



(11)

EP 2 926 950 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
07.10.2015 Bulletin 2015/41

(51) Int Cl.:
B24B 13/06 (2006.01) B24B 9/14 (2006.01)
B24B 51/00 (2006.01)

(21) Application number: **13853659.4**

(86) International application number:
PCT/JP2013/079668

(22) Date of filing: **01.11.2013**

(87) International publication number:
WO 2014/073465 (15.05.2014 Gazette 2014/20)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA ME

(72) Inventors:
• **SUZUE, Takahiro**
Tokyo 161-8525 (JP)
• **DAIMARU, Takashi**
Tokyo 161-8525 (JP)

(30) Priority: **06.11.2012 JP 2012244552**

(74) Representative: **Betten & Resch**
Patent- und Rechtsanwälte PartGmbB
Theatinerstraße 8
(Fünf Höfe)
80333 München (DE)

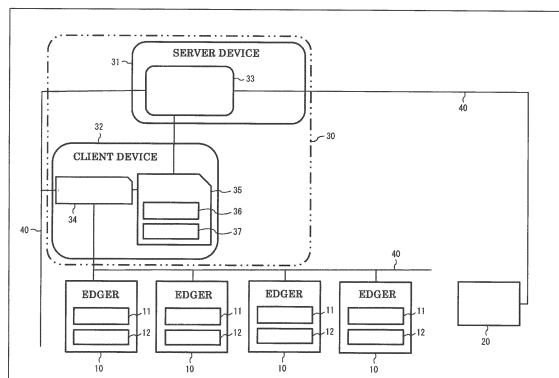
(71) Applicant: **HOYA Corporation**
Tokyo 161-8525 (JP)

(54) **LENS-FINISHING SYSTEM, FINISHED SIZE MANAGEMENT DEVICE, FINISHED SIZE MANAGEMENT METHOD AND EYEGLASS LENS MANUFACTURING METHOD**

(57) There is provided a lens edging system including: a plurality of edgers configured to perform edging to a spectacle lens; and an edging size management device used in connection with the plurality of edgers, the edging size management device comprising a memory unit configured to store and hold information for each model of the edger, regarding edging characteristics when a lens material is edged using an edging tool of the edger, in association with a type of the lens material to be edged by the edger, and a type of the edging tool used by the

edger, wherein the information stored and held in the memory unit is the information regarding edging characteristics of the edger obtained by at least one of the plurality of edgers, and an edger of the same model as at least one of the plurality of edgers comprises a correction unit configured to correct an edging parameter for the edging based on the information stored and held in the memory unit when edging is performed to the lens material using the edging tool of the edger.

FIG.1



11/ ADJUSTMENT UNIT
12/ CORRECTION UNIT
20/ THREE-DIMENSIONAL CIRCUMFERENTIAL LENGTH MEASURING DEVICE
33/ DATABASE PART (MEMORY UNIT)
34/ CONTROL PROGRAM PART
35/ CORRECTION MANAGEMENT PROGRAM PART
36/ ACQUISITION UNIT
37/ MANAGEMENT UNIT

Description

{Technical Field}

[0001] The present invention relates to a lens edging system for edging a spectacle lens, an edging size management device, an edging size management method, and a method of manufacturing a spectacle lens.

{Background Art}

[0002] In general, edgers for edging a spectacle lens perform edging to a plurality of types of lens materials using a plurality of types of edging tools selectively according to the lens material to be edged. Also, size adjustment for edging (called simply size adjustment hereafter) is performed by such edgers as pre-processing before actually edging the lens materials. Such a size adjustment is performed to various lens materials to be edged and various tools used for edging the lens materials respectively at a predetermined stage, of introducing such a device or exchanging tools, so that the error between the real size of a spectacle lens after edging and a desired size is suppressed within an allowable range (prescribed allowable value or less for framing a spectacle lens into a spectacle frame without problem). Specifically, the axis distance between the rotation axis of the lens material and the rotation axis of the edging tool is adjusted as the size adjustment for edging, for example (see, for example, Patent Document 1).

{RELATED ART DOCUMENTS}

{PATENT DOCUMENTS}

{Patent Document 1}

[0003] Japanese Patent No. 4772342

{Disclosure of the Invention}

{Problems to be solved by the invention}

[0004] However, in the conventional size adjustment as described above, size adjustment needs to be performed to all types of lens materials to be edged, individually for each edging tool used by the edger. As a result, in the case of constructing a lens edging system including a plurality of edgers in a spectacle lens edging center, for example, size adjustment is required for each of the plurality of edgers, and much time is required for this size adjustment as a result. Therefore, there is a strong need for simplification of the labor of performing size adjustment for each edger, especially in the case that there are a plurality of edgers.

[0005] An object of the present invention is to provide a lens edging system capable of simplifying the labor of performing size adjustment for each edger in the case

that there are a plurality of edgers, a lens size management device, an edging size management method, and a method of producing a spectacle lens.

{Means for canceling the Problem}

[0006] In order to achieve the above-described object, the present invention is made.

[0007] According to a first aspect of the present invention, there is provided a lens edging system including:

a plurality of edgers configured to perform edging to a spectacle lens; and
an edging size management device used in connection with the plurality of edgers, the edging size management device comprising a memory unit configured to store and hold information for each model of the edger, regarding edging characteristics when a lens material is edged using an edging tool of the edger, in association with a type of the lens material to be edged by the edger, and a type of the edging tool used by the edger,
wherein the information stored and held in the memory unit is the information regarding edging characteristics of the edger obtained by at least one of the plurality of edgers, and
an edger of the same model as at least one of the plurality of edgers comprises a correction unit configured to correct an edging parameter for the edging based on the information stored and held in the memory unit when edging is performed to the lens material using the edging tool of the edger.

[0008] According to a second aspect of the present invention, there is provided the system of the first aspect, wherein an edger of the same model as the edger other than at least one of the plurality of edgers is configured to adjust an edging size of at least one type of the lens material which is previously defined as a reference so that an error between a desired size and a real size of a spectacle lens after edging is suppressed within an allowable range, and thereafter the correction unit is configured to correct the edging parameter when performing edging to the lens material other than at least one type of the lens material defined as a reference.

[0009] According to a third aspect of the present invention, there is provided an edging size management device used in connection with a plurality of edgers that perform edging to a spectacle lens, including:

a memory unit configured to store and hold information for each model of the edger, wherein the information regarding edging characteristics for edging a lens material by the edger using an edging tool, is stored and held in association with a type of the lens material to be edged by the edger and a type of the edging tool used by the edger;
an acquisition unit configured to acquire information

regarding edging characteristic of at least one of the plurality of edgers, as the information stored and held in the memory unit; and
 a management unit configured to control so that an edging parameter for the edging is corrected by the edger of the same model as at least one of the plurality of edgers, based on the information stored and held in the memory unit, when edging is performed to the lens material by the edger using the edging tool.

[0010] According to a fourth aspect of the present invention, there is provided an edging size management method of managing an edging size for a plurality of edgers that perform edging to a spectacle lens, comprising:

acquiring information regarding edging characteristic for performing edging to a lens material by at least one of the plurality of edgers using an edging tool, in association with all types of lens materials to be edged by the edger and all types of edging tools used by the edger,
 storing and holding the information regarding edging characteristics acquired by at least one of the edgers, in association with a model of the edger, a type of the lens material, and a type of the edging tool; and
 correcting an edging parameter for the edging based on the already stored and held information regarding the edging characteristic, when edging is performed to the lens material by an edger of the same model as the at least one of the plurality of edgers, using the edging tool.

[0011] According to a fifth aspect of the present invention, there is provided a method of manufacturing a spectacle lens, wherein a spectacle lens is formed by edging using the edger, with an edging size managed by the edging size management method of claim 4.

{Effects of the Invention}

[0012] According to the present invention, the labor of performing size adjustment for each edger can be simplified in the case that there are a plurality of edgers.

{Brief Description of the Drawings}

[0013]

FIG. 1 is a block diagram showing a configuration example of an entire lens edging system according to an embodiment of the present invention.
 FIG. 2 is an explanatory view showing a specific example of information regarding the edging characteristic of an edger, stored in a database part of a server device in a lens edging system according to an embodiment of the present invention.
 FIG. 3 is an explanatory view showing a specific ex-

ample of a size management table managed by a management unit in a correction management program part of a client device in a lens edging system according to an embodiment of the present invention.

