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(54) **ARRANGEMENT FOR A SPECTACLE LENS BLOCKING SYSTEM, CALIBRATION CYLINDER, METHOD FOR CALI-BRATING A SPECTACLE LENS BLOCKINGS SYSTEM, METHOD OF MANUFACTURING A SPECTACLE LENS AND COMPUTER PROGRAM PRODUCT**

(57) The present invention relates to relates to the field of manufacturing spectacle lenses and in particular to an arrangement (2) for a spectacle lens blocking system configured for blocking a lens blank (10), the arrangement (2) comprising: a block nest (30) comprising a receptacle (31) configured for receiving a blocking piece (20), wherein a tilt angle of the block nest (30) is adjustable; and a calibration cylinder (40), wherein a contact surface (42) of the of the calibration cylinder is adapted to a shape of the receptacle (31) at least at a reference surface (32) of the receptacle indicative of the tilt angle of the block nest (30), and wherein the calibration cylinder (40) comprises an inclination sensor (43) configured for determining the tilt angle of the block nest (30). Further, a calibration cylinder for an arrangement for a spectacle lens blocking system, a method for calibrating a spectacle lens blocking system, a method of manufacturing a spectacle lens and a computer program product are provided.

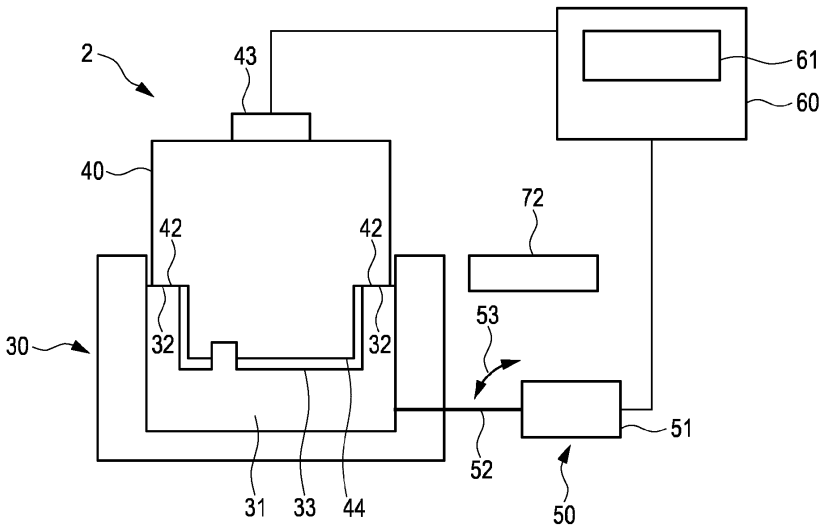

Fig. 5

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to the field of manufacturing spectacle lenses. More precisely, the present invention relates to an arrangement for a spectacle lens blocking system configured for blocking a lens blank. Further, a calibration cylinder for an arrangement for a spectacle lens blocking system, a method for calibrating a spectacle lens blocking system, a method of manufacturing a spectacle lens and a computer program product are provided.

BACKGROUND OF THE INVENTION

[0002] For an industrial mass production of spectacle lenses made of plastic materials or mineral glass, particularly for spectacle lenses having a freeform surface, the lens blanks are blocked to a blocking piece using a device or system, which may be referred to as a blocking device or blocking system, separate from the machining device for grinding or cutting the lens blanks. Blocking the lens blank is necessary to fixate the lens blank in a defined position and in a mechanically resilient manner sustaining the milling or grinding process for individualizing the refractive power of the lens blank. The blocking piece, to which a lens blank is blocked, allows clamping the lens blank via the blocking piece in a form-fitting and/or force-fitting manner to the grinding or cutting machine.

[0003] The lens blank is attached to the blocking piece using a metallic alloy having a low melting temperature. The lens blank is positioned relative to the blocking piece with the finished front surface of the lens blank facing the blocking piece such that the surface normal of the lens blank and the surface normal of the blocking piece are positioned in a predetermined angle, also referred to as tilt angle, relative to each other and the space in between the blocking piece and the front surface of the lens blank is filled with the liquid metallic alloy. The space filled by the alloy may thus not only used for attaching the lens blank to the blocking piece but also for a defined variation of the geometry. The tilt angle can be provided by tilting a block nest of the blocking system. The block nest comprises a receptacle configured for receiving the blocking piece. The blocking system can comprise an actuator for adjusting a tilt angle of the block nest. Different tilt angles of the block nest and thus of the blocking piece with respect to the lens blank can be provided. This provides an advantageous additional degree of freedom in the lens manufacturing process. In particular an appropriate tilt angle can facilitate the machining process of the back surface, thereby increasing the output, reducing cost and providing more flexibility in particular in the manufacturing of high-quality freeform lenses.

[0004] Afterwards, the blocking piece is typically chilled by a cooling device integrated into the blocking device to harden the metallic alloy and by this to fixate the lens blank to the blocking piece. This blocking method may be carried out manually or in an automated manner. After the metallic alloy is hardened, the blocking piece and the lens blank attached to it may be removed from the blocking device.

[0005] After the blocking step, the following manufacturing steps are typically carried out on the blocked lens blank: cutting the marginal contour of the spectacle lens, milling the intended refractive power into the back surface of the lens blank, polishing the milled surface by a polishing device, into which the blocked lens blank is inserted, and applying signature marks at the optical surface allowing an exact positioning of the optical surface.

[0006] Finally, the finished spectacle lens is removed from the blocking piece. In case of a metallic alloy used for blocking, the metallic alloy is heated, molten and submitted to a recycling process.

[0007] As an alternative to a spectacle lens blocking system using a low melting alloy, WO 2022/162100 A1 discloses a blocking piece and method for vacuum blocking a lens blank.

[0008] EP 1738869 A1 discloses a spectacle lens manufacturing method and spectacle lens manufacturing system. This disclosure aims to reduce the types of blanks such as a semi-finished lens blank, materials, and processing time. A spectacle lens design device disposed at a factory on a manufacturing side and a lens processing device connected thereto block an applicable semifinished lens blank or lens blank so that a reference surface thereof tilts at a predetermined angle using a numerical-control curve generator based on order information sent from an order terminal disposed at an spectacle store on an order-placement side, and form both surfaces of a plastic material so that a geometric center of an edge shape positions at a center of a circle of a circular lens to thereby satisfy an optical specification of the spectacle lens-related to the order, and next, the circular lens is processed to have the edge shape of the spectacle lens-related to the order to thereby obtain the spectacle lens-related to the order.

[0009] EP 1738869 A1 teaches that a lens blank can be blocked at a tilt angle with respect to the blocking piece, as shown therein in Fig. 9. After blocking but before processing a surface of the lens blank, EP 1738869 A1 teaches to perform a measurement of the lens tilt in blocked state, wherein in order to recognize the position (tilt) of the lens in the state fitted to the lens polishing device, the positions at predetermined three points at least of the surface or the rear surface of the lens are measured. Based on these at least three surface measurements of each lens the operation of the lens polishing device is adapted.

[0010] The inventors found that, while the approach of processing a tilted lens can be advantageous, a drawback of the solution described in EP 1738869 A1 with the additional at least three surface measurements for each

blocked lens to be processed is that the solution described therein is rather complex and time consuming.

SUMMARY OF THE INVENTION

[0011] It is an object of the present invention to provide to further improve the manufacturing of spectacle lenses. In particular, it would be advantageous to further improve a blocking of spectacle lenses. It would be desirable to provide an arrangement for a spectacle lens blocking system configured for blocking a lens blank, which may improve a throughput in high precision lens manufacturing in cases wherein the lens blank and blocking piece are positioned in a predetermined tilt angle during lens blocking. In particular it would be desirable to allow lens blocking at a tilt angle with high accuracy, so as to overcome the need for at least three subsequent surface measurements for each lens to be processed.

