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(54) **METHOD OF SEPARATING EXCESS LENS FORMING MATERIAL FROM A MOLDED OPHTHALMIC LENS AND APPARATUS**

VERFAHREN ZUR ABSCHEIDUNG VON ÜBERSCHÜSSIGEM LINSENFORMUNGSMATERIAL VON EINER GEFORMTEN OPHTHALMISCHEN LINSE UND VORRICHTUNG

PROCÉDÉ PERMETTANT DE SÉPARER L'EXCÉDENT DE MATÉRIAU DE FORMAGE D'UNE LENTILLE OPHTALMIQUE MOULÉE ET DISPOSITIF

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Description

FIELD

[0001] The invention relates to a method of separating excess lens forming material from a molded ophthalmic lens, in particular a contact lens. The invention also relates to an apparatus for carrying out the method.

BACKGROUND

[0002] It is well established in the art to produce ophthalmic lenses, more specifically hard and soft contact lenses, in an automated manufacture process with reusable molds. In mass production of contact lenses, specifically so-called disposable lenses, a large number of contact lenses must be manufactured in a relatively short period of time. In an advantageous method of mass production, a lens forming material, e.g., a polymer or prepolymer solution is introduced into a female mold half, the casting mold is closed by the respective male mold half and then the lens forming material is polymerized and/or cross-linked e.g. with ultraviolet (UV) light. Such mass production of contact lenses, which is usually performed in a closed loop process, is described, e.g., in WO 98/42497. Suitable polymers formed by photochemical polymerization of suitable prepolymers include polymers based on polyvinyl alcohols (PVA) or silicone hydrogels (SiHy) as well as based on polyethylene glycols (PEG).

[0003] During the UV light induced polymerization and/or cross-linking of the lens forming material within the molds the UV light in the respective zones which are outside of the areas required for contact lens production is masked. Thus, due to this spatial limitation of the irradiated UV light only the unmasked portion of the lens forming material in the mold cavity is hardened, whereas excess material e.g. in an overflow region or area of the mold may remain attached to the lens as "flash". In order to obtain fault-free lenses these residues of non-polymerized and/or non-cross-linked lens forming material, the "flash", must be separated from the molded lens. This separation is supported by a proper sealing of the mold halves and by a very careful shaping of the mold separation planes, in particular in the edge region of the mold cavity which defines the lens edge. The automated manufacture process is also called "full mold process" because there is no working of the lens edge required after the molding of the lens.

[0004] In order to separate the flash from the molded lens in a known manufacture process the mold is opened by moving the mold halves away from each other. The non-polymerized and/or non-cross-linked lens forming material is then flushed away from the mold halves with a jet of a flushing medium, usually water or a solvent, such as, e.g., propanol, isopropanol or the like. Subsequently the molded lens is dried, e.g. by subjecting it to a warm air flow. Most lens forming materials during polymerization and/or cross-linking have a tendency to shrink to a certain - small - extent. Because of the shrinkage a negative pressure builds up within the mold cavity which may hamper the opening of the mold such, that an increased effort is required for the opening. During the opening of the mold and during the flushing some of the non-polymerized and/or non-cross-linked material may reach the exposed surface of the molded lens and may adhere thereto and soil the lens. Thus, very thorough surface cleaning steps for the lens surfaces must be provided in subsequent process steps.

[0005] US 5 316 700 A discloses a method according to the preamble of claim 1 and an apparatus according to the preamble of claim 9.

[0006] It is therefore an object of the present invention to provide a method by which excess lens forming material, which is non-polymerized and/or non-cross-linked, may reliably be separated from the molded lens. A soiling of an exposed surface of the molded lens, whether during opening or during flushing of the mold halves, shall be avoided. Further, a method shall be provided which facilitates the opening of the mold.

SUMMARY

[0007] These and still further objects are met by a method separating excess lens forming material from a molded ophthalmic lens, in particular a contact lens, which comprises the steps specified in claim 1. The objects.are also met by an apparatus for carrying out the method the apparatus comprises at least the features claimed in independent apparatus claim 9. Further improvements of the invention and preferred embodiments are subject of the dependent claims.

[0008] The invention provides a method of separating excess lens forming material from a molded ophthalmic lens, in particular a contact lens. After polymerization and/or cross-linking of a lens forming material within a mold cavity of a mold comprising female and male mold halves to form an ophthalmic lens non-polymerized and/or non-cross-linked lens forming material is flushed away from the mold halves with a jet of a fluid flushing medium, such as, for example, water or a solvent or an inert gas. Subsequently the molded lens is dried. The flushing is accomplished with the mold halves being still arranged in the closed position.

[0009] By keeping the female and male mold halves in the closed position during the removal of excess lens forming material the lens surfaces remain covered by respective molding surfaces of the female and male mold halves. Thus, an accidental soiling of an exposed lens surface is reliably avoided. Also drying of the molded lens may be accomplished in the closed mold.

