AU9540322

(12) PATENT ABRIDGMENT (11) Document No. AU-B-40322/95
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 699067

(54) Title
METHOD OF FILLING A MOULD FOR MANUFACTURING AN OPTICAL LENS

International Patent Classification(s)
(51)[6] **B29C 045/18** **B29D 011/00**

(21) Application No. : **40322/95** (22) Application Date : **08.12.95**

(30) Priority Data

(31) Number	(32) Date	(33) Country
94 14926	**12.12.94**	**FR FRANCE**

(43) Publication Date : **20.06.96**

(44) Publication Date of Accepted Application : **19.11.98**

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(56) Prior Art Documents
US 4257988
US 3938775
US 2542386

(57) Claim

1. Method of filling a mould for making an optical lens and formed of two moulding shells disposed on edge and at the periphery of which is disposed an annular closure member defining with them a moulding cavity, in which method a moulding material is introduced into said moulding cavity through a casting opening formed to this end in said closure member, said casting opening being in the lower part of said moulding cavity.

PAUU011 26/5/91
Regulation 3.2(2)

AUSTRALIA

Patents Act 1990

ORIGINAL

COMPLETE SPECIFICATION

STANDARD PATENT

Application Number:

Lodged:

Invention Title: METHOD OF FILLING A MOULD FOR MANUFACTURING AN OPTICAL LENS

The following statement is a full description of this invention, including the best method of performing it known to us :-

Method of filling a mould for manufacturing an optical lens

The present invention concerns moulding optical lenses, especially, but not exclusively, ophthalmic lenses, from a polymerisable synthetic material.

The traditional mould comprises two moulding shells at the periphery of which is disposed an annular closure member defining with them the required moulding cavity.

If the two moulding shells are made of glass and have substantially parallel surfaces, for example, the closure member is a seal in which the moulding shells are nested or a sleeve which surrounds them.

If, as described in American patent No 5 110 514, for example, the moulding shells are more or less massive, the closure member can be at least in part in one piece with one or both moulding shells.

The conventional way to fill a mould made up in this way of two moulding shells and a closure member is by causing the moulding material to flow into the moulding cavity through a casting opening provided for this purpose in the closure member. This opening is at the periphery of the moulding shells so as not to interfere with the optically active area of the optical lens formed.

In a manual process the moulding shells can be more or less flat, i.e. substantially horizontal, when the material is cast.

In an at least partly automated process, in which the mould to be filled is vertically aligned with a filler device adapted to deliver a particular quantity of moulding material through a nozzle, the moulding shells are disposed on edge, i.e. substantially vertically, and this is also the case, for specific reasons, in the US patent No 5 110 514 already referred to.

When the moulding shells are disposed on edge in

this manner, the mould is filled from the top by gravity only.

Experience shows that unless special measures are implemented, for example a relatively long waiting time (in the order of two hours, for example) between filling the mould and starting polymerisation, the optical lenses obtained frequently have localised optical defects of greater or lesser severity, leading to relatively high reject rates.

The present invention is based on the surprising observation that these optical defects can largely be avoided if the mould is filled from the bottom, this going agains the process which otherwise seems the most natural in that it benefits from the effect of gravity.

The explanation may lie in the fact that, with filling from the top, the "syrup" effect well known to glassmakers is inevitably operative, at least to some degree: given its viscosity, the moulding material flows slowly, in "runs", into the moulding cavity and there is no close control over this process; also, the moulding material is a mixture of constituents which can have different refractive indices and/or coefficients of viscosity, so that stretching or shearing can cause relatively large local index gradients which inevitably produce the optical defects noted if polymerisation occurs too soon after filling.

A long waiting time between filling and starting polymerisation is then required for good homogenisation of the material, in order to avoid optical defects.

The present invention consists in a method of filling a mould for making an optical lens and formed of two moulding shells disposed on edge and at the periphery of which is disposed an annular closure member defining with them a moulding cavity, in which method a moulding material is introduced into said moulding cavity through

a casting opening formed to this end in said closure member, said casting opening being in the lower part of said moulding cavity, and preferably at its lowest point.

To overcome gravity it is sufficient to use pumping means adapted to cause the moulding material to flow without significantly pressurising it.