[0012] To better address one or more of these concerns, according to a first aspect of the invention, an arrangement for a spectacle lens blocking system configured for blocking a lens blank is provided, the arrangement comprising:

- a block nest comprising a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable;
- a calibration cylinder, wherein a contact surface of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the calibration cylinder comprises an inclination sensor configured for determining the tilt angle of the block nest. The arrangement can comprise an actuator configured for adjusting the tilt angle of the block nest.

[0013] According to a further aspect, a calibration cylinder for an arrangement for a spectacle lens blocking system configured for blocking a lens blank is provided, wherein a shape of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the calibration cylinder comprises an inclination sensor configured for determining the tilt angle of the block nest. Such a calibration cylinder may be provided for retrofitting already existing spectacle lens blocking systems with a block nest comprising a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable.

[0014] According to a further aspect, a method is provided for calibrating a spectacle lens blocking system with an arrangement, the arrangement comprising a block nest comprising a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable; and a calibration cylinder, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the calibration cylinder comprises an inclination sensor configured for determining the tilt angle of the block nest; the method comprising the steps of:

- inserting the calibration cylinder into the receptacle of the block nest, wherein the contact surface of the calibration cylinder is in contact with the reference surface of the receptacle indicative of the tilt angle of the block nest;
- determining the tilt angle of the block nest using the inclination sensor of the calibration cylinder. In an optional preceding step, the calibration cylinder may undergo a pre-calibration by placing the calibration cylinder with the inclination sensor on a known levelled surface, in particular a levelled surface with an inclination angle of 0°.

[0015] According to a further aspect, a method of manufacturing a spectacle lens is provided, the method comprising the steps of:

- calibrating a spectacle lens blocking system with an arrangement comprising a block nest comprising a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable; and a calibration cylinder, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the calibration cylinder comprises an inclination sensor configured for determining the tilt angle of the block nest; the calibrating comprising the steps of:
  - inserting the calibration cylinder into the receptacle of the block nest, wherein the contact surface of the calibration cylinder is in contact with the reference surface of the receptacle indicative of the tilt angle of the block nest;
  - determining the tilt angle of the block nest using the inclination sensor of the calibration cylinder;
  - removing the calibration cylinder after determining the tilt angle of the block nest; and
- blocking the spectacle lens with the lens blocking system and machining a surface of the spectacle lens.

[0016] According to a further aspect, a computer program product is provided comprising instructions which, when the program is executed by a computer, cause the computer to carry out the steps of

- obtaining data indicative of a first tilt angle of a block nest set of an arrangement for a spectacle lens blocking system configured for blocking a lens blank, wherein the block nest comprises a receptacle con-

figured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable;

- obtaining data indicative of a second tilt angle of the block nest determined by an inclination sensor of a calibration cylinder of the arrangement for a spectacle lens blocking system configured for blocking a lens blank, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the contact surface of the calibration cylinder is in contact with the reference surface for obtaining the data indicative of the second tilt angle;

- calibrating the first tilt angle of the block nest based on the second tilt angle. The first tilt angle can also be referred to as a set tilt angle and can be a tilt angle set by an actuator of the arrangement for the spectacle lens blocking system. The second tilt angle can also be referred to as a measured tilt angle and can be a tilt angle measured by the inclination sensor of the calibration cylinder.

[0017] According to a further aspect, there is provided a machine-readable storage medium having stored thereon a computer program comprising program code means for carrying out the steps of the computer program product or one of its refinements.

[0018] As used herein "obtaining data" can refer to receiving or retrieving data provided by one or more sensors, even though the sensor hardware as such is not part of the claimed computer program product, and data processing can be performed by a computer according to instructions of the computer program product.

[0019] Preferred embodiments of the invention are defined in the dependent claims. It shall be understood that the claimed arrangement, calibration cylinder, method for calibrating a spectacle lens blocking system, method for manufacturing a spectacle lens, computer program and medium can have similar and/or identical refinements or preferred embodiments as the claimed arrangement for a spectacle lens blocking system configured for blocking a lens blank, in particular as defined in the dependent claims and as disclosed herein.

[0020] The inventors have recognized that even slight inaccuracies of a tilt angle of the block nest may lead to quality impairments of the manufactured spectacle lens. While such inaccuracies may have been tolerated in conventional spectacle lenses, it has been found that with modern-day high-accuracy freeform manufacturing equipment, an inaccuracy of the tilt angle of the block nest may no longer be a negligible contribution. Incorrect tilting of the block nest may result in a defect in the finished lens.

[0021] Moreover, the inventors recognized that in order to provide highest quality spectacle lenses, a one-time calibration of the tilt angle of the block nest in the lens blocking system may not be sufficient. Hence, it would be desirable to provide an arrangement that allows time-efficient recalibrations during manufacturing.

[0022] A highly accurate approach for calibration of a block nest of a lens blocking system is tactile calibration with the use of a device comprising a spacer and a conventional depth gauge. A tilt angle of the block nest may be set in a levelled or 0° position, for example with the use of an actuator for adjusting a tilt angle of the block nest. During the calibration process, the device with the depth gauge may be positioned on a support surface which is used for receiving the lens blank during the blocking process. The device may be rotated on the support surface and the depth gauge measures a distance to a reference surface of the receptacle of the block nest, for example a circumferential reference surface or reference ridge. If the tilt angle of the block nest is perfectly aligned with respect to the support surface for receiving the lens blank, a 360° rotation of the device will not result in height differences of the depth gauge. However, if the tilt-angle is misaligned, a height difference between the reference surface of the receptacle of the block nest and the support surface will vary with rotation.

[0023] While a misalignment can be detected with this approach and can also be corrected, the inventors found that it is rather time consuming. The tilt angle of the block nest may be adapted to be changed in two directions, for example in an x-axis and a y-axis, which may be arranged at an angle of 90° with respect to each other. The 360° rotation of the depth gauge may cross said two axes. If the settings of one of the two tilt axis is changed during calibration, the misalignment may have to be checked again by performing another 360° rotation for measuring height deviations with the depth gauge. A rotation of the device with depth gauge may not allow to determine at first glance which adjustment of both axis is required to compensate a misalignment such that an iterative calibration may be required. Such an iterative procedure with a conventional depth gauge is time-consuming and complex. It is therefore not feasible to carry out frequent intermediate quality checks and re-calibrations during normal production operations without severely limiting productivity.

[0024] The inventors recognized that another drawback of performing a tactile measurement with a conventional depth gauge is that wear can be detected at the measurement tip of the depth gauge (even if supported by a ball), which may lead to an incorrect calibration. In addition, the tactile measurement with rotation of a depth gauge may lead to outliers of the measured values in case of small indentations of the block nest, which may lead to misinterpretations and again an incorrect adjustment of the tilt angle.

[0025] The basic idea of an aspect of the invention is thus to provide an arrangement configured for use in a spectacle lens blocking system, wherein the spectacle lens blocking system is configured for blocking a lens

blank, wherein the arrangement comprises: a block nest comprising a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable, for example with an actuator configured for adjusting the tilt angle of the block nest; and a calibration cylinder, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the calibration cylinder comprises an inclination sensor configured for determining the tilt angle of the block nest. Accordingly, instead of performing a tactile depth measurement with a depth gauge over a circumferential reference surface, the inventors suggest using a calibration cylinder comprising an inclination sensor.

[0026] An advantage of this approach can be that the complexity and time required for accurate calibration of a spectacle lens blocking system configured for blocking a lens blank can be reduced. Necessary calibration times may be shortened due to easier handling and elimination of the iterative verification process. In this way, the downtimes of the respective automatic block machine are shortened during intermediate checks. A further advantage can be that the calibration of an automatic block machine may have a lower complexity, such that possible operating / reading / interpretation errors may be minimized compared to a tactile measurement with a depth gauge. With a two-dimensional inclination sensor, there may also be no need to rotate the calibration tool or scratch a tactile tool over the block nest. This may advantageously reduce wear of the equipment.