[0010] The flushing medium is injected into a peripheral zone of the mold cavity through a feed channel. Then the flushing medium is discharged through a discharge channel together with the excess lens forming material which is non-polymerized and/or non-cross-linked. The

separation process is straightforward and does not require a specific handling of the mold halves or of the molded lens.

[0011] In order to ensure a proper alignment and sealing of the female and male mold halves, they are axially guided in a guide sleeve. The guide sleeve is provided with feed and discharge ports which are connected with the feed channel and the discharge channel, respectively. At least the feed port may be shaped as a cylindrical bore, so that upon insertion of a conical tip of a corresponding feed line a sealing is accomplished.

[0012] For constructive reasons and in order to facilitate the flushing of the mold the feed channel and the discharge channel are arranged in vicinity of separation planes of the female and male mold halves. The separation planes of the female and male mold halves may be formed by annular shoulders engirding the peripheral zone of the mold cavity.

[0013] For reasons of fluid mechanics the feed channel and the discharge channel are arranged such, that the flushing medium is injected into the peripheral zone of a circumferential portion of the mold cavity tangentially and after being guided around the peripheral zone, for example for about 180°, it is discharged into the discharge channel at an opposite circumferential portion of the mold cavity. With this guidance of the fluid flushing medium the flow resistance is reduced while at the same time enhancing the separation properties.

[0014] In another embodiment of the invention the flushing and separation properties are further optimized by injecting and discharging the flushing medium in directions which extend generally parallel to each other.

[0015] In principle flushing can be accomplished with a gaseous medium. In a practical embodiment of the invention the molded ophthalmic lens, however, is flushed with a liquid flushing medium. The liquid flushing medium may be selected to be water or a solvent, such as, for example, propanol, isopropanol and the like.

[0016] After the flushing the molded lens may be dried by such methods as subjecting it to a heated gas stream, for example by subjecting it to a stream of heated air. In an exemplary embodiment of the invention the heated gas stream is introduced through the same feed channel as the flushing medium and it is discharged through the discharge channel. It is to be noted that the flow of the heated gas stream may also be conducted in the opposite direction, where the gas stream enters the mold through the discharge channel and is expelled through the feed channel.

[0017] In order to facilitate the opening of the mold for removal of the molded lens, after the drying of the molded lens, the discharge channel through which the heated gas stream is discharged, is closed. By prohibiting the expelling of the gas stream for a short period of time, an overpressure is built up which supports or assists in the opening of the mold by moving the female and male mold halves away from each other. The magnitude of the overpressure may be controlled by the volume of the gas stream and/or by the time during which the gas stream is prohibited from exiting the closed mold.

[0018] An apparatus for carrying out the method according to any embodiment of the invention at least comprises a female and a male mold half which, in a closed position, define a mold cavity. The female and male mold halves are guided axially in a guide sleeve. The apparatus comprises a feed channel and a discharge channel which open towards feed port and a discharge port, respectively, at a circumference of the guide sleeve and are in connection with a peripheral zone of the mold cavity.

[0019] For constructive reasons the feed and the discharge channel, respectively, are arranged in vicinity of separation planes of the female and male mold halves.

[0020] In order to enhance the separation properties and further to reduce flow resistance the feed and the discharge channels extend tangentially to the peripheral zone of the mold cavity. The feed channel and the discharge channel open to the peripheral zone of the mold cavity at opposite sides of a circumference of the mold cavity. The separation properties and the flow characteristics of the flush medium may be further enhanced by having the feed and the discharge channels extend in a generally parallel direction.

[0021] To ensure a proper sealing of a feed line for the flushing medium, which is attached to the feed port, the latter is shaped as a cylindrical bore and is adapted such, that upon insertion of a conical tip of a feed line a sealing is achieved. The combination of a conical tip and a cylindrical bore results in a line contact which provides a sufficient sealing even if the two sealing components are not exactly aligned with each other.

[0022] These and still further features and advantages of the invention will become apparent from the following description of an exemplary embodiment thereof, reference being made to the schematic drawings, which are not to scale, in which

BRIEF DESCRIPTION OF THE DRAWINGS

[0023]

Fig. 1 is an axially sectioned view of a mold with female and male mold halves in the closed state and held in a guide sleeve; and

Fig. 2 is a view of another embodiment of a mold sectioned along a horizontal plane including feed and discharge channels.

DETAILED DESCRIPTION

[0024] The following description of an exemplary embodiment of the invention is for illustrative purposes only and is not intended to limit of the scope of the invention, which is defined by the claims.

