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(56) Documents cited
GB 1523778 A GB 1245724 A GB 0798031 A

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(54) A method of making a mould provided with cooling means

(57) A method of manufacturing a mould body e.g. for moulding a plastics bottle, to enable extraction of heat during moulding, to which a metal mould block (10) is recessed into its face remote from the mould cavity (12) to leave a thin mould cavity wall (14), a malleable material e.g. clay, defining paths for cooling fluid is applied in the recess, and the recess is filled with a material e.g. non-absorbent foamed epoxy resin, which sets hard to form a filling body, the filling body is removed, the paths of malleable material are removed and the filling body (16) is replaced, leaving passages (18) for cooling fluid between the cavity wall and the filling body.

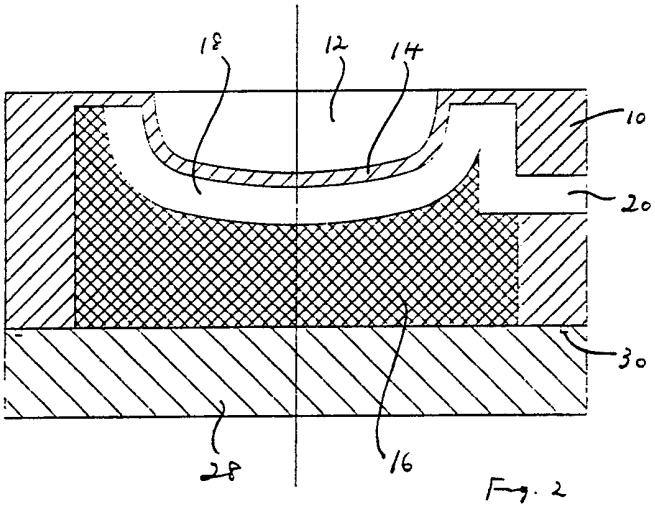
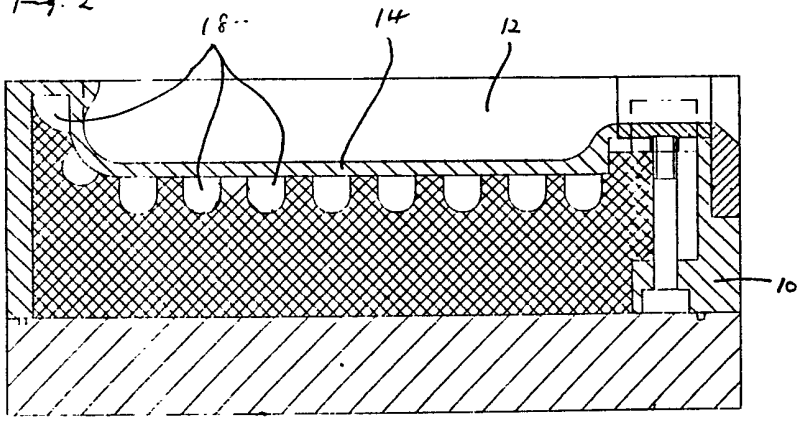