[0027] Moreover, the inventors recognized that it may not be necessary to perform a calibration for every single lens and that it is also not necessary to perform time-consuming individual surface measurements for each blocked lens to be processed, as suggested in the prior art cited in the introductory portion, if a tilt angle of the block nest is calibrated from time to time.

[0028] In the following, some terms which are used throughout the application, shall be shortly explained and defined:

[0029] Unless otherwise indicated, the terminology used in the context of the present application corresponds to the definitions in the standard DIN EN ISO 13666:2019of the DIN (Deutsches Institut für Normung) e.V.

[0030] The terms blank, lens blank or semi-finished lens blank shall refer to a piece of optical material with only one optically finished surface for the making of a lens, cf. No 3.8.1 of the standard DIN EN ISO 13666. The term single-vision blank shall refer to a blank with the finished surface having a single nominal surface power, cf. No 3.8.2 of the standard DIN EN ISO 13666. The term multifocal blank shall refer to a blank with the finished surface having two or more visibly divided portions of different dioptric powers or focal powers, cf. No 3.8.3 of the standard DIN EN ISO 13666. Note that this definition may include fused multifocal blanks and blanks with blended segments, that is, where the dividing line has been smoothed away. The term finished lens may refer to a lens of which both sides have their final optical surface, cf. No. 3.8.7 of the standard DIN EN ISO 13666, wherein the finished lens can be either edged (cut) or uncut.

[0031] In recent years, alloy replacement technologies have emerged in lens blocking. The term alloy or lens blocking with alloy as used herein may also encompass such replacement technologies.

[0032] As used herein, an actuator configured for adjusting a tilt angle of the block nest can be an actuator that is operated manually or automatically, for example an electric or hydraulic actuator. The actuator may be configured for adjusting the tilt angle of the block nest in two axes. The tilt axis may be referred to as x-axis and y-axis herein.

[0033] As used herein, a calibration cylinder may refer to a calibration body wherein a contact surface of the calibration body is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, however not necessarily with a cylindrical shape.

[0034] In a refinement of the arrangement for the spectacle lens blocking system, the calibration cylinder can be adapted to be inserted into the receptacle of the block nest for calibration instead of a blocking piece. In particular, an end portion of the calibration cylinder may correspond to an end portion of the blocking piece. An advantage of this embodiment is that the calibration cylinder can easily be inserted into the receptacle of the block nest. A calibration measurement may thus be performed quickly.

[0035] The inclination sensor for determining the tilt angle of the block nest can comprise a gyroscope. In addition or in the alternative, the inclination sensor for determining the tilt angle of the block nest can comprise an accelerometer. For example, the inclination sensor may comprise a MEMS inclination sensor such as a MEMS gyroscope or a MEMS acceleration sensor. MEMS (Microelectromechanical systems) is the technology of small or microscopic devices incorporating both electronic and moving parts. Such devices may be manufactured in large scale semiconductor technology at low cost and with high measurement quality and reliability. A gyroscope may allow the calculation of orientation and rotation. For example, the gyroscope may be calibrated using a second reference surface and based on its position relative to the calibration with the second reference surface a position and orientation when used for calibration of the tilt angle of the block nest can be determined. An acceleration sensor can be used to measure an orientation and inclination on its orientation with respect to gravity. The inclination sensor can be a two-dimensional inclination sensor for determining the tilt angle of the block nest in two axes. Preferably the axes of such an inclination sensor are aligned with the axes of the actuator configured for adjusting the tilt angle of the block nest. This allows to easily measure and correct the tilt angle as

set by the actuator based on measurements of the inclination sensor.

[0036] The arrangement ca comprise an actuator configured for adjusting a tilt angle of the block nest. The actuator can be configured to adjust the tilt angle of the block nest in two different axes. For example, the actuator can be configured to adjust the tilt angle of the block nest in an x-axis and y-axis which can be orthogonal to each other. Similarly, the inclination sensor can be adapted to determine the tilt angle of the block nest in two different axes. For example, the inclination sensor can be configured to determine the tilt angle of the block nest in an x-axis and y-axis which can be orthogonal to each other. An advantage is that the calibration measurement can be performed quickly by a single measurement. In contrast to the approach with a depth gauge it is thus not necessary to perform a rotary depth measurement.

[0037] The arrangement can be adapted to determine a difference between the tilt angle of the block nest determined by the inclination sensor of the calibration cylinder and a tilt angle of the block nest as set by the actuator. For example, an intended tilt angle set by the actuator can be compared with an actual tilt angle measured by the inclination sensor of the calibration sensor. If the tilt angle measured by the inclination sensor deviates from the set tilt angle, the tilt angle of the block nest can be corrected to correspond to the actual tilt angle measured by the inclination sensor. In addition, this mismatch information can be used to calibrate the block nest, in a way that for future measurements the measured tilt angles and the tilt angles of the block nest match. An advantage is that a mismatch can be corrected with very low effort.

[0038] In a refinement, the arrangement can be adapted to provide instructions to a user on how to reduce the difference between the tilt angle of the block nest determined by the inclination sensor of the calibration cylinder and a tilt angle of the block nest set by the actuator. For example, the user can be instructed to perform e.g., 3 adjustment steps on the x-axis and/or 2 adjustment steps on the y-axis. An advantage of this approach is that also conventional lens blocking systems may be easily retrofitted.

[0039] The arrangement for the spectacle lens blocking system can comprise a controller, wherein the controller is coupled to the inclination sensor of the calibration cylinder and the actuator. The controller can be adapted to control the actuator based on the tilt angle of the block nest determined by the inclination sensor of the calibration cylinder. An advantage of this embodiment is that an automatic calibration can be performed.

[0040] The arrangement for the spectacle lens blocking system can comprise an interface configured to indicate the tilt angle of the block nest determined by the inclination sensor of the calibration cylinder. For example, the interface can be a display or other type of human machine interface (HMI). The display can be directly provided on the arrangement. In addition or in the alternative, an already existing display may be used. Other HMI modalities such as audible feedback may be used in addition or in the alternative.

[0041] In a refinement the interface can comprise a display, wherein the display can be configured to indicate a difference between the tilt angle of the block nest determined by the inclination sensor of the calibration cylinder and a set tilt angle of the block nest, in particular a tilt angle set by the actuator. In a refinement, the display can be configured to indicate (a) the tilt angle of the block nest determined by the inclination sensor of the calibration cylinder or (b) the difference between the tilt angle of the block nest determined by the inclination sensor of the calibration cylinder and a set tilt angle of the block nest as graphical representations in form of a circular spirit level. An advantage can be that it is intuitively apparent for a user of the lens blocking system how the block nest has to be adjusted to provide a desired tilt angle. An optical and color separated display may be used. A correct calibration may thus be unambiguous. For example, a color may change to green if the difference of the tilt angle of the block nest determined by the inclination sensor of the calibration cylinder and a tilt angle of the block nest set by the actuator is below a predetermined accuracy threshold. The accuracy threshold may be different for different series of spectacle lenses. For example, a higher degree of accuracy may be required for spectacle lenses with higher accuracy requirements.

[0042] The arrangement for the spectacle lens blocking system can comprise a second reference surface, wherein the second reference surface is a levelled reference surface, in particular having a tilt angle of 0°, configured for positioning the calibration cylinder on said second reference surface for a 0° tilt angle reference measurement for calibration of the inclination sensor. While an inclination sensor may already provide highly accurate inclination measurements and long-term stability, such an accuracy may not always be sufficient for accuracies required in high quality lens manufacturing, i.e., for manufacturing lenses with small surface errors. For example, readings of an inclination sensor may slightly drift over time. It is thus suggested that the arrangement comprises a second reference surface that may also be referred to as static reference surface. Prior to performing a calibration measurement of the actuator and block nest, the calibration cylinder may thus be positioned on said second reference surface to calibrate the inclination sensor of the calibration cylinder itself. Once the inclination sensor of the calibration sensor is calibrated in this manner it can be used for an even more accurate determination of the tilt angle of the block nest. The second reference surface can be provided on the lens blocking system, in particular in close proximity of the block nest. This facilitates the handling.