[0025] The invention is exemplified with reference to

the manufacture of ophthalmic lenses, in particular contact lenses, in a so-called full mold process. In this known automated production process a large number of contact lenses is manufactured with reusable molds in a closed loop process. A number of reusable molds, which each comprise associated female and male mold halves, are usually arranged in side by side configuration in work-trays which are transported consecutively through the individual treatment stations of a production line. The treatment stations comprise a dosing station, in which a lens forming material, usually a prepolymer or polymer solution, is metered into the mold, a polymerization station, in which the lens forming material is polymerized and/or cross-linked. During the UV light induced polymerization and/or cross-linking of the lens forming material within the molds the UV light in the respective zones which are outside of the areas required for contact lens production is masked. Thus, due to this spatial limitation of the irradiated UV light only the unmasked portion of the lens forming material in the mold cavity is hardened, whereas excess material e.g. in an overflow of the mold remains attached to the lens as "flash". In order to obtain fault-free lenses these residues of non-polymerized and/or non-cross-linked lens forming material, the "flash" must be separated from the molded lens.

[0026] The contact lenses are then removed from the molds and transported through an extraction, rinsing and washing station, a hydration station, a lens inspection station, a packaging station, and a sorting and storage station. Suitable lens forming materials include polymers formed by photochemical polymerization of suitable prepolymers include polymers based on polyvinyl alcohols (PVA) or silicone hydrogels (SiHy) as well as based on polyethylene glycols (PEG).

[0027] Fig. 1 shows an axially sectioned view of a typical mold not according to the invention as is used in so-called full mold processes, which is generally designated with reference numeral 1. The mold 1 comprises a female mold half 2 with a first molding surface 5 and a male mold half 3 with a second molding surface 6. In the shown closed state of the mold 1 the first and second molding surfaces 5, 6 delimit a mold cavity 4, which corresponds in shape to that of the ophthalmic lens to be manufactured. First and second annular shoulders 51, 61, which constitute mold separation planes, are abutting each other. At least one of the mold halves 2, 3 is transparent to UV light. Usually the mold halves are made from quartz or glass. The female and male mold halves 2, 3 are held circumferentially in a sliding fit of a guide sleeve 7 which allows a relative axial movement of the two mold halves 2, 3. The guide sleeve 7 in which the mold halves 2, 3 are held in a sliding fit not only serves for an axial guidance of the mold halves 2, 3 but also constitutes a circumferential sealing for the two associated mold halves 2, 3, which is substantially gas tight.

[0028] The mold cavity 4 is shown filled with a lens forming material P. On top of the male mold half 3 there is indicated an annular mask 15 which masks those zones of the mold cavity 4 which are outside of the areas required for contact lens production from irradiation with UV light. Thus, due to this spatial limitation of the irradiated UV light only the unmasked portion of the lens forming material P in the mold cavity 4 is hardened, whereas excess material e.g. in an overflow of the mold remains attached to the lens as "flash".

[0029] For removing flash, i.e. the excess lens forming material P which has not been polymerized and/or cross-linked, the mold is provided with a feed channel 8 and with a discharge channel 9 which both extend in vicinity of the first and second annular shoulders 51, 61 which constitute the separation planes of the mold 1. In the embodiment shown in Fig. 1 the feed and the discharge channels 8, 9 extend about radially in the female mold half 2. The feed and the discharge channels 8, 9 open towards the mold cavity in a peripheral zone of the mold cavity. They are connected with a feed port 10 and a discharge port 11, respectively, extending through the guide sleeve 7. At least the feed port 10 is adapted to sealingly receive a conical tip 12 of a feed line. For that purpose the feed port 10 has the shape of a cylindrical bore. When the conical tip 12 of the feed line is inserted into the cylindrically shaped feed port 10, a line contact is established, which seals, even if the two sealing partners - tip 12 and feed port 10 - are not in exact axial alignment. By a proper selection of the materials for the tip of the feed line and for the guide sleeve wear of the sealing partners can be reduced to a minimum. According to the example depicted in Fig. 1 the discharge port 11 is cylindrically shaped, too. Correspondingly, a discharge line with a conical tip 13 may be inserted sealingly into the discharge port 11.

[0030] To remove the excess lens forming material a flushing medium is used. As stated, in principle the flushing medium can be gaseous, although a liquid flushing medium such as water or solvents such as, for example, propanol, isopropanol and the like may be more desirably used. The flushing medium is injected into the peripheral zone of the mold cavity 4 through the feed channel 8, and separates the non-polymerized and/or non-cross-linked lens forming material from the formed lens. The flushing medium is injected into the mold cavity 4, e.g., with a pressure sufficient to remove or wash off the non-polymerized lens forming material, for example with a pressure of about 1 bar to about 5 bar. The flushing medium and the separated non-polymerized and/or non-cross-linked lens forming material are then discharged from the mold through the discharge channel 9 and the attached discharge line. The directions of feed and discharging the flushing medium run about parallel to each other into the same direction. After the separation from the flash, the formed lens is dried. For that purpose a heated gas, such as, e.g., heated air, is injected through the feed channel 8 into the mold 1 and discharged through the discharge channel 9 or vice versa.

[0031] At the end of the drying process for a certain short period of time the discharge of the heated gas may

desirably prohibited by closing the discharge port. During that period of time an overpressure is built up within the mold 1, which facilitates the opening of the mold 1. The magnitude of the overpressure may be controlled by the volume of the gas stream and/or by the time during which the gas stream is prohibited from exiting the closed mold.