Fig. 2

Fig. 4



The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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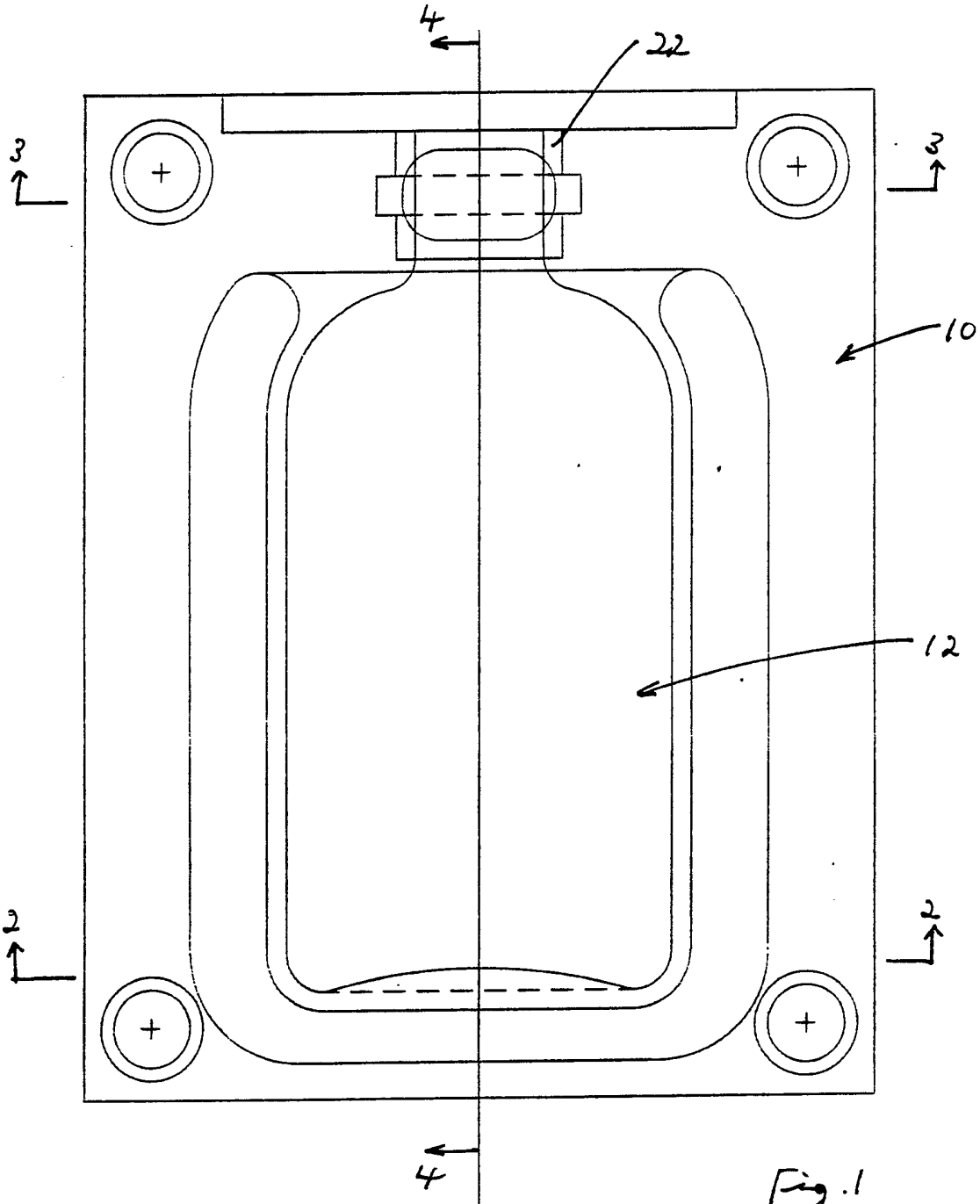

