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(54) **EYEWEAR WASHING MACHINE AND METHOD**

BRILLENWASCHMASCHINE UND VERFAHREN

MACHINE ET PROCÉDÉ POUR LE LAVAGE D'ARTICLE DE LUNETTERIE

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Description

CROSS REFERENCE TO RELATED APPLICATION

[0001] This nonprovisional utility patent application claims the benefit of Provisional Application No. 61/459,857 pursuant to 35 U.S.C. § 119(e) which was filed on March 31, 2011.

BACKGROUND

1. Field of Invention

[0002] The invention relates to devices and methods for cleaning eyewear.

2. Related Art

[0003] Lenses and frames of eyewear gather dust, fingerprints, sweat, and other foreign substances through daily wearing activities. Known eyeglass cleaning devices are described in U.S. Patent No. 5,143,101 issued to Avi Mor on September 1, 1992, U.S. Patent No. 6,338,350 issued to Paul Ewen on January 15, 2002, and U.S. Patent No. 7,412,980 issued to Jean Gehrig et al. on August 19, 2008.

[0004] U.S. Patent No. 5,143,101 discloses a compact portable lens washing apparatus including a wash chamber, a reservoir for holding wash fluid, a pair of spaced nozzles facing each other, a lens support for holding a lens between the nozzles, a pump for squirting wash fluid through the nozzles onto the lens, a heater for heating the wash fluid, mechanism for maintaining a wash fluid vapor atmosphere in the wash chamber after the pump shuts off, and electronic elements for controlling the operation of the apparatus. Also disclosed is a method for washing a lens that includes the steps of impinging the lens surfaces with an organic volatile wash fluid during a wash cycle, shutting of the flow of wash fluid, allowing residual wash fluid to be drawn of the lens edge by fibers or filaments, and drying the lens in the presence of a wash fluid vapor atmosphere.

[0005] U.S. Patent No. 6,338,350 discloses a portable device for cleaning eyeglasses. A transparent enclosure is provided having an upper chamber for cleaning the eyeglasses, a lower left chamber which may be removable for containing the cleaning solution and a lower right chamber housing a pump which is powered by batteries and controlled by a microprocessor. The pump circulates cleaning solution through a plurality of apertures in the floor of the upper chamber which creates a spray on the eyeglasses. A fan with a heating coil then circulates warm air over the eyeglasses in order to dry them.

[0006] U.S. Patent No. 7,412,980 discloses a washing machine for glass lenses or other similar items of the type including a conveyor which has a bearing surface for moving the lenses through a washing chamber made of a succession of washing means. The traction force trans-

mitted by the aforementioned bearing surface is carried out by two chains with endless links, located on the both sides of the aforementioned bearing surface, each chain being joined at the longitudinal side corresponding to the aforementioned bearing surface and is stretched tight between two driving gears, of axis parallel to the plane of the aforementioned bearing surface and perpendicular to the direction of displacement.

[0007] JP 2005 173452 discloses an automatic spectacles cleaning section equipped with means which hold left and right temples of the spectacles in a folded state and rotationally hold the spectacles with respect to at least two or more cleaning liquid jetting means.

[0008] US 5794635, DE 10154161, US 5335394, US 6539957, WO 94/22041, US 2003/201004 and US 5143101 describe further examples of the related art.

SUMMARY

[0009] The accumulation of dust, fingerprints, sweat, and other foreign substances, which impairs vision, is a problem when those who use eyewear are in locations where foreign substances such as sand grains, dust, and oils are commonly present. The manual effort of wiping lenses with a clean cloth is often unavailable or ineffective and can especially damage the lenses of the eyewear when foreign substances, such as sand grains, are wiped across them. The exemplary embodiments of the present invention have a dual purpose of utility and entertainment.

[0010] Regarding utility, embodiments permit a user to direct cleaning solution to user-selected portions of the glasses so that cleaning solution can be focused on the portions of the lenses and/or frames that requiring washing. Thus, exemplary embodiments of the invention provide an eyewear washing machine utilizing nozzles that will direct a wash fluid, under pressure, onto the front and back of the lenses and onto the frames of the eyewear for a preset time period. The eyewear will be secured in place by the user to a support bracket near the center of the machine. The orientation of the support bracket may be user-controlled. The washing cycle will be followed by a drying cycle that will direct a stream of air onto the eyewear utilizing piping and a diffuser connected to a blower.

[0011] Regarding entertainment, the embodiments permit manual cleaning option in a game-like, entertaining format. Additional advantages and novel aspects of embodiments of the invention will be apparent from the following disclosure. Exemplary embodiments of the invention provide for entertaining a user by enabling the user to manually direct the wash fluid onto the lenses or frames of the eyewear by using a trackball to rotate the support bracket and the attached eyewear during the washing cycle.