[0032] The embodiment according to the invention of a mold shown in Fig. 2 is of a very similar construction to that of Fig. 1. Therefore, like components are designated with like reference numerals. The mold is generally designated with reference numeral 21 and is shown in a cross sectional view along a horizontal section plane which includes feed and discharge channels which are designated with reference numerals 28 and 29, respectively. The mold comprises female and male mold halves 2, 3, which are guided in the sliding fit of a guide sleeve 7. The mold cavity 4 is shown filled with a lens forming material P. The embodiment according to Fig. 2 distinguishes from Fig. 1 in the arrangement of the feed and discharge channels 28, 29. More specifically, for reasons of fluid mechanics the feed and the discharge channels 28, 29 extend tangent to the peripheral zone of the mold cavity 4 and are spaced from each other an angular distance of about 180° such, that they open into the mold cavity 4 at opposite circumferential portions thereof. With this guidance of the fluid flushing medium the flow resistance is reduced while at the same time enhancing the separation properties.

Claims

1. Method of separating excess lens forming material from a molded ophthalmic lens, wherein after polymerization and/or cross-linking of the lens forming material (P) within a mold cavity (4) of a mold comprising female and male mold halves (2, 3) to form an ophthalmic lens non-polymerized and/or non-cross-linked lens forming material is flushed away from the mold halves (2, 3) with a jet of a fluid flushing medium and subsequently the molded lens is dried, wherein the flushing is accomplished with the mold halves (2, 3) being still arranged in a closed position, wherein for the flushing of the mold halves (2, 3) the flushing medium is injected into a peripheral zone of the mold cavity (4) through a feed channel (28), and wherein the flushing medium together with the excess lens forming material is discharged through a discharge channel (29), **characterized in that** the female and male mold halves (2, 3) are axially guided in a guide sleeve (7) and wherein the guide sleeve is provided with feed and discharge ports (10, 11) which communicate with the feed channel (28) and the discharge channel (29), respectively, and **in that** the feed channel (28) and the discharge channel (29) are arranged such, that the flushing medium is injected through the feed channel (28) into the peripheral zone of the mold cavity (4) tangentially and after being guided around the peripheral zone is discharged into the discharge channel (29) at an opposite circumferential portion of the mold cavity (4).

2. Method according to claim 1, wherein the feed channel (8; 28) and the discharge channel (9; 29) are arranged in vicinity of separation planes (51, 61) of the female and male mold halves (2, 3).

3. Method according to any one of claims 1 or 2, wherein the flushing medium is injected and discharged in directions which extend parallel to each other.

4. Method according to any one of the preceding claims, wherein the molded ophthalmic lens is flushed with a liquid flushing medium.

5. Method according to any one of claims 1 to 4, wherein after flushing the molded lens is dried by subjecting it to a heated gas stream, which is introduced through the feed channel (28) and discharged through the discharge channel (29).

6. Method according to claim 5, wherein after the drying of the molded lens the discharge channel (29) through which the heated gas stream is discharged, is closed and subsequently the mold (1) is opened by moving the female and male mold halves (2, 3) away from each other.

7. Method according to claim 5, wherein the heated gas stream is a stream of heated air.

8. Method according to claim 1, wherein the molded ophthalmic lens is a contact lens.

9. Apparatus for carrying out the method according to any one of the preceding claims, comprising a female and a male mold half (2, 3) which in a closed position define a mold cavity (4) the apparatus comprising a feed channel (28) and a discharge channel (29), wherein the feed channel (28) and the discharge channel (29) open to the peripheral zone of the mold cavity (4) at opposite sides of a circumference of the mold cavity (4), **characterized in that** the female and male mold halves are guided axially in a guide sleeve (7), wherein the feed channel (28) and the discharge channel (29) open towards a feed port (10) and a discharge port (11), respectively, at a circumference of the guide sleeve (7) and are in connection with a peripheral zone of the mold cavity (4), and wherein the feed channel (28) and the discharge channel (29) extend substantially tangentially to the peripheral zone of the mold cavity (4).

10. Apparatus according to claim 9, wherein the feed channel (28) and the discharge channel (29), respectively, are arranged in vicinity of separation planes

of the female and male mold halves (2, 3).

11. Apparatus according to any one of claims 9 to 10, wherein the feed channel (8, 28) and the discharge channel (9, 29) extend in a parallel direction.

12. Apparatus according to any one of claims 9 to 11, wherein at least the feed port (10) has a cylindrical shape and is adapted such, that upon insertion of a conical tip (12) of a feed line a sealing is achieved.