[0043] It is to be understood that the features mentioned above and those yet to be explained below may be used not only in the combination respectively indicated, but also in other combinations or separately, without departing from the scope of the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0044] These and other aspects of the invention will be apparent from and elucidated with reference to the embodiments described hereinafter. In the following drawings

Fig. 1 shows a schematic first drawing of a lens blank on a blocking piece;

Fig. 2 shows a schematic second drawing of a lens blank on a blocking piece;

Fig. 3 shows a schematic drawing of a section of a lens blocking system with a block nest;

Fig. 4 shows a schematic drawing of different positions of a calibration measurement with a conventional depth gauge;

Fig. 5 shows a schematic drawing of an embodiment of an arrangement for a spectacle lens blocking system comprising a calibration cylinder;

Fig. 6 shows a schematic drawing of a display at a first tilt angle;

Fig. 7 shows a schematic drawing of a display at a second tilt angle;

Fig. 8 shows a flow chart of a method for calibrating a spectacle lens blocking system; and

Fig. 9 shows a flow chart of a method of manufacturing a spectacle lens.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0045] Fig. 1 and Fig. 2 show schematic drawings of a lens blank 10 on a blocking piece 20. The lens blank 10 has a front surface 11 and a back surface 12. The lens blank 10 can be a semi-finished lens blank, wherein the front surface is already an optically finished surface for the making of a spectacle lens. For manufacturing the finished lens, the back surface 12 may still have to be adapted to a specific prescription for a user. During lens manufacturing, the lens blank 10 undergoes several processing steps such as grinding and polishing. For holding the lens during manufacturing, the lens blank 10 is blocked to the blocking piece 20, for example using a metallic alloy 21 having a low melting temperature. The alloy 21 is inserted into a gap between the lens blank 10 and the blocking piece 20. When the alloy cools, a solid connection is formed. The blocking piece 20 servers as a holder and thus as a reference for subsequent manufacturing steps.

[0046] Fig. 1 shows a first arrangement wherein the lens blank 10 is blocked to the blocking piece 20 in a horizontal orientation, i.e., with an inclination angle of 0°. However, for certain lens geometries, it can be advantageous to provide the lens blank 10 and the blocking piece 20 tilted at an angle with respect to each other. Accordingly, the blocking process may not only be used to establish a mechanical connection but can also be used to provide a defined geometry change, for example a tilt angle offset. All subsequent processing steps will thus depend on the position of the lens blank 10 and blocking piece 20 relative to each other.

[0047] Fig. 3 shows a schematic drawing of a section of a lens blocking system 1 with a block nest 30. The block nest 30 comprises a receptacle 31 for receiving the blocking piece 20 and provides support for the blocking piece 20 during the blocking process. Accordingly, a lower surface 22 of the blocking piece 20 is placed on an upper surface of a support structure 32 of the block nest 30. In the shown embodiment, a ringshaped support structure 32 is provided that is adapted to provide support to the lower surface 22 of the blocking piece. After placing the blocking piece 20 into the block nest 30, a tilt angle of the block nest can be set to a desired value. The tilt angle of the block nest 30 may preferably be adjusted in two different axes, for example an x-axis and a y-axis which are orthogonal to each other. The lens blank (not shown in Fig. 3) is placed on a lens holder 35 of the lens blocking system 1 above the block nest 30 with the blocking piece 20. For example, a rim or other lens holder of the spectacle lens blocking system 1 may serve as a lens holder for the lens blank. The lens holder 35 may have a static orientation and is not tilted. The space formed between the lens blank 10 and the blocking piece 20, tilted by the block nest 30, can then be filled with the alloy 21 (see Fig. 2) for blocking the lens blank 10 at a desired orientation and angle on the blocking piece 20. As shown in Fig. 3, an inlet 36 can be provided via which the alloy is inserted for the lens blocking.

[0048] The resulting tilt angle is thus provided by an inclination of the block nest 30 during the lens blocking process. According to an aspect of the present disclosure, it is suggested to use the blocking piece 20 and tilt angle of the block nest 30 during the blocking step as a reference for the further manufacturing steps. Hence, any inaccuracy regarding the tilt angle of the block nest 30 may result in an error of the finished spectacle lens. The inventors recognized that, when calibrating the tilt angle of the block nest, a sufficiently high accuracy may be reached such that at least some additional surface measurements during the manufacturing process may no longer be required. Thereby, the manufacturing process can be simplified and the processing time may be reduced.

[0049] The calibration of the tilt angle of the block nest 30, in particular of the receptacle 31 for receiving the blocking piece 20, can be realized by performing a depth measurement between the lens holder 35 of the lens blocking system 1 and a support surface 32 of the block nest 30 at different positions. The depth measurement

can be performed with a conventional depth gauge 38. This is exemplarily shown in Fig. 4, which shows a schematic drawing of different positions of a calibration measurement with a conventional depth gauge 38. In this way, any height differences to the block nest 30 can be detected at several positions and corrected by tilting the block nest. The calibration of the block nest can be performed via a 0-position setting, also referred to as levelled horizontal orientation of the block nest, wherein a horizontal position is provided with respect to both an x- and y-axis which are arranged 90 degrees to each other. If the settings of the axes are changed during calibration, the block nest may have to be checked again by performing depth measurements at different positions. A drawback of this depth measurement approach is that a depth measurement at a single position may not be sufficient to recognize at which position an x- or y- axis value deviates and by how much. Hence, an iterative calibration process may be necessary for calibrating the tilt angle of the block nest. In this way, a deviation from the correct 0-position may iteratively become smaller and smaller. If the difference between the maximum and minimum height at different positions is within a predetermined tolerance range, the calibration process can be completed.

[0050] Such an iterative calibration procedure without defined positions may be very time-consuming and complex. Although the axes for adjusting the block nest are fixed, no axis points may be defined when rotating a calibration tool with the depth gauge 38 along the rim of the lens holder 35. It may therefore only be possible to estimate how the respective axes must be moved in order to approach the correct 0-position. Therefore, this approach may rely on experience and continuous repeated measurement leading to a successful calibration. Due to the high time expenditure, it is also not practically feasible to perform intermediate checks and calibrations under normal production operation without severely limiting productivity.

[0051] Another weak point of a depth gauge-based calibration method is the tactile measurement. It was found that wear can be detected at the tip of the depth gauge 38, even when using a ball tip, which may lead to an incorrect calibration. In addition, the tactile measurement may lead to outliers of the measured values in the case of small indentations of the block nest, which can lead to misinterpretations.

[0052] Accordingly, some disadvantages of a depth gauge-based tactile measurement can be: (i) time consuming, (ii) complex, (iii) wear, (iv) outliers of measurement values. One or more of these concerns can be overcome with an arrangement as described in the following.

[0053] Fig. 5 shows a schematic drawing of an embodiment of an arrangement 2 for a spectacle lens blocking system configured for blocking a lens blank. The arrangement 2 comprises a block nest 30 comprising a receptacle 31 configured for receiving a blocking piece 20, wherein a tilt angle of the block nest is adjustable. The arrangement 2 further comprises a calibration cylinder 40, wherein a contact surface 42 of the of the calibration cylinder 40 is adapted to a shape of the receptacle 31 at least at a reference surface 32 of the receptacle indicative of the tilt angle of the block nest 30. The calibration cylinder 40 comprises an inclination sensor 43 configured for determining the tilt angle of the block nest 30. Accordingly, when the calibration cylinder 40 is placed on or in the receptacle 31 of the block nest 30 such that the contact surface 42 of the calibration cylinder 40 is positioned on the reference surface 32 of the receptacle 31, an inclination of the calibration cylinder 40 corresponds to an inclination of the block nest 30, in particular of the receptacle 31, so that the inclination sensor 43 allows to determine the tilt angle of the block nest 30 via the tilt angle of the calibration cylinder 40. It shall be understood that the inclination sensor 43 may not only be arranged on a top side of the calibration cylinder 40 but may for example also be integrated therein. The inclination sensor 43 for determining the tilt angle of the block nest 30 can for example be a gyroscope or an accelerometer.

