

DESCRIPTIONGANG-POT MOULD

5 The present invention is concerned with a
gang-pot mould of the kind which is used to
encapsulate integrated circuit components in a
potting compound, such as an epoxy resin. Such a
mould is normally mounted in conventional fashion
10 between top and bottom platens which carry respective
upper and lower mould parts. The lower mould part
has a base plate which sits on the bottom platen and
a plunger block, comprising a plurality of plungers,
is raised and lowered relatively to the base plate by
15 means of one or more hydraulic rams. In use, with
the mould closed, the plunger block and its plungers
are raised from the base plate, within the lower
mould part, so that the upper ends of the plungers
are advanced through pots in the lower mould part
20 into respective culls where the upper and lower mould
parts meet to pressurise fluent resin in the culls
and force the resin through runner systems into mould
cavities between the mould parts and containing the
components to be encapsulated.

25 Conventionally the cavities are defined by and
between upper and lower chases carried by the upper
and lower mould parts, respectively. Each cull is
connected only to its own group of, for example four,
cavities, via its own runner system. Typically, the
30 culls are evenly spaced in a row and the cavities are
evenly spaced in two rows, one on each side of the
row of culls, with two cavities per row per cull.
The cull pitch is then a simple multiple, in this
case two, of the cavity pitch. If the mouldings are
35 to be changed for ones of a different size and or
shape, it may be desirable to change the cavity
pitch, but, with the conventional system, the

cavities can only be changed to another simple multiple of the number of culls and it is unlikely that this will be useful. Also, with the conventional system, if any of the culls is not properly filled with resin, usually in the form of pellets, the corresponding cavities will not be filled and the resulting unsatisfactory mouldings will need to be rejected after that moulding shot. The alternative is to change the number and/or spacing of the culls but this involves complete replacement of the plunger block.

In accordance with the present invention, a gang-pot mould comprises a lower mould part with a vertically movable plunger block comprising a plurality of plungers; and a plurality of culls cooperating with respective ones of the plungers, the culls being interconnected with cavities via a runner system which incorporates at least one common manifold to which all, or a group, of the culls are connected, and to which all, or a group, of the cavities are connected.

With this arrangement there is no preset relationship between the number of cavities and the number of culls. The individual culls and/or cavities may be tapped into the manifold at any appropriate position, although the manifold may be dedicated to a particular number of culls or cavities. It follows that the number of cavities may be changed, for example by removing at least part(s) of upper and lower chases in which the cavities and/or manifold are defined, and replacing them by others with a different configuration without any change in the other parts of the mould.

When the, or a group of the, culls are arranged in a row with rows of cavities on each side, the manifolds may be provided by bridging channels extending one on each side of the row of culls

between the row of culls and the adjacent row of cavities. Runner branches may then lead from each cull to each bridging channel, and from each cavity to the adjacent bridging channel.

5 Some examples of moulds, some constructed in accordance with the present invention, are illustrated diagrammatically in the accompanying drawings.

10 Figure 1 is an elevation, partly in section, of a moulding machine which may incorporate a mould according to the invention;

Figure 2 shows the upper (inverted) and lower chases of a conventional mould, in which each plunger, pot and cull is dedicated to four cavities;

15 Figure 3 is a diagrammatic view of a mould in accordance with the invention, with five plungers serving twenty cavities;

20 Figure 4 is a view similar to figure 3 but showing how the mould can be modified so that five plungers serve twenty four cavities;

Figure 5 is a diagrammatic view of further modifications of mould; and,

Figures 6 and 7 are sections taken on the line VI-VI in figure 5.

25 A gang-pot moulding machine of a kind to which the present invention may be applicable, is shown in Figure 1. This machine is described in more detail in our co-pending application No. 2225553.

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The machine has upper and lower platens 10 and 11 which carry respective upper and lower mould parts 12 and 13. The lower mould part, which in this case is stationary, carries lower chases 14 each providing partial cavities on each side of a row of pots 15, each of which is provided with a plunger 16. The upper mould part 12 similarly has upper chases 17

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each provided with partial cavities, which complement the partial cavities in the chases 14. The upper chases also cooperate with the upper ends the pots 15 to form culls. With the upper mould part lowered onto the lower mould part, to close the cavities, injection moulding is carried out by raising of the plungers 16 to force fluent resin out of the culls through a runner system into the cavities, to encapsulate circuit components which have been predisposed in the cavities.

Figure 2 shows a conventional arrangement which might have been used with such a machine, in which there are four cavities provided by partial cavities 18 in the upper chase 17 and by partial cavities 19 in the lower chase 14, dedicated to each cull defined by a pot 15, and connected to it by a respective runner 20. The number of cavities is therefore necessarily four times the number of pots and plungers.

Figure 3 shows the under side of an upper chase 17 (or equally the upper side of a lower chase 14) of a mould in accordance with the invention, in which each of five culls 15A is connected to a pair of common manifolds in the form of bridging channels 21 in a runner block 22. A pair of cavity bars 23 are each provided with a row of ten partial cavities 18, each of which is connected via a gate or runner 20 to a respective one of the bridging channels 21. It will be appreciated that the cavity bars 23 can be replaced by cavity bars with a different number of partial cavities 18 and runners 20 without disturbing the runner block or changing the number of plungers, pots or culls. This is because the channels 21 run along the edges of the block 22. Of course the complementary partial cavities in the lower chase would also have to be changed, by similarly replacing cavity bars. Thus Figure 4 shows such a change, in

which the cavity bars 23 have been replaced by cavity bars each incorporating twelve partial cavities 18, at different centres to the ten cavities in the Figure 3 example, without disturbing the runner block 22 with its five culls 15A, or the pots 15 and plunger system in the lower mould part.

Figure 5 shows an alternative arrangement in which, when the number of cavities is to be changed, the upper runner block 22A also has to be changed. This is because its bridging channels 21A are spaced from its edges and are provided with branches 24 to be aligned with the gates 20 of the respective cavities. However the culls 15A still tap into the bridging channels 21A at any appropriate position along their lengths, so that all the culls feed all the cavities.

In Figure 5, the part above the central horizontal dot dash line represents one configuration of runner block and cavity bar and that below the line an alternative configuration with a different runner block and cavity bar to be used when a different number of cavities are required.

Figure 6 shows how the gates 20 may be formed in upper cavity bars 23A and Figure 7 shows an alternative arrangement in which the branches 24 lead via gates 24A in a lower runner block, to gates 20 formed in the lower cavity bar 23B.

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CLAIMS

5 1. A gang-pot mould comprises a lower mould part with a vertically movable plunger block comprising plurality of plungers; and a plurality of culls cooperating with respective ones of the plungers, the culls being interconnected with cavities via a runner system which incorporates at least one common manifold to which all, or a group, of the culls are connected, and to which all, or a group, of the cavities are connected.

15 2. A mould according to claim 1, in which a group of the culls, is arranged in a row with two rows of cavities one on each side of the row of culls, there being two manifolds in the form of bridging channels extending one on each side of the row of culls between the row of culls and the adjacent row of cavities.

20 3. A mould according to claim 2, in which each bridging channel extends along a respective edge of a runner block, and each row of cavities is formed in a replaceable cavity bar with gates leading from respective ones of the cavities to an edge of the bar which is juxtaposed with one of the runner block edges so that the gates open into one of the bridging channels.

25 4. A gang-pot mould, substantially as described with reference to the accompanying drawing.

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