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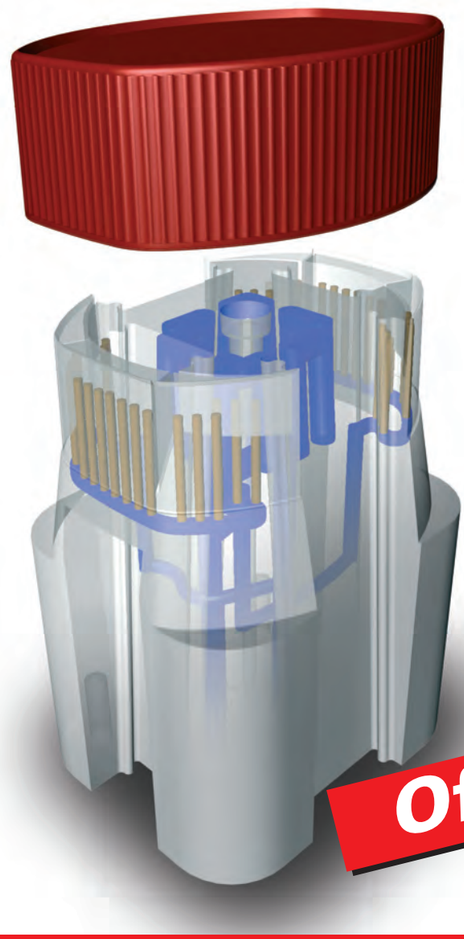
6-Cavity Hot-Runner Mould for Coffee Cup Covers



Offprint

CONTURA® Mold Temperature Control

CONTURA MTC GmbH
Hämmerstraße 6 · 58708 Menden · Phone: +49 2373 39646-50 · Fax: +49 2373 39646-70 · info@contura-mtc.de · www.contura-mtc.de

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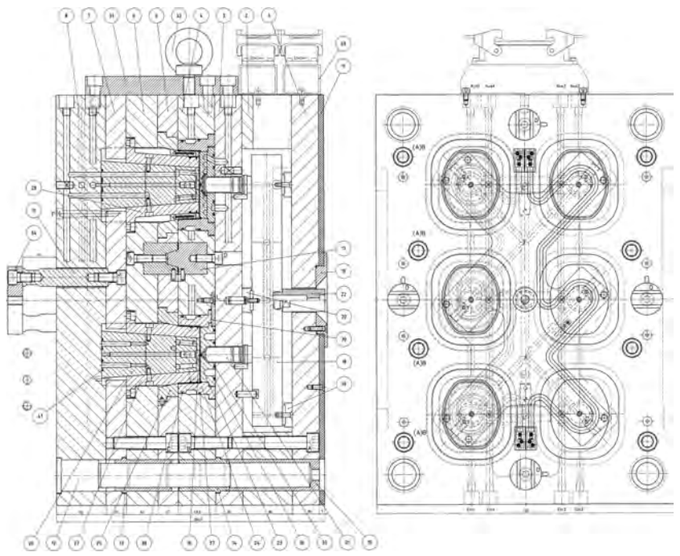

Fig. 1. 6-cavity hot-runner mould for coffee cup covers made from polypropylene
1, 2, 3, 5, 8, 9, 12, 16, 18: hot-runner manifold; 21: heated sprue nozzles with tips; 22: gate and filter; 23: head panel; 26: core; 27: external kufter; 28; internal kufter; 23, 26 to 28: System Contura

Practical Example. The article describes the design details of a hot-runner injection mould for a coffe pot cover that exploit the economics of the injection moulding process while ensuring a high-quality moulded product.

Airtight sealing covers in various colours for coffee cups are injection moulded in this mould from easily flowable polypropylene (Fig. 1). The demands on surface quality are high for this moulded part. To open or close the lock, a turn of <30 angular degrees is required, i.e., segmentation is specified for the inside of the cap. For economical reasons, a hot-runner system with open, externally heated gating nozzles was selected for the high level of production required (manufacturer: PSG Plastic Service GmbH, Mannheim/Germany).

To obtain efficient cycle times, but also to eliminate the drool commonly associated with PP processing, very effective temperature control is provided by a total of eight independent cooling circuits. Particularly the cavities and the threaded segments which are demoulded by angular slides are cooled separately close to contour [1] (Figs. 2 and 3).