[0054] As shown in Fig. 5, a shape of a lower part 44 of the calibration cylinder 40 may correspond to a shape of a blocking piece 20 (see Fig. 1). The calibration cylinder 40 can be adapted to be inserted into the receptacle 31 of the block nest 30 for calibration instead of a blocking piece 20. In certain embodiments the lower part 44 of the calibration cylinder 40 may directly contact a bottom 33 of the receptacle 31. In this case the bottom 33 of the receptacle can serve as a reference surface for the calibration cylinder 40.

[0055] The arrangement 2 for the spectacle lens blocking system can further comprise an actuator 50 configured for adjusting the tilt angle of the block nest 30. For example, as shown in Fig. 5, an electric drive unit 51 may be coupled with the receptacle 31 of the block nest 30 via a first tilt axis 52 to adjust a tilt angle of the block nest 30, as indicated by arrow 53. Optionally, the actuator may be adapted to adjust the tilt angle of the block nest in two different axes. For example, a further electric drive unit (not shown) may be provided to adjust a tilt angle of the block nest in a second axis, preferably a second axis orthogonal to the first axis.

[0056] Referring again to Fig. 5, the arrangement 2 for the spectacle lens blocking system can further comprise a controller 60. The controller 60 is coupled to the inclination sensor 43 of the calibration cylinder 40. The controller can be adapted to read out inclination data from the inclination sensor 43. The inclination data can comprise a tilt angle of the calibration cylinder 40 about a first and/or second axis, for example about a first and second axis in a horizontal plane. The tilt angle received from the inclination sensor 43 can be referred to as a measured tilt angle. Moreover, the controller 60 can be coupled to the actuator 50. The controller can obtain data indicative of a tilt angle of the block nest set by the actuator 50. The tilt angle set by the actuator 50 can be referred to as a set tilt angle. Based thereon, the controller 60 of the arrange-

ment 2 can be adapted to determine a difference between the tilt angle of the block nest 30 determined by the inclination sensor 43 of the calibration cylinder 40 and a tilt angle of the block nest 30 set by the actuator 50.

[0057] In the embodiment shown in Fig. 5, the arrangement 2 may further comprise an optional display 61 or other human-machine-interface (HMI). The arrangement can be adapted to provide instructions to a user via the display 61 or HMI on how to reduce the difference between the tilt angle of the block nest 30 determined by the inclination sensor 43 of the calibration cylinder 40 and a tilt angle of the block nest 30 set by the actuator 50. Based thereon, a different may be reduced by manual adaptation until the set tilt angle corresponds to the actual measured tilt angle determined with the calibration cylinder 40. However, in a more convenient implementation, the controller 60 is coupled to the inclination sensor 43 of the calibration cylinder 40 and the actuator 50 and is adapted to control the actuator 50 based on the tilt angle of the block nest determined by the inclination sensor 43 of the calibration cylinder 40. Thereby, the set tilt angle can be corrected to reflect the actual true tilt angle as determined with the calibration cylinder.

[0058] Fig. 6 and Fig. 7 show schematic drawings of a display 61 representation of the tilt angle measured with the inclination sensor 43 of the calibration cylinder 40 at a first tilt angle and at a second tilt angle. The display 61 is configured to indicate the tilt angle of the block nest determined by the inclination sensor of the calibration sensor. In the embodiment shown in Fig. 6 and Fig. 7, the tile angle is shows as a deviation from a levelled 0-position or levelled horizontal orientation. The x- and y-axis are two orthogonal axed in the horizontal plane. In the shown embodiment, the representation can be similar to a bull's eye spirit level or bubble level designed to indicate whether a surface is in a horizontal orientation. In Fig. 6, a visual indication 62 is provided that reflects a deviation about both the x- and y-axis. In order to calibrate the block nest, the block nest can be tilted both in the x- and y-axis so as to reach a levelled state, as shown in Fig. 7. For example, a color of the visual indication 62 may change to green if the difference of the tilt angle of the block nest determined by the inclination sensor of the calibration cylinder and a tilt angle of the block nest set by the actuator is below a predetermined accuracy threshold.

[0059] Referring again to Fig. 5, the arrangement 2 for the spectacle lens blocking system can comprise an optional second reference surface 72, wherein the second reference surface is a levelled reference surface, in particular having a tilt angle of 0°, configured for positioning the calibration cylinder 40 on said second reference surface for a 0° tilt angle reference measurement for calibration of the inclination sensor 43. As described above, while an inclination sensor may already provide highly accurate inclination measurements and long-term stability, such an accuracy may not always be sufficient for accuracies required in high quality lens manufacturing, i.e., for manufacturing lenses with small surface errors. For example, readings of an inclination sensor may slightly drift over time. It is thus suggested that the arrangement comprises a second reference surface that may also be referred to as static reference surface. Prior to performing a calibration measurement of the actuator 50 and block nest 30, the calibration cylinder 40 may thus be positioned on said second reference surface 72 to calibrate the inclination sensor 43 of the calibration cylinder 40 itself. Once the inclination sensor 43 of the calibration sensor 40 is calibrated in this manner it can be used for an even more accurate determination of the tilt angle of the block nest 30. As shown in Fig. 5, the second reference surface can be provided on the lens blocking system, in particular in close proximity of the block nest 30. This facilitates the handling.

[0060] Fig. 8 shows a flow chart of a method 100 for calibrating a spectacle lens blocking system with an arrangement comprising a block nest comprising a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable; and a calibration cylinder, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the calibration cylinder comprises an inclination sensor configured for determining the tilt angle of the block nest In an optional first step S101, a reference surface of the arrangement may be used to assign a 0-position or horizontal levelled position to the inclination sensor of the calibration cylinder. In step S102 the calibration cylinder is inserted into the receptacle of the block nest, wherein the contact surface of the calibration cylinder is in contact with the reference surface of the receptacle indicative of the tilt angle of the block nest. In step S103, the tilt angle of the block nest is determined using the inclination sensor of the calibration cylinder. For example, deviations of the tilt angle of the block nest from a desired orientation may be visualized as exemplarily shown in Fig. 6 and Fig. 7. Optionally, instructions can be provided on how to adjust the tilt angle of the block nest to reduce a deviation (e.g. 3 adjustment steps for the x-axis and 2 adjustment steps for the y-axis). If the level of the block nest is within a predetermined tolerance range to the reference surface, a visual indication may turn green and the calibration may be completed. However, it is also possible to perform and automated calibration such that a set tilt angle, e.g. set using an actuator, corresponds to the measured tilt angle as determined with the inclination sensor of the calibration cylinder, even without using a display. In step S104, the calibration cylinder may be removed after determining the tilt angle of the block nest.

[0061] Fig. 9 shows a flow chart of a method 200 of manufacturing a spectacle lens. Steps S201 to S204 of the method correspond to steps S101 to S104 of the method 100 described with reference to Fig. 8. In the method shown in Fig. 9, the calibration is followed by a step S205 of blocking the spectacle lens with the lens

blocking system and machining a surface of the spectacle lens. The surface of the spectacle lens can be machined according to a user-specific prescription.

[0062] While the invention has been illustrated and described in detail in the drawings and foregoing description, such illustration and description are to be considered illustrative or exemplary and not restrictive; the invention is not limited to the disclosed embodiments. Other variations to the disclosed embodiments can be understood and effected by those skilled in the art in practicing the claimed invention, from a study of the drawings, the disclosure, and the appended claims.

[0063] In the claims, the word "comprising" does not exclude other elements or steps, and the indefinite article "a" or "an" does not exclude a plurality. A single element or other unit may fulfill the functions of several items recited in the claims. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

[0064] A computer program may be stored/distributed on a suitable medium, such as an optical storage medium or a solid-state medium supplied together with or as part of other hardware, but may also be distributed in other forms, such as via the Internet or other wired or wireless telecommunication systems.