FIG. 4 is a flowchart showing a specific example of a procedure of a size management according to an embodiment of the present invention.

{Mode for Carrying Out the Invention}

[0014] An embodiment of the present invention will be described hereinafter with reference to the drawings.

[0015] Explanation for this embodiment is itemized in the following order.

1. Schematic structure of entire lens edging system
2. Structure of edgers
3. Structure of a size management device
4. Procedure of size management
5. Procedure of manufacturing spectacle lens
6. Effects of the present embodiment
7. Modified example, etc.

<1. Schematic structure of entire lens edging system>

[0016] First, the structure of an entire lens edging system according to this embodiment will be described.

[0017] FIG. 1 is a block diagram showing an example of a schematic structure of an entire lens edging system according to an embodiment.

[0018] The lens edging system is used for edging a spectacle lens and, for example, is constructed in a spectacle lens edging center. More specifically, the lens edging system includes a plurality of edgers 10 disposed in a spectacle lens edging center, a three-dimensional circumferential measuring device 20, a management device 30, and a communication line 40 connecting these devices.

[0019] In the lens edging system with such a structure, the plurality of edgers 10 are respectively configured to edge a spectacle lens. Different models may coexist in the plurality of edgers 10.

[0020] The three-dimensional circumferential length measuring device 20 is configured to measure the circumferential length of each spectacle lens after edging.

[0021] The management device 30 functions as a size management device used in connection with the plurality of edgers 10 and includes a server device 31 and a client device 32 in this embodiment. While these server device 31 and client device 32 both have a function as a computer, they are different in that the server device 31 controls and manages the operation of the entire system, whereas the client server 32 controls and manages the operation of each of the edgers 10. A plurality of client devices 32 may be provided in view of the number of the edgers 10 present in the system and the number of the edgers 10 that can be managed by the client device 32.

Although in this embodiment, the server device 31 and the client device 32 are provided separately, these devices may be provided integrally as one device.

<2. Structure of edgers>

[0022] Next, the edgers 10 in the lens edging system will be described more specifically.

[0023] As described above, the edger 10 is configured to edge a spectacle lens. Edging is performed to an uncut lens having a predetermined shape. By this edging, the outer edge of an uncut lens is processed into a shape that can be fitted into a spectacle frame. The edger 10 performs such edging using a plurality of types of edging tools selectively. The edging tool called here is a cutting/grinding tool used for the circumferential edge of the uncut lens, specifically, there are beveling tools, flattening tools, beveling/polishing tools, flattening/polishing tools, etc.

[0024] There are a plurality of types of uncut lens materials to be edged. Therefore, the edgers 10 are required to edge a plurality of types of lens materials.

[0025] However, there is sometimes a difference in edging properties between the lens materials to be edged (e.g. easy or difficult to cut) depending on the type. In order to respond to such a difference in edging properties, several edging modes are prepared for the edger 10, so that edging conditions at a device side (such as a tool driving speed) can be varied by switching the edging modes.

[0026] There is no necessity for a coincidence between the number of the types of the lens materials to be edged and the number of the edging modes of the edger 10, and in this embodiment, more types of the lens materials than the number of edging modes are assumed to be edged.

[0027] Also, the edger 10 is configured to respond to size adjustment performed as a pre-processing of the edging. Therefore, the edger 10 has a function as an adjustment unit 11.

[0028] The adjustment unit 11 has a function of responding to adjustment of the size. The size adjustment is performed by an operator of the edger 10 or a maintenance technician, etc. at a predetermined stage of introducing the device or exchanging tools, to suppress the error between the real size of a spectacle lens after edging and a desired size within an allowable range. Specifically, as the size adjustment, for example a predetermined lens is actually edged, and its real size after edging is measured. Then, in order to suppress the error between the real size and a desired size within an allowable range, an edging condition for canceling the error is previously set for the edger 10. More specifically, as the edging condition for canceling the error, a correction value is previously set at the edger 10 side, for correcting an edging parameter such as the axis distance between the lens rotation axis and the edging tool rotation axis and the edging tool diameter (offset). Such a size adjust-

ment may be performed using a publicly-known technique (see, for example, Patent Document 1), and as a specific example, the size adjustment is performed as follows; the operator, etc., inputs the correction value into an operation panel of the edger 10 (not shown) for correcting the edging parameter.

[0029] The edger 10 is also configured to respond to correction of the edging parameter as the processing for edging. Therefore, the edger 10 has a function as a correction unit 12.

[0030] The correction unit 12 has a function of responding to the correction of the edging parameter. Similarly to the abovementioned size adjustment, the edging parameter is corrected to cancel the error between the real size and the desired size of the spectacle lens after edging so as to be set in an allowable range. However, the edging parameter is corrected before performing edging by the edger 10, namely, the edging parameter is corrected in an operation stage of the edger 10. In this point, correction of the edging parameter is different from the size adjustment performed in a preparation stage of the edger 10 as the pre-processing of the edging. Also, correcting the edging parameter is not performed by the operator of the edger 10 etc., unlike the edging size adjustment but performed based on the information from the client device 32 connected to the edger 10. Specifically, when the edger 10 is notified of the correction value for canceling the error from the client device 32, an edging amount reflecting this correction value is determined, and thereafter edging is performed. This function as the correction unit 12 can be realized by setting a control program of the edger 10 to control so that the correction value from the client device 32 is received (refers to the client device 32 for the correction value in some cases), and the edger 10 is driven based on this correction value.

[0031] The edger 10 is configured using a publicly-known technique in the point other than the abovementioned point, and therefore explanation therefore is omitted here.

<3. Structure of a size management device>

[0032] Next, in the lens edging system, the management device 30 that functions as an edging size management device will be described more specifically.

[0033] As described above, the management device 30 includes the server device 31 and the client device 32, which will be sequentially described hereinafter.

(Structure of a server device)

[0034] The server device 31 is composed of a computer that manages and controls an overall operation of the lens edging system, and uniformly manages the information regarding the edging performed in the lens edging system. Specifically, the server device 31 is connected to a terminal device not shown installed in a spectacle shop via a wide-area network such as the Internet and

receives an order from this terminal device. When the order is received, the server device 31 manages the information regarding the job in accordance with the order, and manages the results of measuring the circumferential length of a lens after edging obtained by the three-dimensional circumferential measuring device 20, in association with the information regarding the job.

[0035] Also, the server device 31 includes a database part 33 and is configured to store and hold each kind of information in the database part 33. As each kind of information stored and held in the database part 33, there is the information in the system, regarding the edging characteristics of the edger 10, other than the information managed uniformly in the system (e.g. information regarding a job and the related information). Namely, the database part 33 functions as a memory unit that stores and holds the edging characteristics of the edger 10.

[0036] Information regarding the edging characteristics of the edger 10 is used to specify the edging characteristics of each of the edgers 10 when edging a lens material using an edging tool. Specifically, for example, there is on the information regarding edging characteristics, or the information for specifying a dimension of the real size after edging with respect to an externally indicated edging size, namely, information for specifying the error between a desired size and the real size after edging.

[0037] The information regarding edging characteristics stored and held in the database part 33 will be hereinafter described more specifically with a specific example.

[0038] FIG. 2 is an explanatory view showing a specific example of the information regarding the edging characteristic stored and held in the database part 33 according to this embodiment.

[0039] As shown in the figure, the information regarding the edging characteristic is stored and held in association with the type of the lens material to be edged by the edger 10 and the type of the edging tool used by the edger 10. Namely, the information regarding the edging characteristic is stored and held in the database part 33 for each type of edging tool, e.g. beveling tool (see FIG. 2 (a)), flattening tool (see FIG. 2 (b)), beveling/polishing tool (see FIG. 2 (c)), flattening/polishing tool (see FIG. 2 (d)), etc. and for each type of lens material to be edged, e.g. Material A to Material I. Also, each type of the lens material has each corresponding edging mode (e.g. Mode A to Mode D) of the edger 10 used for edging the lens material.

[0040] A specific content of the information regarding the edging characteristic, includes a correlated value of a theoretical lens circumferential length value obtained by realizing an outer shape (outline) as a previously set reference (called "reference shape" hereafter), an actual lens circumferential value obtained by edging a specific power lens (such as zero power lens (Plano), and S+4.00 lens and S-7.00 lens) into a reference shape respectively, an average value of an actual measured circumferential

length of a plurality of lenses, and a value obtained by converting a difference in the circumferential length between the circumferential length reference value and the average value of the actual measured circumferential lengths, to a value in a lens radial direction (called a "radius converted value of the circumferential difference").