[0012] The aforementioned known glasses cleaning devices do not allow for a manual cleaning option in a game-like, entertaining format, as hereinafter described,

or allow the user to focus the wash fluid on the eyewear at the point where there is greatest need. Further, known devices are limited in that they are designed for personal, rather than public, use. None of these known devices are available in a public readily accessible format and provide for the ability to clean the lenses as well as the frames of the eyewear in a focused manner.

[0013] The invention provides an eyewear cleaning device according to claim 1 and a method for operating an eyewear cleaning device according to claim 14.

[0014] Exemplary embodiments of the invention provide a display cabinet that houses a transparent cylindrical wash chamber, the nozzles used for spraying the wash fluid on the lenses and frames of the eyewear during the washing cycle, a portion of the tubing used to transport the wash fluid from a reservoir through a pump to the nozzles during the washing cycle, a portion of the piping used to transport air from a blower to the eyewear during the drying cycle, two vent fans, and the support bracket where the eyewear will be secured during the cleaning process.

[0015] According to exemplary embodiments of the invention, if the user desires to self-clean the eyewear, in the manual mode of operation, the user can utilize a trackball to rotate the support means so that the spray of wash fluid will come into contact with the attached eyewear at locations selected by the user. In addition, the base cabinet will house a computer, wash fluid return assembly, wash fluid reservoir, a pump, tubing to transport the wash fluid to the nozzles in the display cabinet, a blower, a portion of piping to transport air from the blower to the diffuser in the display cabinet, and a motor to raise and lower the cylindrical wash chamber to seal within the display cabinet during operation.

[0016] In exemplary embodiments, the wash fluid is filtered water, preferably through reverse osmosis or deionization filtration methods. Also, in exemplary embodiments, the wash fluid quality detector measures the concentration of total dissolved solids in the wash fluid. Other detectors and parameters may be used for monitoring depending on the wash fluid quality which will largely be dependent upon the environment in which the machine is used. Other types of wash fluid may be employed as well.

[0017] In exemplary embodiments, wash fluid is stored in a reservoir beneath the display cabinet. A pump sprays wash fluid onto the eyewear, and used wash fluid is recovered, filtered and reused resulting in a self contained operation. Periodically, wash fluid is replaced to ensure continued wash quality. A computer controller will be used for controlling the process, recording pertinent data and providing service notifications when needed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018]

FIG. 1 is a perspective view of the exterior of the

machine;

FIG. 2 is an isolated view of the interior of the display cabinet and the upper portion of the operations panel;

FIG. 3 is an isolated view of the support bracket;

FIG. 4 is an interior view of the machine's base cabinet and its components; and

FIGS. 5A & 5B are a process flow algorithm for the machine when in operation.

DESCRIPTION OF EXEMPLARY EMBODIMENTS

[0019] Referring now to the drawings, wherein referenced characters designate like or corresponding parts throughout the several views, there is shown in **FIG. 1**, an exemplary embodiment of the machine. Eyewear **1** in **FIGS. 1 and 2** is shown for illustrative purposes only and is not part of the machine. The hollow display cabinet **2** of the machine is made of a durable, transparent material and is of sufficient size in order to accommodate the cylindrical wash chamber **3**, the support bracket **4**, tubing **13A, 13B**, piping **14**, nozzles **5A, 5B**, and a diffuser **6**, respectively, as shown in **FIG. 2**. Further, the display cabinet **2**, the cylindrical wash chamber **3** must be sufficiently sized so that when the display cabinet **2** and the cylindrical wash chamber **3** are open, the user of the machine is able to insert his hands inside the display cabinet **2** and cylindrical wash chamber **3** and attach eyewear **1** to the support bracket **4**. In this embodiment, the display cabinet **2** is cylindrical in shape with a sliding front door (not shown) and includes a safety mechanism such that the machine's washing and cleaning operations are incapable of functioning unless the display cabinet is closed. Another safety mechanism is employed to prevent the premature closing of the cylindrical wash chamber **3** before a user removes his hands from the machine. The display cabinet **2** is supported by the control cabinet **7**.

[0020] The cylindrical wash chamber **3** when closed and, as shown in **FIG. 2** seals to an inverted dome **8** located on the ceiling of the display cabinet **2**. In this embodiment, the cylindrical wash chamber has an approximate diameter of 12 inches. To open the cylindrical wash chamber **3**, the chamber **3** is lowered vertically downward within the control cabinet **7**. When in motion, the chamber **3** is in contact with a gasket **16** to remove wash fluid droplets that adhere to its interior surface. To close the chamber **3**, it is raised a set distance until it creates a water tight seal with the inverted dome **8**.