[0065] Any reference signs in the claims should not be construed as limiting the scope.

Claims

1. Arrangement (2) for a spectacle lens blocking system (1) configured for blocking a lens blank (10), the arrangement comprising:

   - a block nest (30) comprising a receptacle (31) configured for receiving a blocking piece (20), wherein a tilt angle of the block nest (30) is adjustable; wherein the arrangement is **characterized by**
   - a calibration cylinder (40), wherein a contact surface (42) of the of the calibration cylinder is adapted to a shape of the receptacle (31) at least at a reference surface (32) of the receptacle indicative of the tilt angle of the block nest (30), and wherein the calibration cylinder (40) comprises an inclination sensor (43) configured for determining the tilt angle of the block nest (30).

2. Arrangement according to claim 1, wherein the calibration cylinder is adapted to be inserted into the receptacle of the block nest for calibration instead of a blocking piece.

3. Arrangement according to any of the preceding claims, wherein the inclination sensor (43) for determining the tilt angle of the block nest (30) comprises at least one of a gyroscope or an accelerometer.

4. Arrangement according to any of the preceding claims, wherein the arrangement (2) comprises an actuator (50) configured for adjusting a tilt angle of the block nest (30), in particular wherein the actuator (50) is configured to adjust the tilt angle of the block nest (30) in two different axes.

5. Arrangement according to claim 4, wherein the arrangement (2) is adapted to determine a difference between the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) and a tilt angle of the block nest (30) set by the actuator (50).

6. Arrangement according to claim 5, wherein the arrangement (2) is adapted to provide instructions to a user on how to reduce the difference between the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) and a tilt angle of the block nest (30) set by the actuator (50).

7. Arrangement according to any of claims 4 to 6, further comprising a controller (60), wherein the controller (60) is coupled to the inclination sensor (43) of the calibration cylinder (40) and the actuator (50), and wherein the controller (60) is adapted to control the actuator (50) based on the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40).

8. Arrangement according to any of the preceding claims, comprising an interface, in particular a display (61), configured to indicate the tilt angle of the block nest determined by the inclination sensor (43) of the calibration cylinder (40).

9. Arrangement according to claim 8, wherein the interface comprises a display (61) and wherein the display is configured to indicate a difference between the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) and a set tilt angle of the block nest (30).

10. Arrangement according to claim 8 or 9, wherein the display (61) is configured to indicate (a) the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) or (b) the difference between the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) and a set tilt angle of the block nest (30) as graphical representations in form of a circular spirit level.

11. Arrangement according to any of the preceding

claims, further comprising a second reference surface (72), wherein the second reference surface (72) is a levelled reference surface, in particular having a tilt angle of 0°, configured for positioning the calibration cylinder (40) on said second reference surface (72) for a 0° tilt angle reference measurement for calibration of the inclination sensor (43).

12. Calibration cylinder (40) for an arrangement (2) for a spectacle lens blocking system (1) configured for blocking a lens blank (10) according to any of the preceding claims, wherein a shape of the calibration cylinder (40) is adapted to a shape of the receptacle (31) at least at a reference surface (32) of the receptacle indicative of the tilt angle of the block nest (30), and wherein the calibration cylinder (40) comprises an inclination sensor (43) configured for determining the tilt angle of the block nest (30).

13. Method for calibrating a spectacle lens blocking system with an arrangement comprising a block nest comprising a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable; and a calibration cylinder, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the calibration cylinder comprises an inclination sensor configured for determining the tilt angle of the block nest; the method comprising the steps of:

- inserting the calibration cylinder into the receptacle of the block nest, wherein the contact surface of the calibration cylinder is in contact with the reference surface of the receptacle indicative of the tilt angle of the block nest (S102);
- determining the tilt angle of the block nest using the inclination sensor of the calibration cylinder (S103).

14. A method (200) of manufacturing a spectacle lens, the method comprising the steps of:

- calibrating a spectacle lens blocking system with an arrangement comprising a block nest comprising a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable; and a calibration cylinder, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the calibration cylinder comprises an inclination sensor configured for determining the tilt angle of the block nest; the calibrating comprising the steps of:
  - inserting the calibration cylinder into the receptacle of the block nest, wherein the contact surface of the calibration cylinder is in contact with the reference surface of the receptacle indicative of the tilt angle of the block nest (S202);
  - determining the tilt angle of the block nest using the inclination sensor of the calibration cylinder (S203);
  - removing the calibration cylinder after determining the tilt angle of the block nest (S204);
- blocking the spectacle lens with the lens blocking system and machining a surface of the spectacle lens (S205).

15. A computer program product comprising instructions which, when the program is executed by a computer, cause the computer to carry out the steps of

- obtaining data indicative of a first tilt angle of a block nest of an arrangement for a spectacle lens blocking system configured for blocking a lens blank, wherein the block nest comprises a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable;
- obtaining data indicative of a second tilt angle of the block nest determined by an inclination sensor of a calibration cylinder of the arrangement for a spectacle lens blocking system configured for blocking a lens blank, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the contact surface of the calibration cylinder is in contact with the reference surface for obtaining the data indicative of the second tilt angle;
- calibrating the first tilt angle of the block nest based on the second tilt angle.

Amended claims in accordance with Rule 137(2) EPC.

1. Arrangement (2) for a spectacle lens blocking system (1) configured for blocking a lens blank (10), the arrangement comprising:

- a block nest (30) comprising a receptacle (31) configured for receiving a blocking piece (20), wherein a tilt angle of the block nest (30) is adjustable; wherein the arrangement is **characterized by**
- a calibration cylinder (40), wherein a contact surface (42) of the calibration cylinder is adapted to a shape of the receptacle (31) at least at a

reference surface (32) of the receptacle indicative of the tilt angle of the block nest (30), and wherein the calibration cylinder (40) comprises an inclination sensor (43) configured for determining the tilt angle of the block nest (30).

2. Arrangement according to claim 1, wherein the calibration cylinder is adapted to be inserted into the receptacle of the block nest for calibration instead of a blocking piece.

3. Arrangement according to any of the preceding claims, wherein the inclination sensor (43) for determining the tilt angle of the block nest (30) comprises at least one of a gyroscope or an accelerometer.

4. Arrangement according to any of the preceding claims, wherein the arrangement (2) comprises an actuator (50) configured for adjusting a tilt angle of the block nest (30), in particular wherein the actuator (50) is configured to adjust the tilt angle of the block nest (30) in two different axes.

5. Arrangement according to claim 4, wherein the arrangement (2) is adapted to determine a difference between the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) and a tilt angle of the block nest (30) set by the actuator (50).

6. Arrangement according to claim 5, wherein the arrangement (2) is adapted to provide instructions to a user on how to reduce the difference between the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) and a tilt angle of the block nest (30) set by the actuator (50).

7. Arrangement according to any of claims 4 to 6, further comprising a controller (60), wherein the controller (60) is coupled to the inclination sensor (43) of the calibration cylinder (40) and the actuator (50), and wherein the controller (60) is adapted to control the actuator (50) based on the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40).

8. Arrangement according to any of the preceding claims, comprising an interface, in particular a display (61), configured to indicate the tilt angle of the block nest determined by the inclination sensor (43) of the calibration cylinder (40).

9. Arrangement according to claim 8, wherein the interface comprises a display (61) and wherein the display is configured to indicate a difference between the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) and a set tilt angle of the block nest (30).

10. Arrangement according to claim 8 or 9, wherein the display (61) is configured to indicate (a) the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) or (b) the difference between the tilt angle of the block nest (30) determined by the inclination sensor (43) of the calibration cylinder (40) and a set tilt angle of the block nest (30) as graphical representations in form of a circular spirit level.

