

METHOD FOR THE MANUFACTURE OF MOULDS

The present invention concerns a method for the manufacture of moulds, and in particular of moulds of irregular shape.

The method concerns, in particular, the manufacture of moulds for concrete panels, but the method may be applied to the mould technology for any material to be cast whatsoever or to the manufacture of moulds in which the casting temperature remains within certain limits.

In commonly used mould techniques a material structure is shaped around the desired formed piece, the formed piece being detachable from the said material structure, and the final piece can be cast, by means of a known method, in the resulting cavity. Typically, casting is carried out under conditions for which the final material is, in one form or another, fluid, compressible, extrudible, or molten.

In these circumstances, moulds have been commonly constructed of a readily deformable material, which can be kept solid at some stage and which endures the casting conditions. Solidification can be achieved, e.g., by means of polymers. This is done when metal-casting moulds are manufactured from sand and polymers which act as binders.

By means of various hydration reactions, solidification can be made to take place by the effect of hardening of gypsum.

Alternatively, moulds can be manufactured in desired shapes from solid materials, in which case the material to be cast must have a suitable consistency.

This is a procedure typically used in present-day concrete casting techniques, wherein the mould material used is either metal, wood, plastic, or equivalent and wherein the mould is most commonly a structure defined on five sides. A fluid, or rather stiff, concrete mix is cast into the mould. This mix must be such that it can be packed in one way or another so that it fills all the spaces in the mould completely.

The concrete casting technique described above is problematical to the extent that the materials used restrict the moulds unduly to constructions which have planar faces, which consist of metal sheets, slabs, mould plywood, boards, or different plastic boards and plastic components. The creation of free forms requires difficult and costly work. Moreover, the manufacture of a mould of the sort described above requires an abundance of manual work and storage space, and is therefore costly.

In most cases, such moulds, even though they are not completely disposable, offer a series length of 10 to 50 pieces for concrete panels. The cost of a mould is, however, so high that the mould is, in any case, stored for a certain period of time in case a corresponding series is repeated.

From the above, it has been found that a mould requires an abundance of manual work and very expensive materials. Moreover, the mould is always considerably more expensive than the product manufactured thereby, and the proportion of the cost of the mould in relation to the price of the product starts to lose its significance only when the lengths of the series are several tens of pieces.

In view of automation in the industry of prefabrication of concrete panels or, in general, in the industry making use of casting techniques, the concrete panel techniques described above do not offer any simple possibilities for the automated manufacture of moulds.

An object of the present invention is to eliminate the drawbacks present in the prior-art technology described above and to provide an entirely novel type of method for the manufacture of moulds.

It has been possible to achieve this object by means of the method in accordance with the invention, which is characterised in that

- each mould blank is manufactured by feeding molten thermoplastic organic polymer material into a container which is open at the top and which corresponds to the dimensions of the desired mould, and cooling said organic polymer material below its melting point to form the blank for machining,
- the polymer material detached from the blank upon machining is recovered, and
- this recovered material is heated to a temperature higher than its melting point and fed onto such a mould as is no longer needed, so as to provide a blank for a new mould.

Preferably the melting point of the organic polymer material is less than 150°C.

By means of the invention, it has been possible to combine automatic manufacture of moulds and the use of completely free shapes in a way that has not been applied in the prior art.

The method in accordance with the invention will be described, by way of example, in more detail with the aid of the attached drawings in which:

Figures 1 to 3 show partly schematic views of successive processing stages in one embodiment of the method of the invention.

This method starts from the circumstance that the free shapes of the mould are created by means of a numerically controlled machine tool 3 to 5, moving along a rail 6, which shapes the mould out of a blank of suitable material 8. The machine tool 3 to 5 receives numerical instructions from a computer 2 that reads the drawing, and the machine tool copies the design shown by the drawing on the desired scale three-dimensionally in the mould material 8 so that the details and limitations indicated by the drawing are taken into account. The numerically controlled machine tool 3 to 5, which shapes the mould material 8, receives the drawing data directly from a magnetic or other data set 1 either without an optical reading device or by the intermediate of an optical reading device. Then the concrete 13 is cast from a feeder 14 in a way known per se, into the ready-processed mould 8.

The mould materials 8 advantageously suitable for this technique are, according to the invention, such as can be used again and again for the formation of new mould blanks. Such materials are, e.g. such organic polymers

whose molecular weight is so low that they have an adequate fluidity at reasonable temperatures, examples being, polyethylene wax, paraffin and polymerised tall oil. Thereby, they can be cast into a desired space 7 as a preliminary blank, out of which the final mould can be prepared.

The manufacture of a mould out of organic polymer materials of this kind, which melt at a temperature preferably below 150°C , takes place as follows:

Into a space 7 defined on five sides, in which the mould blank is intended to be formed, the polymer material 8 is cast while molten so as to fill the whole space 7. After this material 8 has solidified, the desired shape is machined using either hot-shearing or mechanical milling or a combination of both of these at the same time. The detached material 12 removed by this machining is collected in a container 11 and, after melting performed by means of a heating spiral 16, returned through a valve 10 and a pump 15 onto another mould structure, which has already been discarded or used. Thereby it refills the cavities provided in the earlier mould and permits renewed form-milling (Fig.3).

Typically advantageous organic polymer materials which

meet the requirements of the said mould technique are, for example, polymer waxes, whose molecular weight is 1500 to 3300, as well as various products of polymerization of tall oil.

CLAIMS

1. Method for the manufacture of moulds out of mould material blanks by machining each blank into a desired shape by means of a machine tool controlled by a computer on the basis of a dimensioning data set,

characterised in that

- each mould blank is manufactured by feeding molten thermoplastic organic polymer material into a container which is open at the top and which corresponds to the dimensions of the desired mould, and cooling said organic polymer material below its melting point to form the blank for machining,
- the polymer material detached from the blank upon machining is recovered, and
- this recovered material is heated to a temperature higher than its melting point and fed onto such a mould as is no longer needed, so as to provide a blank for a new mould.

2. Method as claimed in claim 1, characterised in that said organic polymer material is selected from the group of polyethylene wax, paraffin, and polymerised tall oil.

3. Method as claimed in claim 1, characterised in that the recovered organic polymer material detached from the



blank upon machining is passed into a separate container.

4. Method as claimed in claim 3, characterised in that the recovered organic polymer material is heated in said separate container.

5. Method as claimed in claim 1, characterised in that milling is used for machining.

6. Method as claimed in claim 1, characterised in that hot-shearing is used for machining.

7. Method as claimed in claim 1, characterised in that said organic polymer material has a melting point which is lower than 150°C.

8. A method of manufacturing moulds according to claim 1, substantially as herein described with reference to the accompanying drawings.

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