Fig. 1

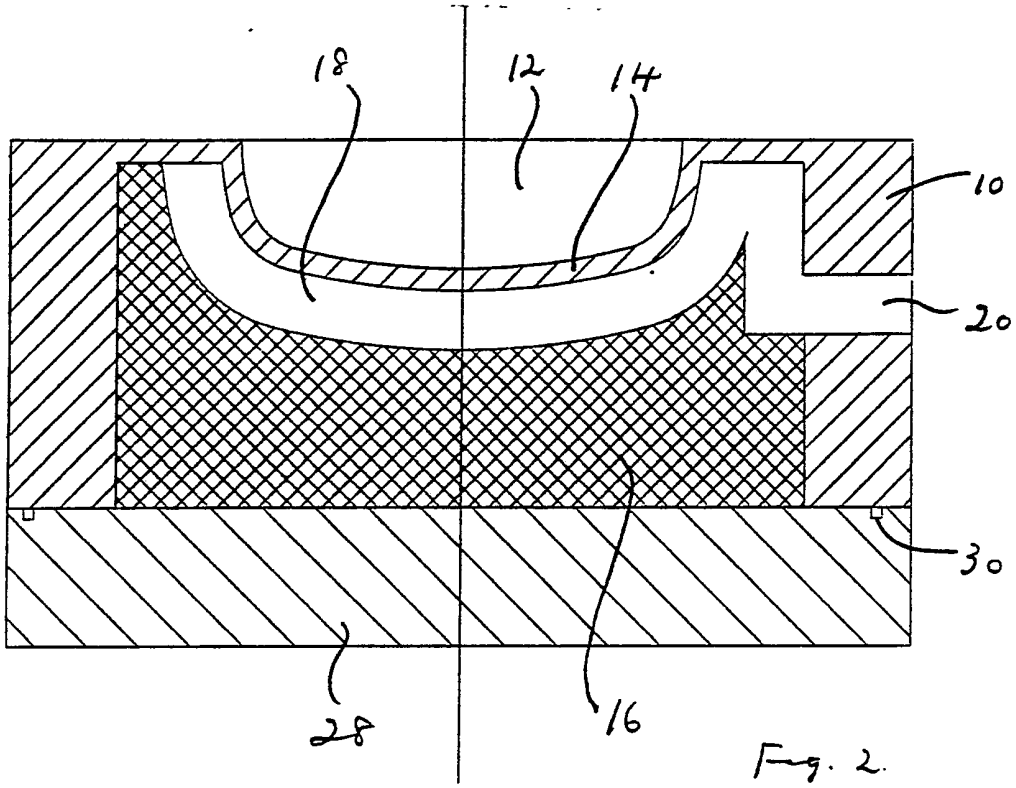

Fig. 2

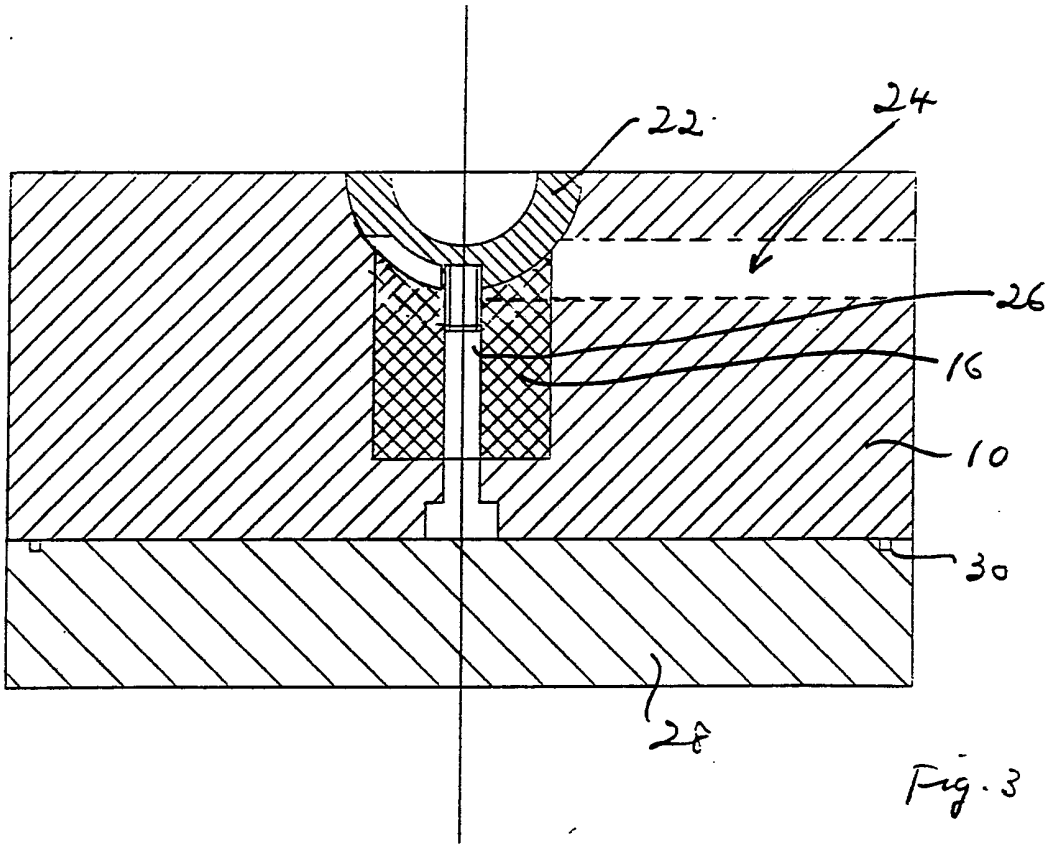

Fig. 3

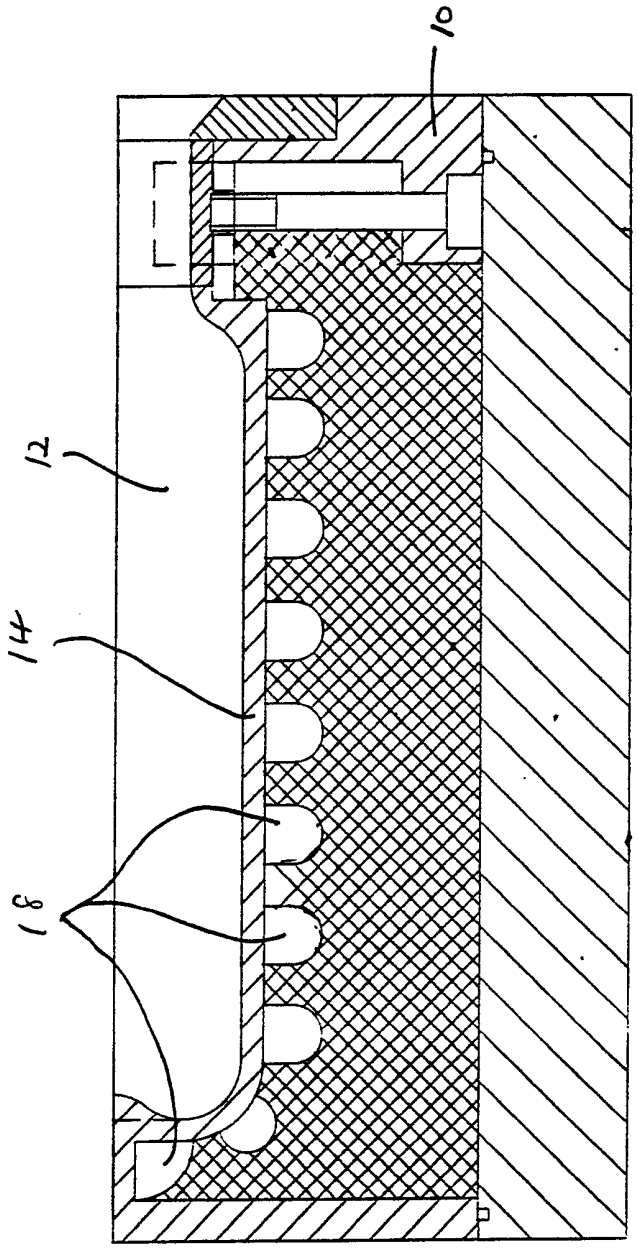

Fig. 4

Method of and Means for Extraction of Heat in Moulds

This invention relates to a method of and means for the extraction of heat from the moulding material during moulding of an article within a metal mould.

Extraction of heat from a mould during moulding is commonly effected by machining passages into the mould shell and through which a cooling fluid is passed during moulding. In part due to the requirement to machine these passages, the mould is usually formed in several parts, cut with formations which ensure alignment on assembly, including continuity of machined passages which usually extend from one part into the next. Metal moulds are thus expensive to produce and, in spite of this, the cooling arrangement is not necessarily as efficient as would be desirable.

It is an object of this invention to provide an improved method and means for the extraction of heat from metal moulds. This can lead in turn to simplification in the construction of the mould shell and less expensive production thereof.

According to one aspect of the invention, there is provided a method of manufacturing a mould body to enable extraction of heat from the moulding material during moulding, according to which a metal mould block, shaped or to be shaped into one face with a recess corresponding to the shape of at least part of the article to be moulded. is recessed into the opposite face to leave a relatively thin mould cavity wall within the block, the back of the cavity

wall has a path for cooling fluid thereover defined by one or more lengths of malleable material applied to said back of the cavity wall, the recess into said opposite face of the mould block is filled with a pourable non-porous material which sets or can be caused to set hard, thus forming a shaped filling body, the set filling body is removed, the lengths of malleable material removed, and the filling body replaced and fixed in place, thereby forming between said filling body and the back of the cavity wall one or more passages for carrying the cooling fluid.