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Mould with Close to Contour-Cooling

To exclude heat marks on the gate side of the moulded part, ten bonded copper cores provide very efficient thermal exchange in the gating area. Temperature at the hot-runner manifold and sprue nozzles is 240 °C. Depending on the colour setting, cycle times of less than 12.5 s are achieved. Since the various pigments affect the dimensional behaviour of moulded parts differently during moulding, correspondingly different mould wall temperatures have to be selected. This explains the variation in cycle times. The minimum input temperature of the coolant (water) is 15 °C.

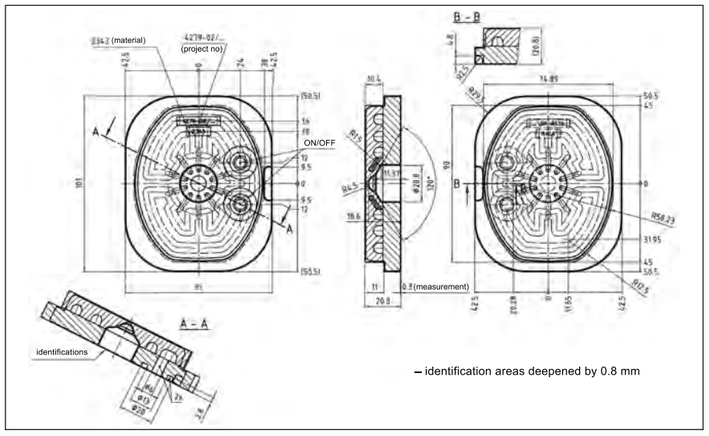

Fig. 2. Insert 23 (from Fig. 1) mit ten copper cores each for cooling the gate area
(pictures: Contura MTC GmbH, Menden/Germany)

This mould is a 6-cavity hot-runner system with open sprue nozzles and tips. The nozzles and the hot-runner manifold are each heated and temperature regulated externally. The intermediate gate with filter insert is unheated and equipped with an immersion nozzle for melt decompression. The hot-runner manifold support disks are composite structures equipped with a steel jacket for support and a ceramic core to minimise heat loss by conduction [2]. The sprue nozzles are connected to the hot-runner manifold non-positively by a sliding seal face.

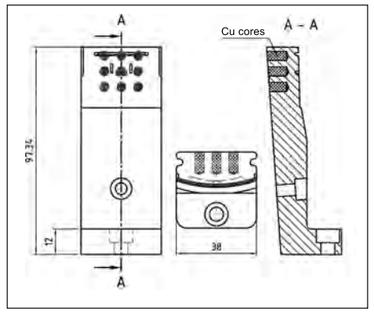

Fig. 3. Internal kufter 28 (from Fig. 1) mit nine copper cores each for cooling the thread segments

Demoulding the Thread Segments

The thread segments arranged at 90° angles to each other are demoulded on the core side by lifters. The double-wall design with a distance between walls of 5 mm cannot be temperature regulated by conventional systems. To this end, the slides were equipped with bonded copper cores whose front end is in contact with the coolant (Fig. 3). To avoid heat marks, the insert on the nozzle side is equipped with a coolant channel system that follows the contour and ten additional copper cores for efficient heat removal from the gate area (Fig. 2). In all, the mould has over 36 (!) cores, kufters, etc., manufactured by System Contura in order to optimise the thermal conditions with the ultimate goal of reducing cycle time.

The tool steel used – material no. 1.2343 ESU – has a hardness of 50+ 4 HRC and is partly nitrated to ensure wear and slideability.

The thread segments are released by angular slides after the mould opens. The parts are demoulded to free-fall with compressed-air assist (see detail 16, Fig. 1). ■

REFERENCES

1 Contura Mould Temperature Control GmbH, Menden, Germany
2 Unger, P.: Hot Runner Technology, Hanser Publishers, Munich 2006

Manufacturer Cooling

CONTURA MTC GmbH
Hämmerstraße 6
58708 Menden · Germany
Phone: +49 2373 39646-50
Fax: +49 2373 39646-70
info@contura-mtc.de
www.contura-mtc.de