[0041] Also, as specific examples of the information regarding the edging characteristic, a device side correction value and a parameter correction value can be given, in addition to the abovementioned information. These device side correction value and parameter correction value are both used to suppress the error between the real size of a lens after edging and a desired size within an allowable range. However, the device side correction value and the parameter correction value are different from each other in the point that the device side correction value is set and used at the edger 10 side, and meanwhile the parameter correction value is used by notifying the edger 10 of this value from the client device 32. Also, they are different from each other in the point that the device side correction value is used for size adjustment, whereas the parameter correction value is used for correcting the edging parameter. The following relationship is established between the device side correction value and the parameter correction value: "radius converted value of the circumferential difference" = "device side correction value" + "parameter correction value."

[0042] The information regarding the edging characteristic as described above is stored and held in the database part 33 individually for each model of the edgers 10 when the edgers 10 of a plurality of models coexist in the system.

[0043] Such information regarding the edging characteristic in the database part 33 is obtained by actually edging the specific power lens by at least one of the plurality of edgers 10 in the system. The number of the at least one of the edgers 10 that performs actual edging may be one when there is only one model in the system, although when a plurality of models coexist in the system, the number must be the same as that of the models or larger.

(Client device)

[0044] The client device 32 includes a computer that controls and manages the operation of each edger 10 in the system under the management and control by the server device 31. Specifically, the client device 32 receives information regarding a job managed by the server device 31 from the server device 31 and notifies the edger 10 of this information to execute the job (i.e. edging of a spectacle lens), thereby controlling the job processing operation performed by the edger 10. Also, the client device 32, prior to the job processing, acquires information regarding edging characteristics obtained by at least one edger 10 in the system, sends the acquired information to the server device 31, and requests the server device

31 to store and hold the information.

[0045] To perform such processing, the client device 32 includes a control program part 34 and a correction management program part 35.

[0046] The control program part 34 is configured to manage and control the job executed by the edgers 10. Namely, the control program part 34 has the functions of receiving information regarding the job from the server device 31, notifying the edger 10 of the information to execute the job (job execution instruction), etc. These functions may be realized by using a publicly-known technique, and therefore detailed explanation therefore is omitted here.

[0047] The correction management program part 35 which is not included in conventional systems, is configured to notify the edger 10 of correcting the edging parameter when the job is executed by the edger 10, based on the information stored and held in the database part 33 of the server device 31. To perform such processing, the correction management program part 35 has a function as an acquisition unit 36 and a management unit 37.

[0048] The acquisition unit 36 has a function of acquiring information regarding the edging characteristic obtained by at least one edger 10 in the system and sending the acquired information to the server device 31 so that the information is stored and held in the database part 33 of the server device 31. The information regarding the edging characteristic may be acquired using the publicly-known technique. As a specific example, it can be considered that the information regarding the edging characteristics is obtained by using a display device such as a display of the client device 32 and an input device such as a keyboard, so that display GUI (Graphical User Interface) screen is displayed to prompt input of the information, and each kind of information is inputted by the operator, etc., from the input device. As the other example, it can be considered that the client device 32 acquires the information regarding the edging characteristic from the edger 10, by receiving each kind of information inputted by the operator, etc., using the operation panel, etc., of at least one edger 10.

[0049] The management unit 37 has a function of managing the edger 10 to correct the edging parameter when the control program part 34 gives an instruction of executing the job to the edger 10, and the edger 10 executes the job according to this instruction. The management of edging parameter correction is performed using a size management table for each edger 10. Namely, the management unit 37 creates a size management table for each edger 10 and, using the created size management table, notifies the edger 10 of the correction value managed by the size management table, so that the edging parameter is corrected individually for each edger 10.

[0050] FIG. 3 is an explanatory view showing a specific example of the size management table managed by the management unit 37 of the correction management program part 35 of this embodiment.

[0051] As shown in the figure, the size management

table is created for each edger 10 to manage (store and hold) the type of lens material to be edged by the edger 10 (Material A, Material B, ...), the type of edging tool used by the edger 10 (beveling tool, flattening tool, ...), and correction values H11, H12, ... in association with one another, wherein the correction values H11, H12... are required for correcting the edging parameter by combining the above types respectively. As described later in detail, the "parameter correction value" is read from the database part 33 and then stored and held in the section of the correction values H11, H12, ... in the size management table.

[0052] It can be considered that the correction management program part 35 having the function as the acquisition unit 36 and the management unit 37 is realized by a software program run by the client device 32, which is a computer. In this case, the correction management program part 35 as a software program is installed on the client device 32 and is used. However, the present invention is not necessarily limited thereto, and as long as the client device 32 is accessible, the correction management program part 35 may exist in the server device 31 or other client device 32 in the system.

<4. Procedure of size management>

[0053] Next, the procedure of the size management in the lens edging system with above structure will be described.

[0054] FIG. 4 is a flowchart showing a specific example of the procedure of the size management according to this embodiment.

(Processing by First Edger)

[0055] In the lens edging system of this embodiment, when the first edger 10 of a certain model is introduced, first, the size adjustment is performed by the edger 10 (Step 101; the step is abbreviated as simply "S" hereafter). The edging size adjustment is performed by an operator etc. using a function of the edger 10 as the adjustment unit 11.

[0056] Specifically, an unedged plano lens of a predetermined lens material (e.g. Material A) is edged into a reference shape of a desired size by the first edger 10. A circular shape in plan view with a circumferential length as a reference value, can be considered as the reference shape of a desired size. This is because by having the circular shape in plan view, measurement of the real size described later can be easy. Further, the plano lens is selected to be edged, because an influence of a lens curve can be eliminated, thereby making it easy to perform outline edging and real size measurement with high precision.

[0057] The outline edging is performed to the plano lens, using each type of edging tool by the first edger 10. Therefore, the plano lens after outline edging is obtained by the number of all types of the edging tools used by

the first edger 10.

[0058] After the outline edging is performed to the plano lens, the real size of the circumferential length of the plano lens after edging is measured. This size measurement may be performed using the three-dimensional circumferential length measuring device 20 in the system, but the present invention is not limited thereto. For example, the measurement may be performed by an operator etc. using vernier calipers or any other measuring device.

[0059] Then, the operator etc. compares a desired size (circumferential length reference value) with the real size and performs the size adjustment to the first edger so that the error is suppressed within an allowable range. Specifically, the error between the desired size and the real size is calculated by the radius converted value for example, and thereafter by operating the operation panel of the first edger 10 by the operator, etc., the correction value of the edging parameter (such as a tool diameter of the edging tool) is previously set at the edger 10 side, for each type of the edging tool, so that the calculated error is canceled. Such processing may be performed using the function (publicly-known function) specific to the first edger 10.

[0060] Thus, the first edger 10 can perform outline edging to the plano lens made of at least predefined lens material so that the error between the desired size and the real size is suppressed in an allowable range, even if any type of the edging tool is used. In other words, the edging characteristic described later can be properly grasped.

[0061] After the size adjustment is performed to the first edger 10, the edging characteristic of this edger 10 is grasped (S102). The edging characteristic is grasped by actually performing edging to the specific power lens so that the outer shape is a reference shape of a desired size, and measuring the real size of the spectacle lens after edging. The reference shape of a desired size is the same as the case of the abovementioned plano lens. It can be considered that the real size is also measured using the three-dimensional measuring device 20 in the system, similarly to the case of the abovementioned plano lens. However, the present invention is not limited thereto, and the measurement may be performed using vernier calipers or any other measuring device.

[0062] Specifically, an unedged specific power lens (such as zero power lens (Plano), S+4.00 lens, S-7.00 lens) is prepared, and

[0063] The circumference of each specific power lens is actually edged into the reference shape of a desired size by the first edger 10, and the lens circumferential length after edging (i.e. the real size of each specific power lens after edging) is measured.

[0064] By using the measurement result thus obtained, the difference between the circumferential length and the reference value of the circumferential length (i.e. the error between a desired size and the real size) can be calculated. Thus, the edging characteristic of the first edger

10 can be specified. Namely, in the case of the plano lens, the outline edging can be performed so as to suppress the error between the desired size and the real size in an allowable range. However, when the specific power lens is selected to be edged, what kind of error is generated or whether the error is suppressed in the allowable range, can be grasped as the edging characteristic of the specific power lens.