Patentansprüche

1. Verfahren zur Abscheidung von überschüssigem Linsenformungsmaterial von einer geformten ophthalmischen Linse, wobei nach der Polymerisation und/oder dem Vernetzen des Linsenformungsmaterials (P) innerhalb eines Formhohlraums (4) einer Form umfassend eine weiblichen und eine männliche Formhälfte (2, 3) zum Ausbilden einer ophthalmischen Linse unpolymerisiertes und/oder unvernetztes Linsenformungsmaterial von den Formhälften (2, 3) mit einem Strahl eines fluiden Spülmediums weggespült wird und danach die geformte Linse getrocknet wird, wobei das Spülen mit den immer noch in einer geschlossenen Position angeordneten Formhälften (2, 3) bewerkstelligt wird, wobei für das Spülen der Formhälften (2, 3) das Spülmedium durch einen Zuführkanal (28) in eine periphere Zone des Formhohlraums (4) injiziert wird, und wobei das Spülmedium zusammen mit dem überschüssigen Linsenformungsmaterial durch einen Abführkanal (29) abgeleitet wird, **dadurch gekennzeichnet, dass** die weibliche und die männliche Formhälfte (2, 3) axial in einer Führungshülse (7) geführt sind und wobei die Führungshülse mit Zuführ- und Abführöffnungen (10, 11) versehen ist, die mit dem Zuführkanal (28) bzw. dem Abführkanal (29) kommunizieren, und dass der Zuführkanal (28) und der Abführkanal (29) derart angeordnet sind, dass das Spülmedium durch den Zuführkanal (28) tangential in die periphere Zone des Formhohlraums (4) injiziert wird und, nachdem es um die periphere Zone geführt worden ist, an einem entgegengesetzten Umfangsabschnitt des Formhohlraums (4) in den Abführkanal (29) a abgeleitet wird.

2. Verfahren nach Anspruch 1, wobei der Zuführkanal (8; 28) und der Abführkanal (9; 29) in der Nähe von Trennebenen (51, 61) der weiblichen und der männlichen Formhälfte (2, 3) angeordnet sind.

3. Verfahren nach einem der Ansprüche 1 oder 2, wobei das Spülmedium in Richtungen injiziert und abgeleitet wird, die sich parallel zueinander erstrecken.

4. Verfahren nach einem der vorangehenden Ansprüche, wobei die geformte ophthalmische Linse mit einem flüssigen Spülmedium gespült wird.

5. Verfahren nach einem der Ansprüche 1 bis 4, wobei die geformte Linse nach dem Spülen getrocknet wird, indem sie einem erhitzten Gasstrom ausgesetzt wird, der durch den Zuführkanal (28) eingeleitet und durch den Abführkanal (29) abgeleitet wird.

6. Verfahren nach Anspruch 5, wobei nach dem Trocknen der geformten Linse der Abführkanal (29), durch den der erhitzte Gasstrom abgeleitet wird, geschlossen wird und danach die Form (1) geöffnet wird durch Bewegen der männlichen und weiblichen Formhälften (2, 3) weg voneinander.

7. Verfahren nach Anspruch 5, wobei der erhitzte Gasstrom ein Strom erhitzter Luft ist.

8. Verfahren nach Anspruch 1, wobei die geformte ophthalmische Linse eine Kontaktlinse ist.

9. Vorrichtung zum Ausführen des Verfahrens nach einem der vorhergehenden Ansprüche, umfassend eine weibliche und eine männliche Formhälfte (2, 3), die in einer geschlossenen Position einen Formhohlraum (4) definieren, wobei die Vorrichtung einen Zuführkanal (28) und einen Abführkanal (29) umfasst, wobei der Zuführkanal (28) und der Abführkanal (29) auf entgegengesetzten Seiten eines Umfangs des Formhohlraums (4) zur peripheren Zone des Formhohlraums (4) offen sind, **dadurch gekennzeichnet, dass** die weibliche und die männliche Formhälfte axial in einer Führungshülse (7) geführt sind, wobei der Zuführkanal (28) und der Abführkanal (29) zu einer Zuführöffnung (10) bzw. einer Abführöffnung (11) an einem Umfang der Führungshülse (7) offen sind und in Verbindung mit einer peripheren Zone des Formhohlraums (4) stehen, und wobei sich der Zuführkanal (28) und der Abführkanal (29) im Wesentlichen tangential zur peripheren Zone des Formhohlraums (4) erstrecken.

10. Vorrichtung nach Anspruch 9, wobei der Zuführkanal (28) bzw. der Abführkanal (29) in der Nähe von Trennebenen der weiblichen und der männlichen Formhälfte (2, 3) angeordnet sind.

11. Vorrichtung nach einem der Ansprüche 9 bis 10, wobei sich der Zuführkanal (8, 28) und der Abführkanal (9, 29) in einer parallelen Richtung erstrecken.

12. Vorrichtung nach einem der Ansprüche 9 bis 11, wobei mindestens die Zuführöffnung (10) eine zylindrische Form und derart ausgelegt ist, dass beim Einführen einer konischen Spitze (12) einer Speiseleitung eine Abdichtung erzielt wird.