11. Arrangement according to any of the preceding claims, further comprising a second reference surface (72), wherein the second reference surface (72) is a levelled reference surface, in particular having a tilt angle of 0°, configured for positioning the calibration cylinder (40) on said second reference surface (72) for a 0° tilt angle reference measurement for calibration of the inclination sensor (43).

12. Calibration cylinder (40) for an arrangement (2) for a spectacle lens blocking system (1) configured for blocking a lens blank (10), the arrangement comprising a block nest (30) comprising a receptacle (31) configured for receiving a blocking piece (20), wherein a tilt angle of the block nest (30) is adjustable;
characterized in that a shape of the calibration cylinder (40) is adapted to a shape of the receptacle (31) at least at a reference surface (32) of the receptacle indicative of the tilt angle of the block nest (30), and wherein the calibration cylinder (40) comprises an inclination sensor (43) configured for determining the tilt angle of the block nest (30).

13. Method for calibrating a spectacle lens blocking system with an arrangement comprising a block nest comprising a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable; and a calibration cylinder, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the calibration cylinder comprises an inclination sensor configured for determining the tilt angle of the block nest; the method comprising the steps of:

- inserting the calibration cylinder into the receptacle of the block nest, wherein the contact surface of the calibration cylinder is in contact with the reference surface of the receptacle indicative of the tilt angle of the block nest (S102);
- determining the tilt angle of the block nest using the inclination sensor of the calibration cylinder (S103).

14. Method (200) of manufacturing a spectacle lens, the method comprising the steps of:

- calibrating a spectacle lens blocking system according to the method of claim 13;
- removing the calibration cylinder after determining the tilt angle of the block nest (S204);
- blocking the spectacle lens with the lens blocking system and machining a surface of the spectacle lens (S205).

15. A computer program product comprising instructions which, when the program is executed by a computer, cause the computer to carry out the steps of

- obtaining data indicative of a first tilt angle of a block nest of an arrangement for a spectacle lens blocking system configured for blocking a lens blank, wherein the block nest comprises a receptacle configured for receiving a blocking piece, wherein a tilt angle of the block nest is adjustable;
- obtaining data indicative of a second tilt angle of the block nest determined by an inclination sensor of a calibration cylinder of the arrangement for a spectacle lens blocking system configured for blocking a lens blank, wherein a contact surface of the of the calibration cylinder is adapted to a shape of the receptacle at least at a reference surface of the receptacle indicative of the tilt angle of the block nest, and wherein the contact surface of the calibration cylinder is in contact with the reference surface for obtaining the data indicative of the second tilt angle;
- calibrating the first tilt angle of the block nest based on the second tilt angle.

