, so that the blank will be on the outside of the moulded object. If it is desirable to have the blank on the inside of the object, it will be made without the hole 4. In this case the valve closes just as efficiently as a result of the pressure from the moulding composition being transmitted via the blank to the outer surface of the valve, so that both damage to the blank and blocking the gap 5 are prevented.

The axial movement of the shank 11 inwardly to a closed state of the valve is limited by the valve

base 12 being stopped by an abutment 17, which is the bottom of the space 13. The valve base comes into contact with the stop 17 only when the composition has pressed the peripheral portion of the mushroom head 9. 5 against the seating 10 and has achieved a certain elastic deformation of the mushroom head 9, which is relieved from further stress by the valve base bottoming. Coolant ducts, not illustrated on the drawing, are disposed in the valve shank 11 up to the 10 mushroom head, which thus has its strength reduced. The limitation of the stress on it is therefore necessary.

To afford a larger suction surface in the plane where the blank is sucked against the mould 15 half, the annular gap 5 is considerably enlarged in a region terminating towards the cavity, such as to form an annular, wide ditch along the periphery of the mushroom head 9. The coacting surfaces of the mushroom head 9 and seating 10 are conical and 20 complementary, with the outer edge of the seating merging into the ditch.

(17)

6

* C L M S *

CLAIMS

1. Mould disposed for the injection moulding of cans or other objects made from thermoplastic material, comprising mould halves (1, 2) mutually reciprocally arranged in an injection moulder, and which form
5 between them at least one mould cavity for producing an object one per work cycle, the cavity being adapted to receive a film, foil or plane or planar piece of material, hereinafter called a "blank" (3) for
10 attaching to the object formed between the mould halves during each work cycle, one half being adapted to keep the blank located in the mould during a sequence of the work cycle with the aid of vacuum obtained via at least one orifice (5) in said half, said orifice opening out into the mould cavity and being in communication
15 with a source of vacuum, characterized in that the orifice is a gap between a valve body (9) and its seating (10), both situated in one of the halves (1), the body (9) being adapted resiliently yieldingly to assume an open valve position, such that on closing
20 the mould, and until molten moulding composition is injected into the cavity, it retains the blank (3) in position, but on injection of the composition it is immediately urged against its seating (10) by the composition, the blank (3) thus being released, as
25 well as the composition being prevented from penetrating into the gap.

2. Mould as claimed in claim 1, characterized in that the valve body (9) is formed as a mushroom valve with a shank (11), and in that the gap is annular and
30 is formed between the mushroom head (9) and its seating (10).

3. Mould as claimed in claim 2, characterized in that the mushroom head (9) is situated immediately opposite and facing towards a gate (8) situated in the
35 opposing mould half (2), for injecting the composition,



7

and such that in the case where the blank (3) has a hole (4) concentric with the gate said mushroom head will be subjected directly to the flow of the injected composition, or for the case where the blank has no
5 hole, it will be subjected indirectly to the flow of said composition via the intermediary of the blank.

4. Mould as claimed in claim 2 or 3, characterized in that the shank (11) is biased by at least one spring (15) in the interior of its mould
10 half (1), said spring biasing the mushroom head (9) into its open position, there being stop means (16, 17) arranged for limiting the reciprocal movement of the mushroom valve (9, 11) outwards to the open position, and inwards to a closing position also
15 limiting the stress on the mushroom head (9) transferred to it via its engagement against its seating (10), and caused by the pressurized molten moulding composition.

5. Mould as claimed in any one of claims 2 - 4,
20 characterized in that the annular gap (5) is made larger, in the region of a portion thereof, terminating towards the cavity to form an annular, wide ditch along the outer periphery of the mushroom head (9).

6. A mould, substantially as herein described with
25 reference to the accompanying drawing.