Using this method, it is advantageously possible to start polymerisation immediately after filling, to the benefit of productivity, and as the moulding material remains homogeneous during filling the optical lenses obtained are advantageously free of optical defects which may cause them to be rejected, which is beneficial to the overall cost.

In some embodiments described in US patent No 5 110 514, for specific reasons which constitute the subject matter of that patent, the mould is filled from the bottom, but this is not a mould for making an optical lens and comprising two moulding shells disposed on edge.

In all cases where the mould is to produce an optical lens filling is traditionally from the top, whether the moulding shells are disposed on edge or flat.

There is nothing in this US patent to suggest filling from the bottom a mould for making an optical lens and including moulding shells disposed on edge.

The features and advantages of the invention will emerge from the following description given by way of example with reference to the appended diagrammatic drawings, in which:

figure 1 is a locally cut away perspective view showing filling from the bottom in accordance with the invention of a mould for making an optical lens;

figure 2 is a view of this mould in transverse section on the line II-II in figure 1;

figure 3 is a perspective view showing another embodiment of the invention.

Referring to the figures, the overall object is to fill a mould 10 for making an optical lens, for example an ophthalmic lens. The mould 10 is formed by two moulding shells 11A, 11B disposed on edge and an annular closure member 12 at the periphery of the shells, defining with them the required moulding cavity 13.

In the embodiment shown it is assumed that the moulding shells 11A, 11B are made of glass.

The moulding shells 11A, 11B in practice have a generally circular outside contour, but this is not necessarily always the case.

Their facing inside surfaces are a negative image of the required surfaces of the optical lens to be moulded.

These surfaces are coaxial in practice, with a common axis A.

With the moulding shells 11A, 11B disposed on edge, the axis A is substantially horizontal and the moulding shells 11A, 11B are substantially vertical.

In the embodiment shown in figures 1 and 2 the closure member 12 is a sleeve around the moulding shells 11A, 11B and engaged with their edge.

The sleeve can be formed from a strip which is wound around the edge of the moulding shells 11A, 11B.

This strip can be an adhesive synthetic material or a heat-shrink synthetic material.

A casting opening 14 in the closure member 12 is provided for introducing the moulding material into the moulding cavity 13.

This is just a hole in practice.

In accordance with the invention, the casting opening 14 is in the lower part of the moulding cavity 13, preferably at its lowest point.

Pumping means 15 are used to fill the moulding cavity 13.

The pumping means 15 are preferably such that the moulding cavity 13 is fed continuously with moulding material.

By continuous feeding here is meant totally smooth feeding.

In the embodiment of the invention shown in figures 1 and 2 the pumping means 15 include a pressure source 16 on the upstream side of a storage vessel 17 containing the moulding material 18 and which can be connected by a pipe 19 which can be applied, like a filling nozzle, to the casting opening 14 of the moulding cavity 13.

The pressure source 16 is a compressed air vessel, for example, connected to the storage vessel 17 by a pipe 20 controlled by a valve 21. Its entry into the storage vessel 17 is above the level of the moulding material 18 contained therein.

The valve 21 is simply opened to a greater or lesser degree to obtain the required flowrate for the moulding material 18 and to fill the moulding cavity 13 and therefore the mould 10 progressively from the bottom.

A vent 22 is preferably provided in the upper part of the moulding cavity 13, at its highest point, for example.

The moulding material 18 can be a substance which is at least partly polymerisable by exposure, for example by exposure to ultraviolet radiation, or a substance at least partially polymerisable by heat, or a substance which is polymerisable by exposure and by heat.

In the embodiment shown in figure 3 the closure member 12 is formed of two jaws 12', 12" carried by a frame 24 and adapted to enclose the edge of the moulding shells 11A, 11B, each having to this end a semicircular interior contour; at least one of them is mobile to enable insertion of the moulding shells 11A, 11B between them.

For example, the bottom jaw 12' is fixed and includes the casting opening 14 to which a pipe 25 is connected.

The top jaw 12" is mobile, sliding in the frame 24 and moved by rams 26, and incorporates the vent 22.

These provisions are not in themselves any part of the present invention and they will not be described in more detail here.