[0021] Mounted near the center of the display cabinet **2** and the chamber **3** when closed there is a support bracket **4**, which, as shown in **FIGS. 2 and 3**, is attached to gear assembly **25** located in the top **9** of the display cabinet **2**. As shown in **FIG. 3**, the support bracket **4** comprises a stem **17**, two linear bars **19**, which are opposite one another and emanating from the rear edge of a disc **20**, a bracket bar **21**, which protrudes from the front of the disc **20** perpendicular to the linear bars **19**, and a

nose bridge holding assembly **18** attached to the end of the bracket bar **21** that is opposite the stem **17**. In this embodiment, the stem **17** is cylindrical in shape and has a length of approximately 12 inches and a diameter of approximately 0.5 inches. The stem **17** connects to a gear assembly **25** located in the top **9** that enables the support bracket **4** to rotate from side to side. The linear bars **19** can be cylindrical in shape with an approximate diameter of 0.5 inches and each have a length of approximately four inches. Further, the linear bars **19** each have, extending vertically at their outermost end, a loop **22** of adequate size to allow the arms of standard eyewear **1** to pass through each loop **22** when being secured into the support bracket **4** as shown in **FIG. 2**. The bracket bar **21** is also rectangular in shape with an approximate length of three inches. Contained within the bracket bar **21** is a resilient member (e.g., spring **26**) connected to the disc **20** and the nose bridge holding assembly **18**. Attached at the end of the bracket bar **21**, which is opposite the end attached at the disc **20**, is the nose bridge holding assembly **18**, which further comprises a vertically-aligned cradle or notch **23**, with a fastener **24** molded into the cradle **23**, which secures the eyewear **1** during operation of the machine. In this embodiment the fastener **24** is metal with a polyethylene cover.

[0022] The support bracket **4** for the eyewear **1** is capable of accommodating eyewear **1** of varying sizes and shapes. The cradle **23** and the fastener **24**, with a polyethylene cover further provide a slip resistant surface for the eyewear **1**. Further, as shown in **FIG. 3**, the tensile strength of the spring connecting the holding assembly **18** and the disk **20** is calibrated to snugly clamp the nose bridge of the eyewear **1**. The slip resistance and secure hold of the support bracket **4** elements are necessary so that the eyewear **1** remains stationary throughout the washing and drying cycles and through the various movements created by the gear assembly **25**. The loops **22** of the support bracket **4** and the disk **20** are sized to fit the stems of eyewear **1** of varying styles and leave the eyewear **1** in an open position. The support bracket **4** firmly supports the eyewear **1**, and because the eyewear **1** is maintained in an open position the support bracket provides the greatest available surface area for wash fluid **39** contact and cleaning purposes.

[0023] As shown in **FIGS. 1 and 2**, the bottom center of the display cabinet **2** includes a drain **10** with a diameter approximately the same as the cylindrical wash chamber **3**. The drain is underlain by a fabric filter **11**. The top **9** is also equipped with two vent fans **12** and an antenna **29** for receiving and transmitting information. An operations panel **15** is situated in front of the display cabinet **2** and includes a touch screen **27** and a trackball **28** so the user can operate the machine. The operations panel **15** also includes a payment center **46** where the user can choose his method of payment. In the exemplary embodiment the payment center **46** allows the user to pay using cash, credit or debit card, or through an electronic transaction (e.g., smart phone application with code retrieval

and input). The operations panel **15** is operatively connected to the computerized controller **42**.

[0024] Referring to **FIG. 4**, the wash fluid reservoir **30** is made of a durable, non-corrosive material and is located at the bottom in the interior of the base cabinet **12**. The weight of the wash fluid **39** stored in the wash fluid reservoir **30**, will further aid in stabilizing the machine. A wash fluid quality detector **31** will be placed the wash fluid reservoir **30**, as shown in **FIG. 4**. In exemplary embodiments of the invention, the wash fluid reservoir **30** has a 5-gallon capacity and is a standard water bottle. Further the wash fluid quality detector measures total dissolved solid in the wash fluid **39**. The preferred wash fluid **39** is water filtered through reverse osmosis or other filtration methods.

[0025] The use of water filtered with reverse osmosis as the wash fluid **39** has distinct advantages over other options considered and used by others. First, because the wash fluid **39** is water, there will not be a need for special handling, management of materials, or concerns over leakage. This would be the case if other solvents were used. Second, reverse osmosis water normally has a pH which is slightly less than normal (pH of 7). Therefore, the use of reverse osmosis water as a wash fluid helps to dissolve solids which are adhering to the eyewear **1**. Third, because of its lower mineral content, reverse osmosis water will prevent spotting on the eyewear **1**. A final advantage of the reverse osmosis water over other types of wash fluids is the ability to regenerate and reuse the wash fluid **39** once it is determined to be ineffective. The ability to reuse a large percentage of wash fluid **39** greatly increases the cost efficiency of the machine. Also, the ability to use common water filtration devices to filter and recycle used wash fluid **39** allows for greater operating times between wash fluid change outs.