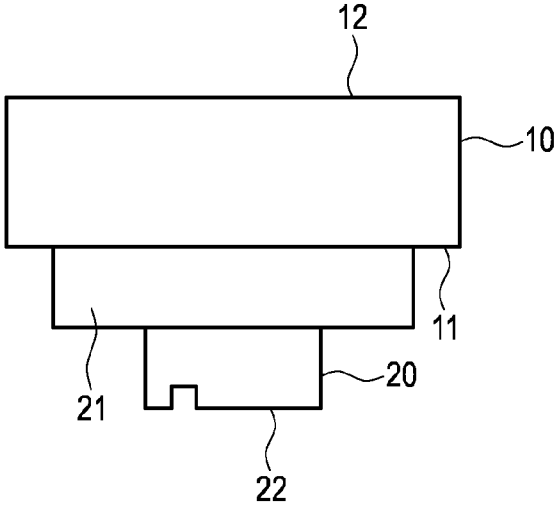

Fig. 1

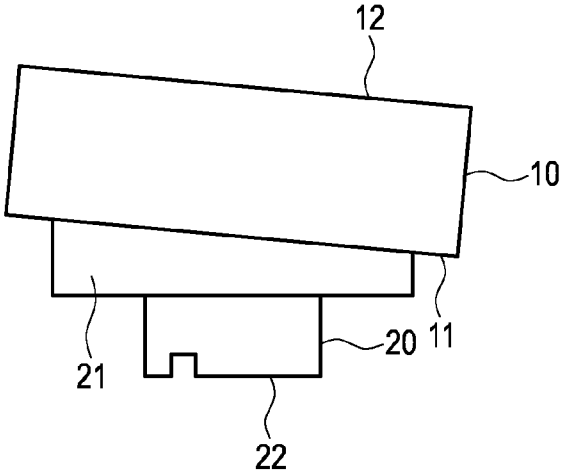

Fig. 2

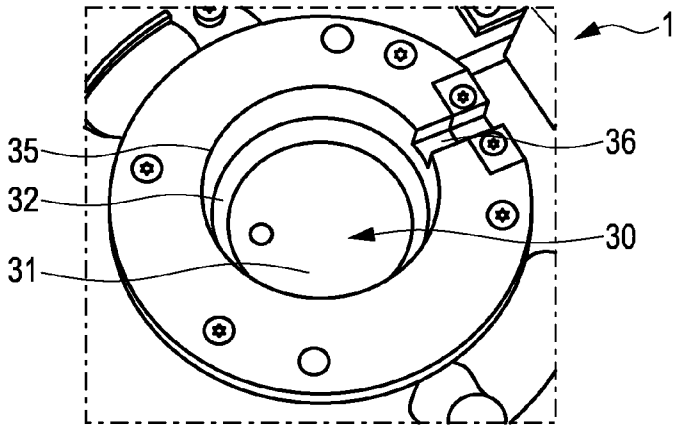

Fig. 3

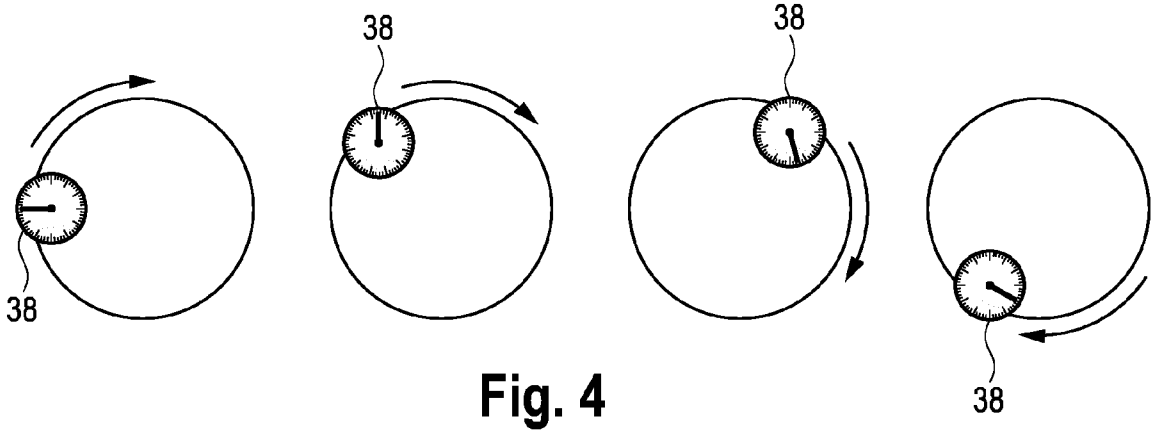

Fig. 4

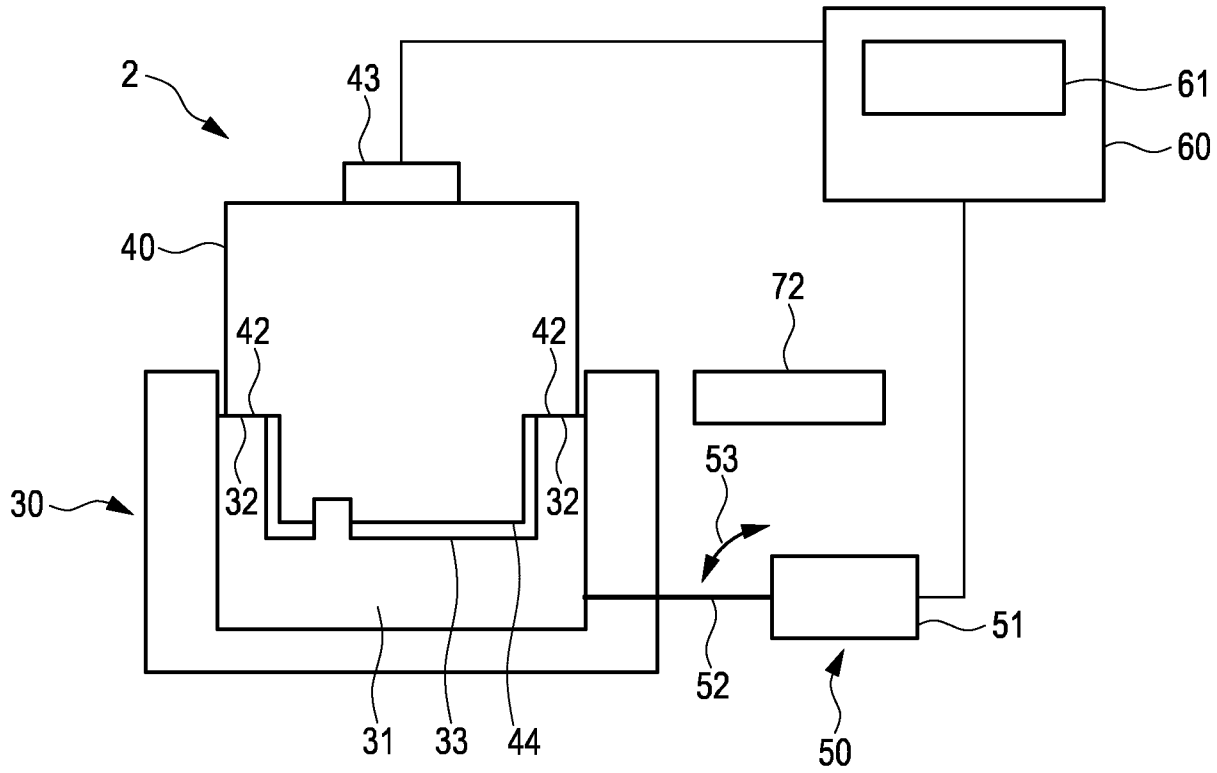

Fig. 5

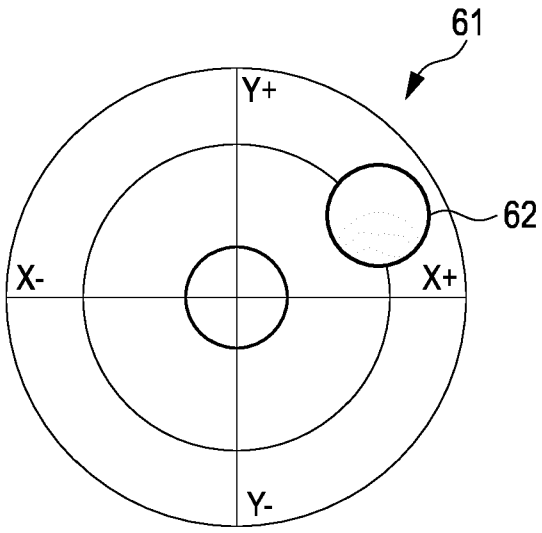

Fig. 6

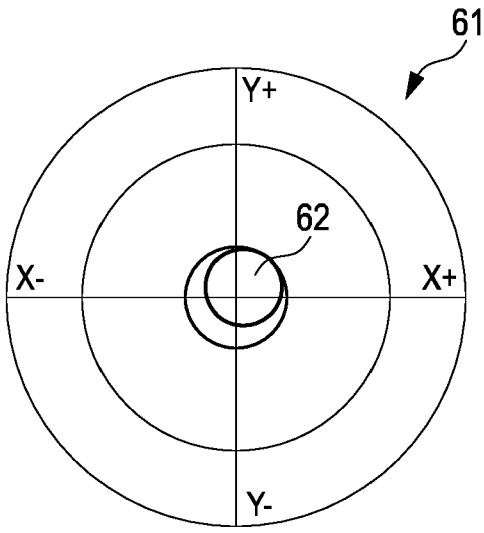

Fig. 7

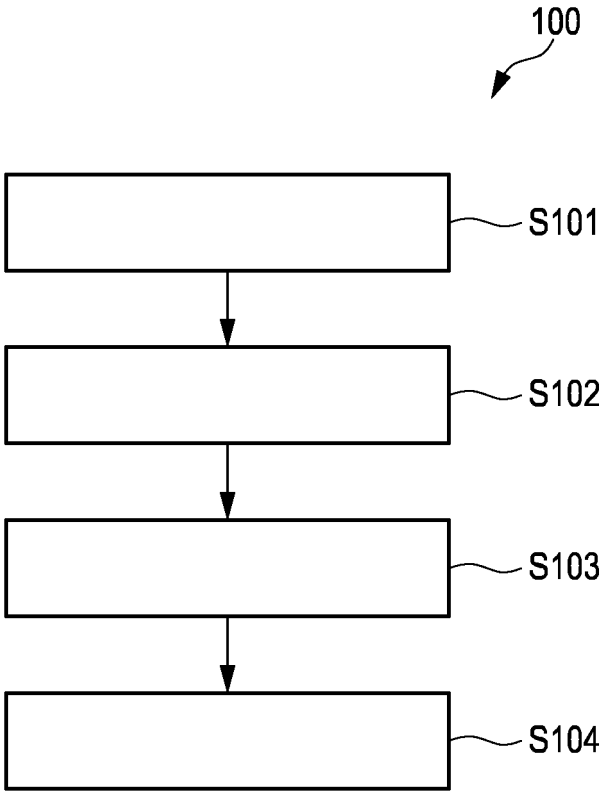

Fig. 8

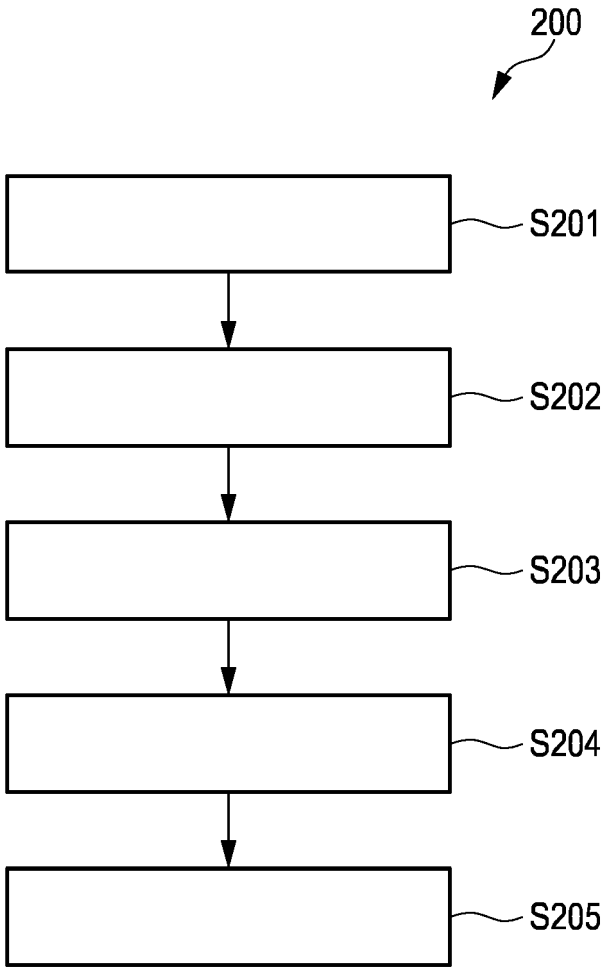

Fig. 9

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EUROPEAN SEARCH REPORT

Application Number
EP 23 18 9457

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B24B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	24 November 2023	Forciniti, Marco

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24-11-2023

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