According to another aspect of the invention, there is provided a mould shell comprising a metal mould block shaped into one face with a recess corresponding to the shape of the article to be moulded and recessed into its opposite face to leave a relatively thin mould cavity wall within the block, and a hard set material which has been poured into the recess to form a filling body filling the recess in said opposite face except for one or more passages for carrying cooling fluid formed between said filling body and the back of the cavity wall.

Further features and advantages of the invention will be apparent from the following description, making reference to the accompanying drawings, in which:-

Figure 1 is a plan view of a mould shell; and

Figures 2 to 4 are respectively cross-sectional views on the lines 2-2, 3-3 and 4-4 of Figure 1.

The invention is exemplified with reference to a bottle mould wherein a plastics bottle is produced by blow moulding, but the invention is also applicable to metal

moulds for producing other articles, including articles produced by other moulding techniques such as injection moulding.

The complete mould consists of two similar mould shells which during moulding are brought together to define the mould cavity. One such shell is shown in the drawings.

The illustrated mould shell comprises a metal mould block 10, for example of steel or aluminium, recessed at 12 into one face to define the shape of the bottle to be moulded. The block 10 is also recessed into its opposite face to leave a relatively thin mould cavity wall 14, say about 3 mm thick, within the block.

The recess in said opposite face of the block 10, i.e. behind the mould cavity wall 14, is substantially filled with a hard set material which has been poured into said recess to form a filling body 16. An example of a suitable filling material is a closed cell, i.e. non-absorbent, foamed plastics material such as a foamed epoxy resin. However, various other filling materials which set into a hard non-absorbent filling body could be used instead

The filling body 16 fills the recess behind the mould cavity wall 14 except for one or more tortuous channels 18 which are defined between the filling body and the rear face of the cavity wall. Inlet and outlet passages for cooling water or other cooling fluid are formed through the block 10 to communicate with said channel or channels 18. One such passage through the mould block 10 is shown at 20 in Figure 2.

The simple machining required to form the inlet and outlet

passages 20 in the mould block 10 means that, if desired, this block can be an integral structure, instead of two or more assembled parts as is usual.

In practice, in the case of the illustrated mould shell for a bottle, a separate neck insert 22, for example of beryllium-copper or other suitable alloy of high heat conductivity, is incorporated in the mould shell, together with a separate cooling arrangement 24 for this insert, which is the region where maximum heat extraction is required during moulding. Neck insert 22 is fixed in position by a sealing and fixing adhesive, and holding screw 26 holds the insert in position while the adhesive is setting. Further details of the neck insert arrangement are to be found in my copending Patent Application No. , to which reference should be made.

The present invention is concerned, more especially, with the mould block 10, the filling body 16, and the manner of production of the channel or channels 18 for cooling fluid.

In the first stage of production of the mould shell, the mould block 10, with empty recess behind the relatively thin mould cavity wall 14, has the path of the channel or channels 18 defined by the placing in position of one or more lengths of a malleable material such as modelling clay or other mouldable soft material of putty-like consistency. The lengths of this malleable material are preferably formed with a D-shaped cross-section, the flat face being pressed against the mould cavity wall 14. One or more tortuous paths are defined, winding back and forth across the width of or possibly the length of the mould cavity, including the part of the wall 14 which forms the bottle base. The defined path or paths may also extend around the wall in

the neck region of the wall, unless, as described above, a neck insert with separate cooling arrangement is preferred for this region. The path or paths are positioned to connect at the ends with inlet and outlet passages for cooling fluid machined in the block 10, or such passages could be machined subsequently. The freedom to define the cooling means in one or more sections is important for the purpose of maximising heat extraction for differing types, sizes and shapes of bottle.

The interior surface of the recess behind the mould cavity is then coated with a release agent.

The recess behind the mould cavity is then filled with a casting resin such as a foamed epoxy resin poured into place.