Revendications

1. Procédé de séparation de matériau excédentaire de formation de lentille d'une lentille ophtalmique moulée, dans lequel, après polymérisation et/ou réticulation du matériau de formation de lentille (P) dans une cavité de moule (4) d'un moule comprenant des demi-moules femelle et mâle (2, 3) destiné à former une lentille ophtalmique, un matériau de formation de lentille non polymérisé et/ou non réticulé est rincé des demi-moules (2, 3) avec un jet d'agent de rinçage fluide, puis la lentille moulée est séchée, où le rinçage est effectué avec les demi-moules (2, 3) étant toujours disposés dans une position fermée où, pour le rinçage des demi-moules (2, 3), l'agent de rinçage est injecté dans une zone périphérique de la cavité de moule (4) à travers un canal d'alimentation (28), et dans lequel l'agent de rinçage ensemble avec le matériau excédentaire de formation de lentille est refoulé à travers un canal de refoulement (29), **caractérisé en ce que** les demi-moules femelle et mâle (2, 3) sont guidés axialement dans un manchon de guidage (7) et **en ce que** le manchon de guidage est muni d'orifices d'alimentation et de refoulement (10, 11) qui communiquent respectivement avec le canal d'alimentation (28) et le canal de refoulement (29), et **en ce que** le canal d'alimentation (28) et le canal de refoulement (29) sont disposés de sorte que l'agent de rinçage soit injecté à travers le canal d'alimentation (28) dans la zone périphérique de la cavité de moule (4) de manière tangentielle et, après avoir été guidé autour de la zone périphérique, il soit refoulé dans le canal de refoulement (29) au niveau d'une partie circonférentielle opposée de la cavité de moule (4).

2. Procédé selon la revendication 1, dans lequel le canal d'alimentation (8 ; 28) et le canal de refoulement (9 ; 29) sont disposés dans le voisinage de plans de séparation (51, 61) des demi-moules femelle et mâle (2, 3) .

3. Procédé selon l'une quelconque des revendications 1 ou 2, dans lequel l'agent de rinçage est injecté et refoulé dans des directions qui s'étendent parallèlement l'une à l'autre.

4. Procédé selon l'une quelconque des revendications précédentes, dans lequel la lentille ophtalmique moulée est rincée avec un agent de rinçage liquide.

5. Procédé selon l'une quelconque des revendications 1 à 4, dans lequel, après rinçage, la lentille moulée est séchée en la soumettant à un flux gazeux chauffé qui est introduit à travers le canal d'alimentation (28) et qui est refoulé à travers le canal de refoulement (29).

6. Procédé selon la revendication 5, dans lequel, après le séchage de la lentille moulée, le canal de refoulement (29) à travers lequel le flux gazeux chauffé est refoulé, est fermé, puis le moule (1) est ouvert en écartant les demi-moules femelle et mâle (2, 3) l'un de l'autre.

7. Procédé selon la revendication 5, dans lequel le flux gazeux chauffé est un flux d'air chauffé.

8. Procédé selon la revendication 1, dans lequel la lentille ophtalmique moulée est une lentille de contact.

9. Appareil pour exécuter le procédé selon l'une quelconque des revendications précédentes, comprenant des demi-moules femelle et mâle (2, 3) qui, en position fermée, définissent une cavité de moule (4), l'appareil comprenant un canal d'alimentation (28) et un canal de refoulement (29), dans lequel le canal d'alimentation (28) et le canal de refoulement (29) s'ouvrent au niveau de la zone périphérique de la cavité de moule (4) au niveau de côtés opposés d'une circonférence de la cavité de moule (4), **caractérisé en ce que** les demi-moules femelle et mâle sont guidés axialement dans un manchon de guidage (7), **en ce que** le canal d'alimentation (28) et le canal de refoulement (29) débouchent respectivement sur un orifice d'alimentation (10) et un orifice de refoulement (11), au niveau d'une circonférence du manchon de guidage (7) et sont connectés avec une zone périphérique de la cavité de moule (4), et **en ce que** le canal d'alimentation (28) et le canal de refoulement (29) s'étendent de manière sensiblement tangentielle à la zone périphérique de la cavité de moule (4).

10. Appareil selon la revendication 9, dans lequel le canal d'alimentation (28) et le canal de refoulement (29) sont respectivement disposés au voisinage de plans de séparation des demi-moules femelle et mâle (2, 3).

11. Appareil selon l'une quelconque des revendications 9 à 10, dans lequel le canal d'alimentation (8, 28) et le canal de refoulement (9, 29) s'étendent dans une direction parallèle.

12. Appareil selon l'une quelconque des revendications 9 à 11, dans lequel au moins l'orifice d'alimentation (10) a une forme cylindrique et est adapté de telle sorte que, lors de l'insertion d'une pointe conique (12) d'une conduite d'amenée, une étanchéité soit réalisée.