As an alternative to the above, the closure member 12 can be a standard type seal, i.e. a seal in which the moulding shells 11A, 11B are nested.

The closure member 12 can instead be at least in part in one piece with one or both moulding shell(s) 11A, 11B, as in some of the embodiments described in US patent No 5 110 514, for example.

The present invention is not limited to the embodiments described and shown, but encompasses any variant execution and/or combination of their component parts.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

~~XXXXXX~~
CLAIMS

1. Method of filling a mould for making an optical lens and formed of two moulding shells disposed on edge and at the periphery of which is disposed an annular closure member defining with them a moulding cavity, in which method a moulding material is introduced into said moulding cavity through a casting opening formed to this end in said closure member, said casting opening being in the lower part of said moulding cavity.

2. Method according to claim 1 wherein said casting opening is at the lowest point of said moulding cavity.

3. Method according to claim 1 or claim 2 wherein pumping means are used to fill said moulding cavity.

4. Method according to claim 3 wherein said pumping means are adapted to feed moulding material continuously into said moulding cavity.

5. Method according to claim 4 wherein said pumping means include a pressure source on the upstream side of a storage vessel containing said moulding material.

6. Method according to any one of claims 1 to 5 wherein said moulding material is at least in part polymerisable by exposure.

7. Method according to any one of claims 1 to 5 wherein said moulding material is at least in part polymerisable by heat.

8. Method according to any one of claims 1 to 5 wherein said moulding material is polymerisable by exposure and by heat.

9. Method according to any one of claims 1 to 8 wherein said closure member is a sleeve disposed around said moulding shells.

10. Method according to any one of claims 1 to 8 wherein said closure member is formed of two jaws at

least one of which is mobile and which are adapted to enclose said moulding shells.

11. Method according to any one of claims 1 to 8 wherein said closure member is a seal in which said moulding shells are nested.

12. Method according to any one of claims 1 to 8 wherein said closure member is at least in part in one piece with one or both moulding shell(s).

DATED this 8th day of December 1995.

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ABSTRACT

A mould (10) for making an optical lens is formed of two moulding shells (11A, 11B) disposed on edge and an annular closure member (12) around their periphery and defining with them a moulding cavity (13). To fill the mould (10) a moulding material (18) is introduced into the moulding cavity (13) through a casting opening formed to this end in the closure member (12). The casting opening is in the lower part of the moulding cavity (13). Applications include the manufacture of ophthalmic lenses.

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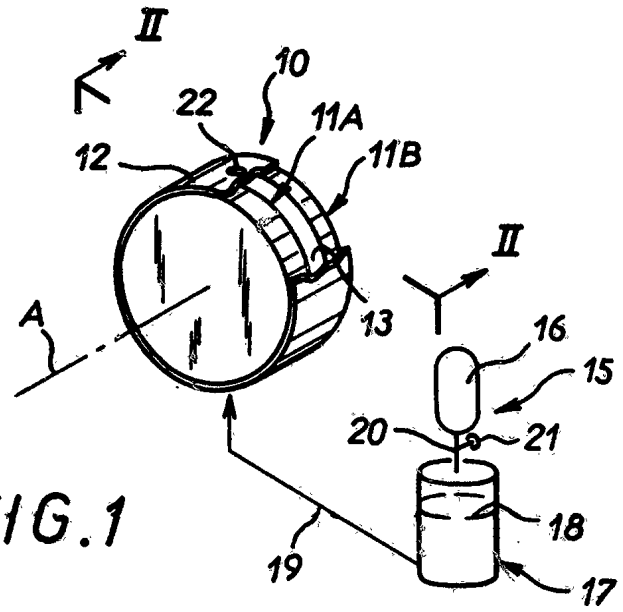

FIG.1

FIG.2

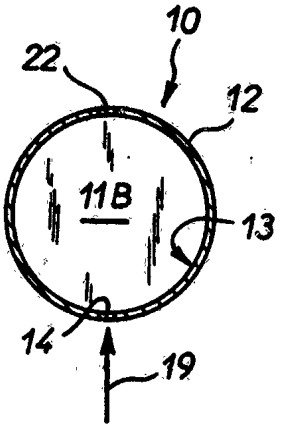

FIG.3