[0065] Also, in the first edger 10, the edging characteristic is grasped for all types of lens materials to be edged by this edger 10, and for all types of edging tools used by this edger 10. Accordingly, by grasping the edging characteristics of all types of lenses, an influence of the difference between types of the lens material or the difference between edging tools can be recognized. Namely, how the edging characteristics of the first edger 10 is influenced by the above difference can be recognized.

[0066] By grasping the edging characteristic using the abovementioned method, information regarding the edging characteristic of the first edger 10 (specifically, each value constituting the information shown in FIG. 2 for example) is specified.

[0067] As described above, the edging characteristic is grasped for the first edger 10, which is at least one edger 10 in the system. However, "at least one" suggests the possibility that the edging characteristic is grasped for each of the plurality of edgers 10 of the same model. When the edging characteristic is grasped for each of the plurality of edgers 10, high precision and high reliability can be expected for the result of grasp. However, as described above, the edging characteristic is preferably grasped by the first edger 10 only, in consideration of the labor of grasping the edging characteristic.

[0068] Here, the size adjustment is performed to the first edger 10 by the operator, etc., as needed, using the device side correction value (for example, see FIG. 2). The size adjustment here is performed to each type of the edging tool, with the predefined lens material (such as material A) as a reference. This lens material will be hereinafter referred to as "reference glass material." Specifically, first, difference of the circumferential length (called circumferential difference hereafter) of the specific power lens made of the reference glass material is measured, then the obtained value is converted to a radius converted value, and this value is grasped by the operator, etc. For example, when the edging tool is a beveling tool (for example, see FIG. 2 (a)), the radius converted value of the circumferential difference is "0.00" regarding the reference glass material, and when the edging tool is a beveling/polishing tool (for example, see FIG. 2 (c)), the radius converted value of the circumferential difference is "0.01" regarding the reference glass material. Then, when the radius converted value of the circumferential difference is grasped, regarding the reference glass material, the grasped radius converted value of the circumferential difference is previously set by an operation of the operator, etc., at the edger 10 side,

for each type of the edging tool, as the device side correction value of the edger 10, by using the function of the first edger 10 as the adjustment unit 11. The device-side correction value set at the edger 10 is called a "machine offset value" hereafter." Thus, for example, regarding the beveling tool, the machine offset value is set to "0.00" or non-setting state (for example, see FIG. 2 (a)), whereas regarding the beveling/polishing tool, the machine offset value is set to "0.01" (for example, see FIG. 2 (c)). Even in a case that the edger 10 can have a plurality of edging modes (such as mode A to mode D), a value in common with all edging modes is set. Such processing may be performed using the function (publicly-known function) specific to the first edger 10.

[0069] By performing such a size adjustment, the first edger 10 can perform outline edging to the lens made of at least the reference glass material, so as to suppress the error between the desired size and the real size within an allowable range, even if any kind of the edging tool is used. In other words, regarding at least the lens made of the reference glass material, edging characteristics can be uniform (standardized) even in a case of using any type of the edging tool.

(Processing by edging size management device)

[0070] Thereafter, the client device 32 acquires information regarding the edging characteristic of the first edger 10 so that the acquired information is stored and held in the database part 33 of the server device 31 (S104).

[0071] Specifically, in the client device 32, the acquisition unit 36 of the correction management program part 35 displays the GUI screen to prompt the input of the information so that the operator, etc., can input each kind of information.

[0072] It can be considered that the input of each kind of information is performed using the input device of the client device 32. The input of each kind of information may also be performed using the operation panel etc. of the first edger 10, which is connected to the client device 32. The information inputted here is the information obtained in the abovementioned step (S102), which is the information regarding the edging characteristic of the first edger 10. More specifically, it is the information regarding each item shown in FIG. 2. Among these items, input of the reference value of the circumferential length and the actually measured circumferential length is essential. However, the other item may be acquired by inputting it in the GUI screen similarly to a required input item, or may be acquired by the acquisition unit 36 by calculating from the input content of the required input item.

[0073] Thus, the information regarding the edging characteristic shown in FIG. 2 is stored and held in the database part 33 of the server device 31. Storing and holding in the database part 33 is performed in association with the information for identifying the model of the first edger 10 (Namely, individually for each model of the

edger 10).

(Processing by second and subsequent edger)

[0074] Here, explanation is given for a case that edger 10 of the same model as the first edger 10 is newly introduced to the lens edging system. The newly introduced edger 10 is called as second and subsequent edger 10 hereafter.

[0075] When the second and subsequent edger 10 is introduced, first, size adjustment is performed to each of the edgers 10 (S105a, S105b, ...). The size adjustment is performed by the operation of the operator, etc., using the function of the edger 10 which is the adjustment unit 11 of this edger 10.

[0076] However, the size adjustment performed to the second and subsequent edger 10 is different from the size adjustment performed to the first edger 10 in the following point.

[0077] Since the edging characteristic of the second and the subsequent edger 10 is not grasped like the case performed by the first edger 10, the size adjustment for appropriately grasping the edging characteristic, is not required. Therefore, regarding the second and subsequent edger 10, the pre-size adjustment using the plano lens like the case performed by the first edger 10, is not performed, and instead, the size adjustment using the specific power lens made of the reference glass material is performed.

[0078] Specifically, each of the second and subsequent edger 10 performs edging to an unedged zero power lens (Plano) made of the glass material, so that the outer shape is the reference shape of a desired size (namely, the size in which the circumferential length has the reference value). Then, the real size of the circumferential length of the zero power lens after edging is measured. The measurement may be performed using the three-dimensional circumferential length measuring device 20. However, the present invention is not limited thereto, and for example, the measurement may be performed by the operator etc. using vernier calipers or any other measuring device.

[0079] Such edging and measurement are performed by each of the second and subsequent edger 10, for each edging tool used by each edger 10. Accordingly, the measurement result can be obtained regarding the power zero lens after outline edging and the real size, by the number of all types of the edging tools used by the second and subsequent edger 10.

[0080] Thereafter, the operator etc. compares the desired size (reference value of the circumferential length) and the real size, calculates the error between the desired size and the real size using the radius converted value, and operates the operation panel of the second and subsequent edger 10 so that the correction value is previously set for each type of the edging tool, which is the value of correcting the edging parameter (such as tool diameter of the edging tool) at the edger 10 side as the

machine offset value, so as to cancel the calculated error. Such processing may be performed using the function (publicly-known function) specific to the second and subsequent edgers 10.

[0081] By performing such a size adjustment, the outline edging can be performed by the second and subsequent edger 10 made of at least the reference glass material, so that the error between the desired size and the real size is suppressed within the allowable range, even when any type of edging tool is used. Namely, similarly to the first edger 10, the edging characteristic can be uniform (standardized) when edging to at least the reference glass material, even if any type of edging tool is used.

(Processing by edging size management device)

[0082] Subsequently, the client device 32 creates a size management table (for example, see FIG. 3), for each edger 10, regarding the edger 10 that exists in the edging system, namely, first, second and subsequent edger 10 (S106).

[0083] Specifically, in the client device 32, the management unit 37 of the correction management program part 35 recognizes the type of the lens material (material A, material B, ...) to be edged by the edger 10, and the type of the edging tool (beveling tool, flattening tool, ...) used by the edger 10, for each edger 10 under management. Although these types are recognized for each edger 10, the same recognition result is obtained when the edger 10 is the same model. When the type of lens material and the type of edging tool are recognized, a framework (pattern) is created for managing (storing and holding) these types in a table form in association with correction values H11, H12, ... for correcting the edging parameter. The table is thus created as a size management table for each edger 10. Creation of the table, and acquisition of the information required for creating the table, may be performed using the publicly-known technique, and the method itself is not particularly limited.

[0084] After the size management table is created for each edger 10, a value (an initial value) is stored in each section of the correction values H11, H12, ... in the size management table (S107).

[0085] Specifically, in the client device 32, first, the management unit 37 of the correction management program part 35 accesses the database part 33 of the server device 31 to read "a parameter correction value" out of the information regarding the acquired edging characteristics of the first edger 10. The "parameter correction value" is associated with each type of lens material and each type of edging tool. When the "parameter correction value" is read, the management unit 37 of the correction management program part 35 stores the obtained "parameter correction value" in the corresponding section of the correction values H11, H12, ... in the size management table, in association with the type of the lens material and the type of the edging tool. Thus, the size man-

agement table is completed, in which the "parameter correction value" is stored, out of the information regarding the acquired edging characteristic of the first edger 10, as correction values H11, H12 ... for correcting the edging parameter.