After the casting resin has set to form a solid body filling the recess, this filling body 16 is removed from the block, the moulding clay defining path or paths for cooling fluid is removed, and the filling body 16 is replaced. As a result, one or more "D" cross-section channels for the passage of cooling fluid are formed between the back of the cavity wall 14 and the filling body 16.

The mould block is closed by a back plate 28, possibly with the interposition of sealing strips 30. If necessary, the back face of the filling body can be machined flat to enable the back plate 28 to be fitted.

The above-described means for cooling the mould during moulding can be produced relatively inexpensively, and the cost of the mould shell may also be reduced as the cooling means enables a one-piece block 10 to be employed.

Moreover, if in practice cooling is not as efficient as may be desired, the back plate and block are removable to enable an alternative system of one or more paths for cooling fluid to be defined.

Various modifications of the above-described mould shell and method of cooling thereof are possible within the scope of the invention hereinbefore defined.

Claims

1. A method of manufacturing a mould body to enable extraction of heat from the moulding material during moulding, according to which a metal mould block, shaped or to be shaped into one face with a recess corresponding to the shape of at least part of the article to be moulded, is recessed into the opposite face to leave a relatively thin mould cavity wall within the block, the back of the cavity wall has a path for cooling fluid thereover defined by one or more lengths of malleable material applied to said back of the cavity wall, the recess into said opposite face of the mould block is filled with a pourable non-porous material which sets or can be caused to set hard, thus forming a shaped filling body, the set filling body is removed, the lengths of malleable material removed, and the filling body replaced and fixed in place, thereby forming between said filling body and the back of the cavity wall one or more passages for carrying the cooling fluid.

2. A method as claimed in claim 1, according to which the lengths of malleable material are formed into a D-shaped cross-section, the flat face being pressed against the back of the mould cavity wall.

3. A method as claimed in claim 1 or claim 2, according to which, after application of the lengths of malleable material, the interior surface of the recess behind the mould cavity is coated with a release agent.

4. A method as claimed in claim 1 or claim 2 or claim 3, according to which the lengths of malleable material are shaped to define one or more tortuous paths across the width or along the length of the recess behind the mould cavity.

5. A method as claimed in any of claims 1 to 4, applied to a bottle mould.

6. A method as claimed in claim 5, according to which the one or more paths defined by the lengths of malleable material are shaped to extend around that part of the back of the mould cavity wall which forms the bottle base as well as that part of the back of the cavity wall which forms the bottle wall.

7. A method as claimed in claim 6, according to which the one or more paths defined by the lengths of malleable material are shaped to extend around that part of the back of the mould cavity which forms the bottle neck.

8. A method as claimed in any of claims 1 to 7, according to which inlet and outlet passages for cooling fluid are machined in the mould block to connect with the ends of the one or more paths defined by the lengths of malleable material.

9. A method as claimed in any of claims 1 to 8, according to which, after the filling body has been placed, the mould is closed behind the filling body by a back plate.

10. A method of manufacturing a mould body substantially as hereinbefore described.

11. A mould shell comprising a metal mould block shaped into one face with a recess corresponding to the shape of the article to be moulded and recessed into its opposite face to leave a relatively thin mould cavity wall within the block, and a hard set material which has been poured into the recess to form a filling body filling the recess in said

opposite face except for one or more passages for carrying cooling fluid formed between said filling body and the back of the cavity wall.

12. A mould shell as claimed in claim 11, in which the mould block is formed as a single part.

13. A mould shell as claimed in claim 11 or claim 12, in which the filling material is a foamed epoxy resin.

14. A mould shell as claimed in any of claims 11 to 13, in which the mould block has one or more passages for cooling fluid machined therein to connect with the ends of the passages formed between said block and the filling body.

15. A mould shell as claimed in any of claims 11 to 14, in which the relatively thin mould cavity wall is about 3 mm thick.

16. A mould shell as claimed in any of claims 11 to 15, in which the cooling passages form one or more tortuous paths, winding back and forth from side to side or end to end of the mould cavity.

17. A mould shell substantially as hereinbefore described with reference to the accompanying drawings.

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