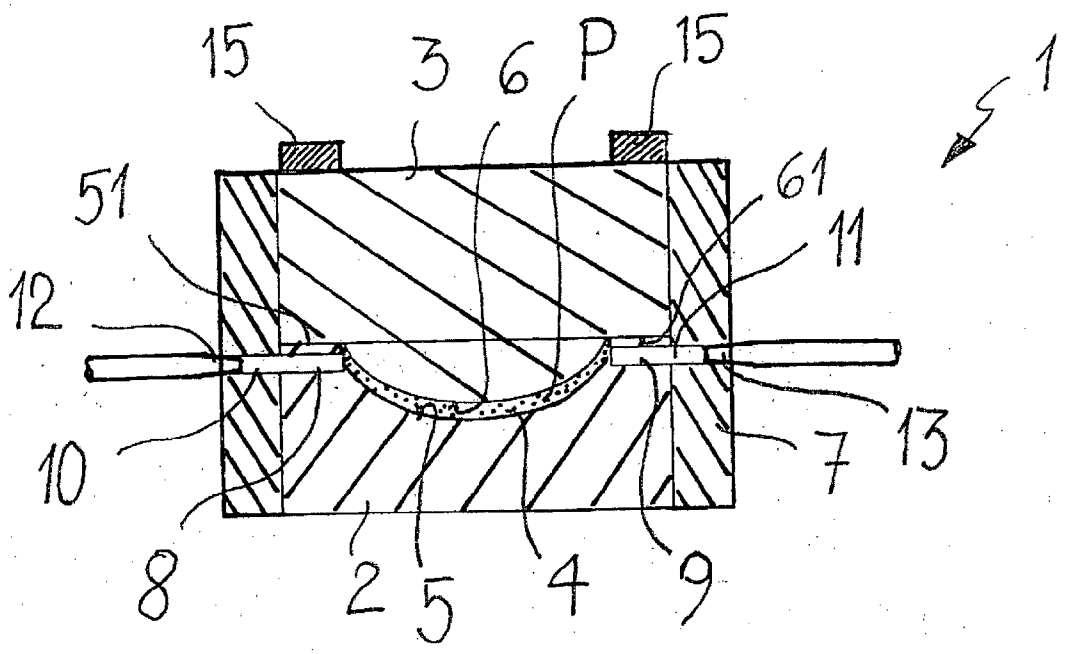

Fig. 1

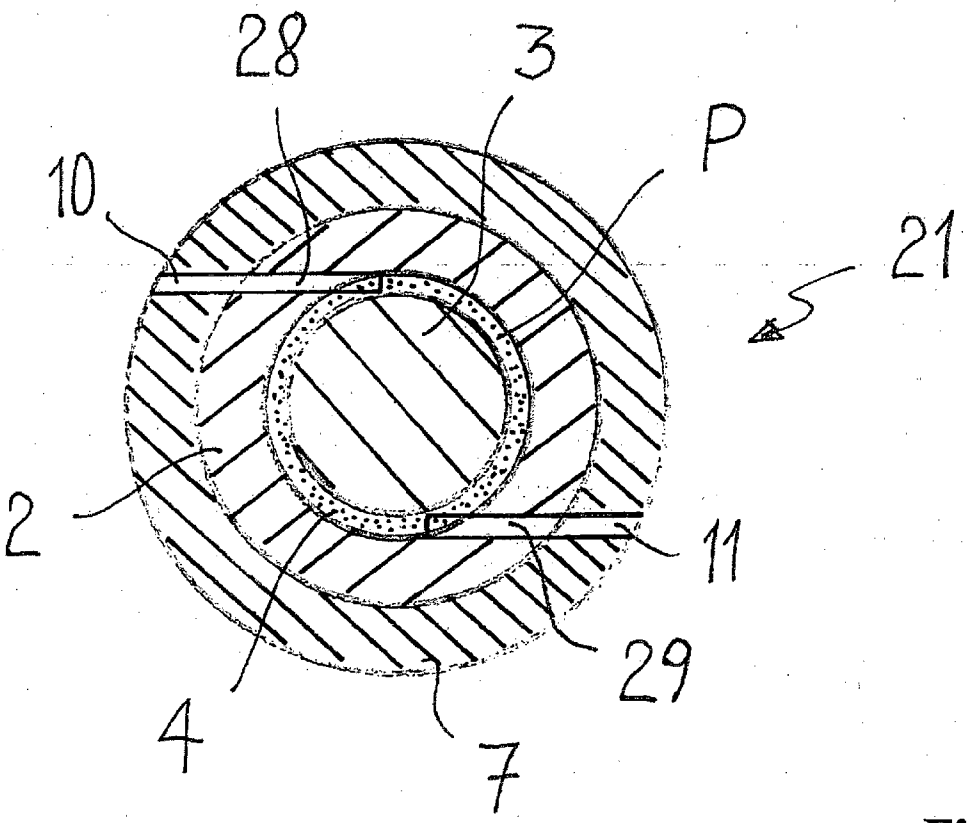

Fig. 2

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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- US 5316700 A **[0005]**