[0086] According to such a size management table, correction values H11, H12 ... can be managed (stored and held) for each type of the lens material, and further for each type of the edging tool. Accordingly, when the correction value is managed by the edger 10 side, considerably various types of correction values for each type of the lens material and for each type of the edging tool can be uniformly managed, unlike the case that the edger 10 can respond to only a single correction value or only the correction value for each edging mode (such as mode A to mode D). Namely, the management of the correction value of the edging parameter that cannot be realized by a conventional technical knowledge, can be realized.

[0087] Although the size management table thus completed is provided for each edger 10, the content of the table is the same for the edger 10 of the same model, at least at the point when the size management table is completed. Namely, the "parameter correction value" acquired for the first edger 10, is stored in both of the size management table for the first edger 10, and the size management table for the second and subsequent edger 10.

[0088] After completion of the size management table, correction values H11, H12, ... in the size management table may be suitably updated according to an operation state of each edger 10. For example, the following case can be considered: the real size of the circumferential length of the lens after edging is measured at a predetermined stage after operation of the edger 10, and based on the measurement result, correction values H11, H12, ... may be changed to new correction values so that the error between the desired size and the real size is suppressed within an allowable range. In this case, the real size of the lens after edging is not under an influence of the operation state of the edger 10 (for example, an influence of a progress of wear of the edging tool). Namely, regardless of the operation state of the edger 10, accuracy of the edging performed to the spectacle lens can be improved, which can be achieved by creation of the size management table for each edger 10 by the management unit 37 of the correction management program part 35 in the client device 32. In other words, it can be said that creation of the size management table for each edger 10 contributes to improvement of the accuracy of the edging after operation of each edger 10.

[0089] Through the abovementioned procedure, the preparatory stage of the lens edging system of this embodiment is completed. Namely, after the abovementioned steps (S101 to S107), the lens edging system of this embodiment is advanced to the operation stage of performing edging to the spectacle lens.

[0090] In the operation stage, the server device 31 monitors presence or absence of an order (i.e. presence

or absence of a job) for the spectacle lens. When the job occurs, each type of information required for executing the job is managed in the database part 33, and a job number unique to the job is barcoded and outputted. The barcoded job number is attached to an uncut lens to be edged under this job, and sent to the first edger 10 or any one of the second and subsequent edger 10 that performs the edging. Hereinafter, the first edger 10 or any one of the second and subsequent edgers 10 that performs the edging is simply called the edger 10.

[0091] When the barcoded uncut lens is sent, the edger 10 reads the barcode with a barcode reader of the edger 10 to recognize the job number and notifies the client device 32 of this job number. Based on this job number, the client device 32 requests the server device 31 to notify the client device 32 of the information regarding the job specified by this job number. Then, when the requested notification (each kind of information) is received from the server device 31, the client device 32 notifies the edger 10 which is a request source, of each kind of information. Each kind of information to notify the edger 10, includes job identification data (such as a job number), lens data (such as a product code to specify a lens material, a lens power, a lens thickness, a front surface shape curve value, a rear surface shape curve value, the kind of antireflection film, and the kind of lens color), edged shape data (such as spectacle lens frame's three- and two-dimensional edging shapes, a theoretical circumferential length, distinction between a left eye and a right eye, and a frame/pattern, etc.), edging condition data (such as the kind of lens material and the kind of edging tool, etc.).

[0092] Also, in the client device 32, in addition to the abovementioned notification of each kind of information, the correction management program part 35 has a function as the management unit 37, to access the information stored in the size management table for the selected edger 10, and read from the size management table the correction value of the edging parameter (namely, corresponding "parameter correction value") in association with the type of the lens material and the type of the edging tool according to the job executed by the edger 10, and notify the edger 10 of the selected "parameter correction value" read from the size management table (S108).

[0093] Thus, the edger 10 is notified of the "parameter correction value" read from the size management table, from the client device 32 as the information, in addition to each kind of information such as lens data, edged shape data, and edging condition data, etc., to execute the job by the edger 10.

(Processing by edger that performs edging job)

[0094] Meanwhile, when the edger 10 is notified of the abovementioned each kind of information from the client device 32 to execute the job, the edger 10 starts execution of the edging job based on the notification,

namely, the based on the content of each kind of information.

[0095] At this time, when executing the edging job, the edger 10 has a function as the correction unit 12 to receive the notification of the "parameter correction value", and determine an edging amount reflecting the received "parameter correction value". Namely, based on the received "parameter correction value", the edging parameter specified by the each kind of information from the client device 32, specifically the edging tool diameter (offset amount), is corrected using the "parameter correction value" (S109a, S109b, S109c).

[0096] The abovementioned correction by the correction unit 12 is performed based on the size management table managed by the client device 32. The size management table is capable of collectively managing an extremely wide variety of correction values for each type of lens material and each type of edging tool. Accordingly, by correcting the edging parameter by the correction unit 12, each of the all types of lens materials to be edged by the edger 10, can be appropriately corrected, irrespective of the edging mode which can be set in the edger 10. Also, each of the all types of edging tools that can be used by the edger 10, can be appropriately corrected.

[0097] After the edging parameter is corrected by the correction unit 12, the edger 10 performs edging to a spectacle lens using the edging parameter after the correction, with a size after correction (S110a, S110b, S110c).

[0098] At this time, for example, the second and subsequent edger 10 corrects the edging parameter based on the "parameter correction value" acquired by the first edger 10, namely, based on the information regarding the edging characteristic of the device other than its own device. However, in the second and subsequent edger 10, the size adjustment is performed prior to the edging reflecting the result of correcting the edging parameter (S105a, S105b), so that the edging characteristic is uniform (standardized). Accordingly, even when the edging parameter is corrected based on the "parameter correction value" acquired by the first edger 10, appropriate edging can be performed by the second and subsequent edger 10, reflecting the result of correcting the edging parameter (or capable of suppressing the error between the desired size and the real size within an allowable range), similarly to the case of the first edger 10.

[0099] In the lens edging system of this embodiment, the size management is performed through the abovementioned procedure, when edging is performed to the spectacle lens by the edger 10.

<5. Procedure of manufacturing a spectacle lens >

[0100] Next, the procedure of manufacturing a spectacle lens using the abovementioned lens edging system will be described briefly.

[0101] In the lens edging system, when the server device 31 receives an order from a spectacle shop, the un-

cut lens with barcoded job number is sent to one of the edgers 10 as a job execution body. Then, based on the results of reading the barcode by the edger 10, the edger 10 is notified of each kind of information required for executing the job, from the client device 32. At this time, as already described, the edger 10 is notified of the correction value of the edging parameter together, from the client device 32. Namely, the edger 10 is notified of the correction value of the edging parameter (e.g. a correction value converted to a radius value) for each job (each order from the spectacle shop).

[0102] Here, when the uncut lens is set, which is made of the lens material ordered from the spectacle shop, edging is started by the edger 10 to form the circumferential edge of the set uncut lens into the edged shape suited to the order from the spectacle shop.

[0103] At this time, an amount for edging the uncut lens by the edger 10 is the amount reflecting the notification from the client device 32, namely, reflecting the correction value. Namely, the edger 10 performs edging to the spectacle lens, while correcting the edging parameter for each job (for each order from the spectacle shop), under management of the edging size by the sever device 31 and the client device 32. Then, after the edging by the edger 10 is ended, the spectacle lens after edging is taken out from the edger 10, and the client device 32 is notified of the end of the edging from the edger 10, and the server device 31 is also notified accordingly from the client device 32.

[0104] Through the abovementioned procedure, the spectacle lens is manufactured according to the order from the spectacle shop, in the lens edging system of this embodiment.

<6. Effects of this embodiment>

[0105] According to this embodiment, the following effects can be obtained.

[0106] In this embodiment, the information regarding the edging characteristic is grasped by the first edger 10 as at least one of the edgers 10 in the lens edging system, and the information regarding the edging characteristic is stored and held in the database part 33, and based on the stored and held information, the correction management program part 35 creates the size management table for each edger 10.

[0107] When each edger 10 edges the spectacle lens, the edging parameter (specifically tool diameter of the edging tool for example) for the edging is corrected based on the information regarding the content managed by the size management table, namely, the edging characteristic grasped by the first edger, for not only the first edger 10 but also the second and subsequent edger 10. Therefore, according to the lens edging system of this embodiment, even when the edging is performed by either one of the first edger 10 and the second and subsequent edger 10, the error between the desired size and the real size of the spectacle lens after the edging is suppressed

within an allowable range by correcting the edging parameter.

[0108] Moreover, according to this embodiment, the edging parameter is corrected based on the information regarding the edging characteristic grasped by the first edger 10, not only for the first edger 10 but also for the second and subsequent edger 10. Namely, in the case of the same model, the edging parameter is corrected for the second and subsequent edger 10 as well, by using the information as it is for the edging characteristic of the first edger 10. Accordingly, regarding the second and subsequent edger 10, the size adjustment for each edging tool may be performed, to at least the lens made of the reference glass material, when the lens is introduced in the lens edging system, and there is no necessity for performing the size adjustment individually for all types of the lens material to be edged by the edger 10. Namely, the edging characteristic of the second and subsequent edger 10 is not required to be grasped unlike the case with the first edger 10. Therefore, even when the lens edging system including a plurality of edgers is constructed, the labor of the size adjustment in the second and subsequent edger 10 can be considerably simplified.

[0109] It can be said that this is very effective for constructing the lens edging system responding to a so-called custom-made lens (lens manufactured based on various specifications for not only the lens prescription but also the lens material and the circumferential edging of the lens, in each order from a client). This is because regarding the custom-made lens, the edger is required to respond to various lens materials and edging tools, etc., and a remarkable effect appears in simplifying the size adjustment for the second and subsequent edger 10.

[0110] Also, in this embodiment, the second and subsequent edger 10 performs size adjustment for each type of the edging tool, so that the error is suppressed in the allowable range, between the desired size and the real size of the spectacle lens after edging made of the reference glass material (namely, at least one type of the lens material previously defined as a reference), and corrects the edging parameter based on the edging characteristic of the first edger 10 when edging is performed to the lens material other than the reference glass material. Namely, the second and subsequent edger 10, performs size adjustment to the lens made of the reference glass material, so that the edging characteristics are uniform (standardized) corresponding to mainly the first edger 10. Accordingly, even when the edging parameter is corrected based on the edging characteristic of the first edger 10, appropriate edging can be performed, reflecting the result of correcting the edging parameter for the second and subsequent edger 10, similarly to the case of the first edger 10 (namely, the error between the desired size and the real size can be suppressed in the allowable range). In this case, the "parameter correction value" for the first edger 10 is not simply applied to the second and subsequent edger, but a technical concept is realized so that the difference of the edging characteristics between

each kind of lens materials, is applied to the second and subsequent edger 10 based on a relation with the edging characteristic of the reference glass material.

[0111] Moreover, in this embodiment, the edging parameter is corrected using the size management table managed by the correction management program part 35 for any one of the first edger 10 and the second and subsequent edger 10. Accordingly, unlike the case that the correction values is managed for each edging mode (e.g. Mode A to Mode D) at each edger 10 side, an extremely wide variety of correction values for each type of lens material and for each type of edging tool used by each edger 10 can be managed collectively. This is because although the number of the edging mode in which the edger 10 can be set, is naturally limited in terms of a memory storage capacity of storing information in this edger 10, a larger information memory storage capacity can be used compared with the edger 10, by setting the edging mode at the management program part 35 of the client device 32. Namely, management of the correction value of the edging parameter that cannot be performed by a conventional technique, can be realized, and therefore suitable edging can be performed to each of the spectacle lenses having various specifications. It can be said that this is very effective for constructing the lens edging system particularly responding to the custom-made lens.

<7. Modified example etc.>

[0112] Embodiments of the present invention have been described above. However, the above-described disclosure shows an exemplary embodiment of the present invention. Namely, the technical scope of the present invention is not limited to the abovementioned exemplary embodiment.

[0113] For example, although in the above-described embodiment, the correction management program part 35 that manages the correction of the edging parameter by each edger 10 is disposed in the client device 32, the correction management program part 35 may be disposed in any location in the lens edging system and may be disposed in another device (e.g. the server device 31).

[0114] Also, although the above-described embodiment shows an example of managing the edging parameter by the correction management program part 35, using the size management table for each edger 10, the present invention is not necessarily limited thereto. As already described above, by using the size management table for each edger 10, the operation state of the edger 10 can be prevented from being influenced by the result of edging. However, in the case of performing only the correction of the edging parameter by each edger 10 at an initial stage of the operation, each edger 10 can be notified of the "parameter correction value" required for correcting the edging parameter, even if there is no size management table, by reading the stored and held information from the database part 33 every time correcting

the edging parameter.

[0115] Moreover, regarding the transfer of each kind of information between the client device 32 and each edger 10, such as the transfer of a "parameter correction value," the specific method is not particularly limited. Namely, the transfer of each kind of information may be performed mainly by the client device 32 to each edger 10 or may be performed mainly by each edger 10 in such a manner as requesting the information from the client device 32 as needed, or reading the information from the size management table, etc., of the client device 32.

[0116] Furthermore, the above-described embodiment shows an example of executing the job by each edger 10, each edger 10, the server device 31, and the client device 32 installed in the edging center, according to the order from a terminal device installed at the spectacle shop. However, the present invention is not necessarily limited thereto. For example, the edging job can be executed according to the order from the terminal device installed not in the spectacle shop but in the edging center. Specifically, it is conceivable to construct a mechanism of measuring a spectacle frame shape by a measurement device installed in the edging center, then framing the edged lens into a spectacle frame whose shape is measured, and delivering the edged lens from the edging center as a finished product.

{Description of the Reference Numeral}

[0117]

- 10 edger
- 11 adjustment unit
- 12 correction unit
- 20 three-dimensional circumferential length measuring device
- 30 management device (edging size management device)
- 31 server device
- 32 client device
- 33 database part (memory unit)
- 34 control program part
- 35 correction management program part
- 36 acquisition unit
- 37 management unit
- 40 communication line

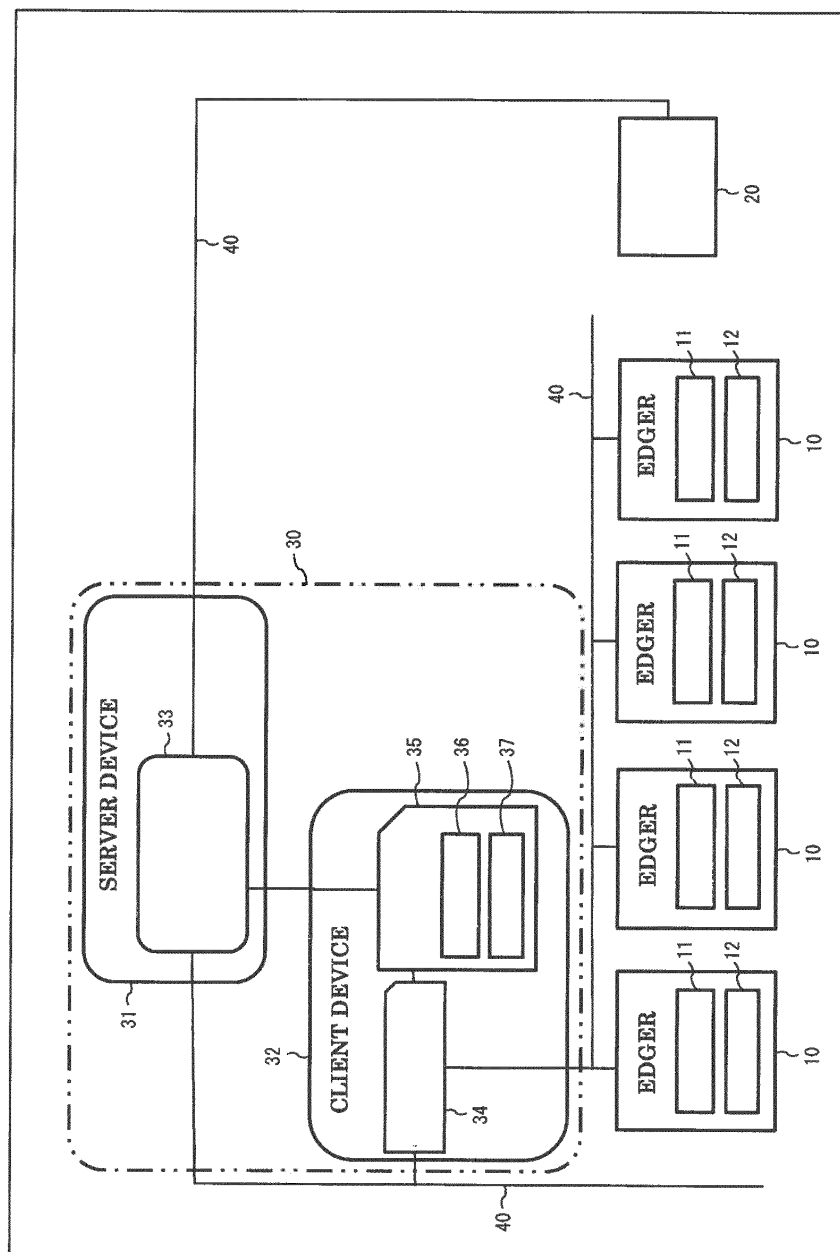
Claims

1. A lens edging system comprising:

- a plurality of edgers configured to perform edging to a spectacle lens; and
- an edging size management device used in connection with the plurality of edgers, the edging size management device comprising a memory unit configured to store and hold information for