SZTNH-100029168

ELJÁRÁS TÖBBLET LENCSEKÉPZŐ ANYAG FORMÁZOTT SZEMÉSZETI LENCSÉRŐL VALÓ LEVÁLASZTÁSÁRA, VALAMINT BERENDEZÉS

Szabadalmi igénypontok

1. Eljárás többlet lencseképző anyag formázott szemészeti lencséről való leválasztására, ahol szemészeti lencse létrehozásához lencseképező anyag (P) anya és apa szerszámfelet (2, 3) tartalmazó szerszám szerszámüregében (4) történő polimerizációját és/vagy térhálósodását követően a nem polimerizálódott és/vagy nem térhálósodott lencseképző anyagot a szerszámfelekről (2, 3) folyékony lemosóközeg-sugárral lemossuk, és ezt követően a formázott lencsét megszárítjuk, ahol a lemosást még a szerszámfelek (2, 3) zárt helyzetében végezzük el, ahol a szerszámfelek (2, 3) lemosásához a lemosóközeget bevezetőcsatornán (28) át a szerszámüreg (4) külső tartományába fecskendezzük, továbbá ahol a lemosóközeget a többlet lencseképző anyaggal együtt ürítőcsatornán (29) át ürítjük, **azzal jellemezve**, hogy az anya és apa szerszámfeleket (2, 3) megvezetőperselyben (7) tengelyirányban megvezetjük, ahol a megvezetőpersely bevezető- és ürítőnyílásokkal (10, 11) van ellátva, melyek rendre a bevezetőcsatornával (28) és az ürítőcsatornával (29) közlekednek, **továbbá** a bevezetőcsatorna (28) és az ürítőcsatorna (29) úgy vannak elrendezve, hogy a lemosóközeget a szerszámüreg (4) külső tartományába a bevezetőcsatornán (28) át érintőirányban fecskendezzük be és a külső tartományban való körülvezetést követően a szerszámüreg (4) szemközti kerületi részén az ürítőcsatornába (29) ürítjük.

2. Az 1. igénypont szerinti eljárás, ahol a bevezetőcsatorna (8; 28) és az ürítőcsatorna (9; 29) az anya és apa szerszámfelek (2, 3) elválasztási síkjainak (51, 61) közelében vannak elrendezve.

3. Az 1. vagy a 2. igénypont szerinti eljárás, ahol a lemosóközeget egymással párhuzamos irányokban fecskendezzük be és vezetjük el.

4. Az előző igénypontok bármelyike szerinti eljárás, ahol a formázott szemészeti lencsét folyékony lemosóközeggel lemossuk.

5. Az 1-4. igénypontok bármelyike szerinti eljárás, ahol a formázott lencsét a lemosást követően fűtött gázáramnak alávetve szárítjuk, amit a bevezetőcsatornán (28) át vezetünk be és az ürítőcsatornán (29) át vezetünk el.

6. Az 5. igénypont szerinti eljárás, ahol a formázott lencse szárítását követően a fűtött gázáram elvezetésére használt ürítőcsatornát (29) zárjuk, és ezt követően az apa és anya szerszámfeleket (2, 3) egymástól eltávolítva a szerszámot (1) nyitjuk.

7. Az 5. igénypont szerinti eljárás, ahol a fűtött gázáramként fűtött légáramot használunk.

8. Az 1. igénypont szerinti eljárás, ahol a formázott szemészeti lencse kontaktlencse.

9. Berendezés az előző igénypontok bármelyike szerinti eljárás foganatosítására, amely tartalmaz anya és apa szerszámfelet (2, 3), melyek zárt helyzetben szerszámüreget (4) képeznek, a berendezés tartalmaz bevezetőcsatornát (28) és ürítőcsatornát (29), ahol a bevezetőcsatorna (28) és az ürítőcsatorna (29) a szerszámüreg (4) kerületének szemközti oldalain a szerszámüreg (4) külső tartományába nyílnak, **azzal jellemezve**, hogy

az anya és apa szerszámfelek tengelyirányban megvezetőperselyben (7) vannak megvezetve, ahol a bevezetőcsatorna (28) és az ürítőcsatorna (29) a megvezetőpersely (7) kerületénél rendre bevezetőnyílásba (10) és ürítőnyílásba (11) nyílnak, továbbá a szerszámüreg (4) külső tartományával közlekednek, ahol a bevezetőcsatorna (28) és az ürítőcsatorna (29) a szerszámüreg (4) külső tartományához képest lényegében érintőirányban terjednek.

10. A 9. igénypont szerinti berendezés, ahol a bevezetőcsatorna (28) és az ürítőcsatorna (29) rendre az anya és apa szerszámfelek (2, 3) elválasztási síkjainak közelében vannak elrendezve.

11. A 9. vagy a 10. igénypont szerinti berendezés, ahol a bevezetőcsatorna (8, 28) és az ürítőcsatorna (9, 29) párhuzamosan terjednek.

12. A 9-11. igénypontok bármelyike szerinti berendezés, ahol legalább a bevezetőnyílás (10) henger alakú és olyan módon van kiképezve, hogy tápvezeték kúpos csúcsának (12) behelyezésekor tömítés jön létre.