- each model of the edger, regarding edging characteristics when a lens material is edged using an edging tool of the edger, in association with a type of the lens material to be edged by the edger, and a type of the edging tool used by the edger, wherein the information stored and held in the memory unit is the information regarding edging characteristics of the edger obtained by at least one of the plurality of edgers, and an edger of the same model as at least one of the plurality of edgers comprises a correction unit configured to correct an edging parameter for the edging based on the information stored and held in the memory unit when edging is performed to the lens material using the edging tool of the edger.
2. The lens edging system according to claim 1, wherein an edger of the same model as the edger other than at least one of the plurality of edgers is configured to adjust an edging size of at least one type of the lens material which is previously defined as a reference so that an error between a desired size and a real size of a spectacle lens after edging is suppressed within an allowable range, and thereafter the correction unit is configured to correct the edging parameter when performing edging to the lens material other than at least one type of the lens material defined as a reference.
3. An edging size management device used in connection with a plurality of edgers that perform edging to a spectacle lens, comprising:
 a memory unit configured to store and hold information for each model of the edger, wherein the information regarding edging characteristics for edging a lens material by the edger using an edging tool, is stored and held in association with a type of the lens material to be edged by the edger and a type of the edging tool used by the edger;
 an acquisition unit configured to acquire information regarding edging characteristic of at least one of the plurality of edgers, as the information stored and held in the memory unit; and
 a management unit configured to control so that an edging parameter for the edging is corrected by the edger of the same model as at least one of the plurality of edgers, based on the information stored and held in the memory unit, when edging is performed to the lens material by the edger using the edging tool.
4. An edging size management method of managing an edging size for a plurality of edgers that perform edging to a spectacle lens, comprising:
- acquiring information regarding edging characteristic for performing edging to a lens material by at least one of the plurality of edgers using an edging tool, in association with all types of lens materials to be edged by the edger and all types of edging tools used by the edger, storing and holding the information regarding edging characteristics acquired by at least one of the edgers, in association with a model of the edger, a type of the lens material, and a type of the edging tool; and
 correcting an edging parameter for the edging based on the already stored and held information regarding the edging characteristic, when edging is performed to the lens material by an edger of the same model as the at least one of the plurality of edgers, using the edging tool.
5. A method of manufacturing a spectacle lens, wherein a spectacle lens is formed by edging using the edger, with an edging size managed by the edging size management method of claim 4.

FIG.1



- 11/ ADJUSTMENT UNIT
- 12/ CORRECTION UNIT
- 20/ THREE-DIMENSIONAL CIRCUMFERENTIAL LENGTH MEASURING DEVICE
- 33/ DATABASE PART (MEMORY UNIT)
- 34/ CONTROL PROGRAM PART
- 35/ CORRECTION MANAGEMENT PROGRAM PART
- 36/ ACQUISITION UNIT
- 37/ MANAGEMENT UNIT

FIG.2

(a)

BEVEL		141.37 (CIRCUMFERENTIAL LENGTH REFERENCE VALUE FOR PLANO LENS)						
LENS MATERIAL	EDGING MODE	a	b	c	d	e	f	g
MATERIAL A	MODE A	141.35	141.36	141.40	141.37	0.00	0.00	0.00
MATERIAL B	MODE B	140.97	140.95	140.85	140.92	0.07	0.00	0.07
MATERIAL C	MODE A	141.40	141.36	141.40	141.39	0.00	0.00	0.00
MATERIAL D	MODE C	141.41	141.39	141.39	141.40	0.00	0.00	0.00
MATERIAL E	MODE C	141.38	141.36	141.38	141.37	0.00		0.00
MATERIAL F	MODE C	141.38	141.36	141.39	141.38	0.00		0.00
MATERIAL G	MODE C	141.37	141.37	141.38	141.37	0.00		0.00
MATERIAL H	MODE C	141.36		141.35	141.36	0.00		0.00
MATERIAL I	MODE D	140.81			140.81	0.09	0.00	0.09

mm

(b)

FLATTENING		141.39 (CIRCUMFERENTIAL LENGTH REFERENCE VALUE FOR PLANO LENS)						
LENS MATERIAL	EDGING MODE	a	b	c	d	e	f	g
MATERIAL A	MODE A	141.39	141.44	141.43	141.42	0.00	0.00	0.00
MATERIAL B	MODE B	140.90	140.95	140.92	140.92	0.07	0.00	0.07
MATERIAL C	MODE A	141.36	141.41	141.37	141.38	0.00	0.00	0.00
MATERIAL D	MODE C	141.38	141.39	141.41	141.39	0.00	0.00	0.00
MATERIAL E	MODE C	141.36	141.36	141.38	141.37	0.00		0.00
MATERIAL F	MODE C	141.37	141.39	141.42	141.39	0.00		0.00
MATERIAL G	MODE C	141.40	141.39	141.38	141.39	0.00		0.00
MATERIAL H	MODE C	141.37		141.40	141.39	0.00		0.00
MATERIAL I	MODE D	140.88			140.88	0.08	0.00	0.08

mm

(c)

BEVELING/POLISHING		141.36 (CIRCUMFERENTIAL LENGTH REFERENCE VALUE FOR PLANO LENS)						
LENS MATERIAL	EDGING MODE	a	b	c	d	e	f	g
MATERIAL A	MODE A	141.18	141.33	141.42	141.31	0.01	0.01	0.00
MATERIAL B	MODE B	141.05	141.20	141.11	141.12	0.04	0.01	0.03
MATERIAL C	MODE A	141.06	141.05	141.14	141.08	0.04	0.01	0.03
MATERIAL D	MODE C	141.52	141.48	141.45	141.48	-0.02	0.01	-0.03
MATERIAL E	MODE C	141.51	141.44	141.34	141.43	-0.01		-0.02
MATERIAL F	MODE C	141.41	141.36	141.29	141.35	0.00		-0.01
MATERIAL G	MODE C	141.25	141.22	141.21	141.23	0.02		0.01
MATERIAL H	MODE C	141.14		141.12	141.13	0.04		0.03
MATERIAL I	MODE D	140.79			140.79	0.09	0.01	0.08

mm

(d)

FLATTENING/ POLISHING		141.38 (CIRCUMFERENTIAL LENGTH REFERENCE VALUE FOR PLANO LENS)						
LENS MATERIAL	EDGING MODE	a	b	c	d	e	f	g
MATERIAL A	MODE A	141.26	141.39	141.53	141.39	0.00	0.00	0.00
MATERIAL B	MODE B	141.38	141.35	141.29	141.34	0.01	0.00	0.01
MATERIAL C	MODE A	141.13	141.15	141.26	141.18	0.03	0.00	0.03
MATERIAL D	MODE C	141.66	141.59	141.45	141.57	-0.03	0.00	-0.03
MATERIAL E	MODE C	141.58	141.56	141.37	141.50	-0.02		-0.02
MATERIAL F	MODE C	141.54	141.48	141.31	141.44	-0.01		-0.01
MATERIAL G	MODE C	141.25	141.18	141.20	141.21	0.03		0.03
MATERIAL H	MODE C	141.14		141.13	141.14	0.04		0.04
MATERIAL I	MODE D	140.87			140.87	0.08	0.00	0.08

a/ PLANO: MEASURED CIRCUMFERENTIAL LENGTH b/S+4.00: MEASURED CIRCUMFERENTIAL LENGTH

c/ S-7.00: (*S-6.00) MEASURED CIRCUMFERENTIAL LENGTH

d/ AVERAGE VALUE OF MEASURED CIRCUMFERENTIAL LENGTHS

e/ RADIUS CONVERTED VALUE OF CIRCUMFERENTIAL DIFFERENCE

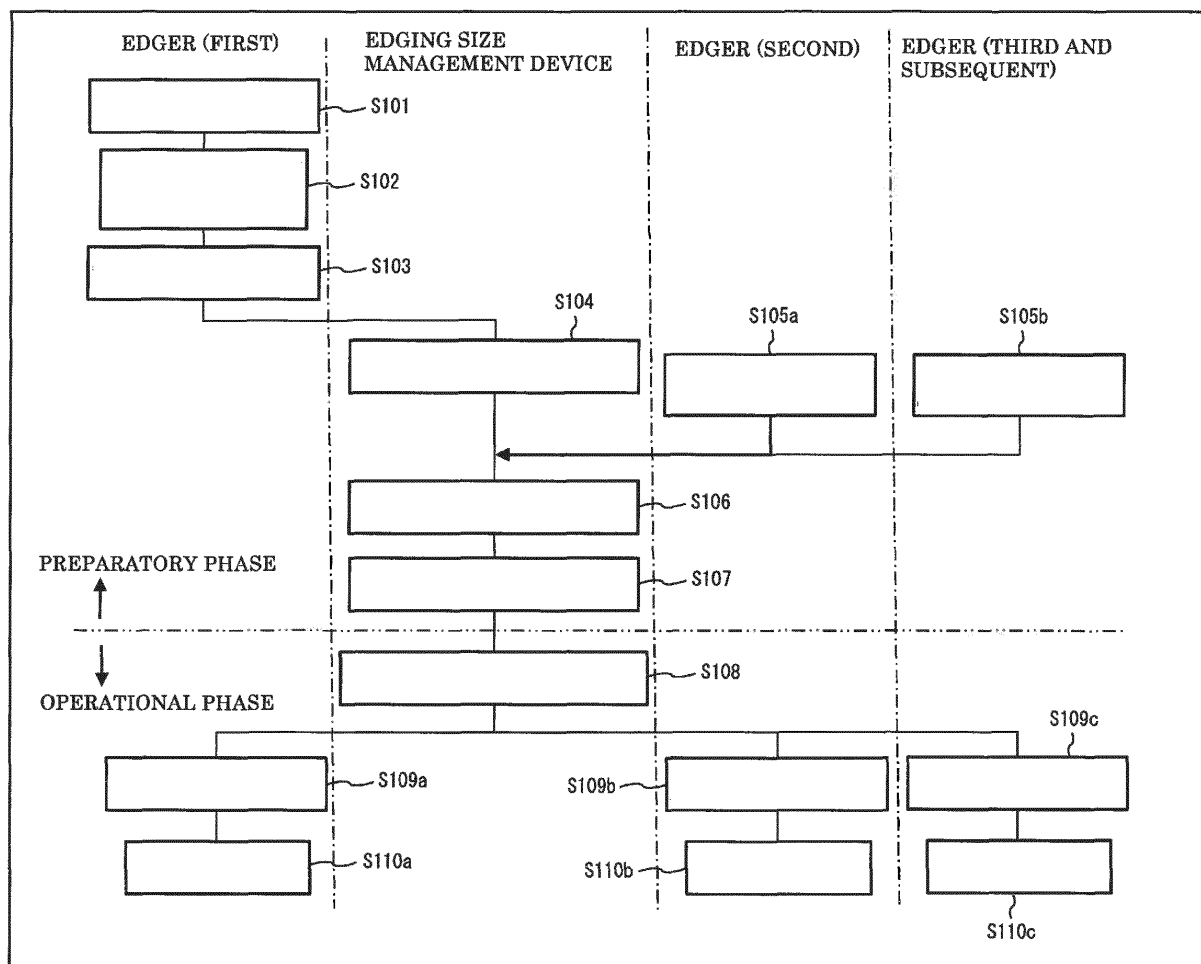
f/ DEVICE-SIDE CORRECTION VALUE g/ PARAMETER CORRECTION VALUE

FIG.3

LENS MATERIAL						
EDGING TOOL	MATERIAL A	MATERIAL B	MATERIAL C	MATERIAL D	MATERIAL E	...
	H11	H12	H13	H14	H15	
	H21	H22	H23	H24	H25	
	H31	H32	H33	H34	H35	
	H41	H42	H43	H44	H45	
	:	:	:	:	:	:

*H11 TO H45 ARE PARAMETER CORRECTION VALUES

FIG.4



S101/ PRESCRIBED PLANO LENS IS SIZE-ADJUSTED FOR EACH TOOL

S102/ EDGING CHARACTERISTIC IS GRASPED WHEN EDGING IS PERFORMED TO A PRESCRIBED CURVE LENS MADE OF GLASS MATERIAL

S103/ MACHINE OFFSET VALUE IS SET AS NEEDED, FOR REFERENCE GLASS MATERIAL

S104/ INFORMATION REGARDING EDGING CHARACTERISTIC IS ACQUIRED, STORED, AND HELD

S105a/ LENS MADE OF REFERENCE GLASS MATERIAL IS SIZE-ADJUSTED FOR EACH TOOL (INCLUDING SETTING A MACHINE OFFSET VALUE)

S105b/ LENS MADE OF REFERENCE GLASS MATERIAL IS SIZE-ADJUSTED FOR EACH TOOL (INCLUDING SETTING A MACHINE OFFSET VALUE)

S106/ SIZE MANAGEMENT TABLE IS PREPARED FOR EACH EDGING TOOL

S107/ STORED AND HELD INFORMATION IS READ AND THE READ INFORMATION IS STORED IN EACH TABLE

S108/ EACH EDGER IS NOTIFIED OF CORRECTION VALUE OF EDGING PARAMETER BASED ON THE INFORMATION IN THE TABLE

S109a/ TOOL DIAMETER OF EDGING PARAMETER IS CORRECTED BASED ON THE RECEIVED CORRECTION VALUE

S109b/ TOOL DIAMETER OF EDGING PARAMETER IS CORRECTED BASED ON THE RECEIVED CORRECTION VALUE

S109c/ TOOL DIAMETER OF EDGING PARAMETER IS CORRECTED BASED ON THE RECEIVED CORRECTION VALUE

S110a/ EDGING TO THE LENS OF A SIZE AFTER CORRECTION

S110b/ EDGING TO THE LENS OF A SIZE AFTER CORRECTION

S110c/ EDGING TO THE LENS OF A SIZE AFTER CORRECTION

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/079668

A. CLASSIFICATION OF SUBJECT MATTER

B24B13/06(2006.01) i, B24B9/14(2006.01) i, B24B51/00(2006.01) i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B24B13/06, B24B9/14, B24B51/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2013

Kokai Jitsuyo Shinan Koho 1971-2013 Toroku Jitsuyo Shinan Koho 1994-2013

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 2005/044513 A1 (Hoya Corp.), 19 May 2005 (19.05.2005), entire text; all drawings & US 2006/0276106 A1 & EP 1681136 A1	1-5
A	JP 4-13539 A (Topcon Corp.), 17 January 1992 (17.01.1992), entire text; all drawings (Family: none)	1-5
A	JP 2000-225548 A (Shigiya Machinery Works Ltd.), 15 August 2000 (15.08.2000), paragraph [0054]; fig. 4 (Family: none)	1-5

☒ Further documents are listed in the continuation of Box C.
 ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search
03 December, 2013 (03.12.13)Date of mailing of the international search report
17 December, 2013 (17.12.13)Name and mailing address of the ISA/
Japanese Patent Office

Authorized officer

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/JP2013/079668

5	C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
10	A	US 2012/0133886 A1 (Essilor International), 31 March 2012 (31.03.2012), entire text; all drawings & EP 2410372 A1	1-5
15			
20			
25			
30			
35			
40			
45			
50			
55			

Form PCT/ISA/210 (continuation of second sheet) (July 2009)

REFERENCES CITED IN THE DESCRIPTION

This list of references cited by the applicant is for the reader's convenience only. It does not form part of the European patent document. Even though great care has been taken in compiling the references, errors or omissions cannot be excluded and the EPO disclaims all liability in this regard.

Patent documents cited in the description

- JP 4772342 B [0003]