[0026] As shown in **FIG. 4**, a pump **32** is mounted inside the base cabinet **12**. A suction hose **33** is attached at one end to the pump **32** and extends from the pump **32** into the wash fluid reservoir **30** near its base. The end of the suction hose **33** has an in-line filter **34** attached to it. When the machine is operating during the washing cycle, the pump **32** will draw wash fluid **39** from the wash fluid reservoir **30**, through the in-line filter **34** and through the suction hose **29**. The wash fluid **39** is then conveyed from the pump **32** through tubing **13A**, **13B**, which are connected at the pump **32** outlet. A blower **35** is mounted in the base cabinet. As shown in **FIGS. 2 and 4**, the tubing **13A**, **13B** and piping **14** extend up from the pump **32** and the blower **35**, respectively, through the base cabinet **12** and into the display cabinet **2**. As shown in **FIG. 2**, tubing **13A** and **13B** extend and connect to nozzles **5A** and **5B** to a point approximately 3 inches in front and behind of nose bridge holding assembly **18** when the cylindrical wash chamber **3** is closed. The center of the diffuser **6** will be aligned horizontally with the nose bridge holding assembly **18** and situated approximately 5 inches above the eyewear **1** when attached to support bracket **4**. In this embodiment, the pump **32** has an operating pressure

range of at least 200 to no greater than 1,000 pounds per square inch (psi). The preferred application pressure is at least 250 psi and no more than 300 psi.

[0027] Referring to FIG. 4, there is an accordion drain line 36 that is attached to the catch-pan 37 that supports the cylindrical wash chamber. Used wash fluid 39 collects in the catch-pan 37 following the washing cycle and drains through the accordion drain line 36 into a collector 38. A transfer pump 40 pumps used wash fluid 39 through a filter series 41 and returns the wash fluid to the reservoir 30. In exemplary embodiments, the filter series 41 comprises an ultraviolet light filter followed by a carbon filter, and the collector 38 has a capacity of one-half gallon. Other filtration methods may include reverse osmosis or ion exchange and can be considered in series or in isolation depending on the filtration demand.

[0028] As shown in FIGS. 1, 2 and 3, the exterior of the operations panel 15 includes a trackball 28, which controls the gear assembly 25, and a touch screen 27 to allow the user to interact with the computerized controller 42. The machine also includes one or more audio speakers 45 which allow for audio communication with the user depending on the machine status. In automatic mode, the computerized controller 42, which, as shown in FIG. 4, is mounted in the base cabinet 12, will activate the gear assembly 25 causing the support bracket 4 to rotate side-to-side. As shown in FIG. 3, this rotation will deflect the loops 22 approximately one inch in each direction from the support bracket's 4 starting position during both the wash cycle and drying cycle. This will allow for all parts of standard eyewear 1 respectively to be fully exposed to the nozzles 5A and 5B, and the diffuser 6 during the washing cycle and drying cycle, respectively. When the machine is being operated in manual mode, the user can activate the gear assembly 25 and cause the support bracket 4 to rotate by moving the trackball 28. Instead of the touch screen 27, a touchpad may be used.

[0029] Other input devices, such as a joystick, a directional keypad, etc. may also be used in addition to or instead of the trackball 28. According to the present example, when the machine is being operated in manual mode, the trackball 28 is both durable and the requires limited motion to be affected, and has been found by the inventor to be more appealing to young children who use the machine.

[0030] Further, the computerized controller 42 activates a sliding motor 43, as shown in FIG. 4 that will rotate the display cabinet 2 to an open position allowing the user to secure the eyewear 1 to the support bracket 4. Once the eyewear is secured and hands are cleared from the machine, the computerized controller 42 activates a lift motor 44 that will raise the cylindrical wash chamber 3 to a closed position. The computerized controller 42 also activates sliding motor 43 to close the display cabinet 2. The computerized controller 42 will then initiate the wash cycle by activating the pump 32 for a preset time period and then initiate the drying cycle by activating the blower 35, which operates for a preset time

period. Near the conclusion of the machine's drying cycle, the computerized controller 42 activates the two vent fans 12 which will operate for a preset period to evacuate residual moisture in the cylindrical wash chamber 3. The computerized controller 42 completes the process by opening the cylindrical wash chamber 3 with the lift motor 44 and the display cabinet 2 with the sliding motor 43 to allow the user to remove his eyewear 1 from the support bracket 4.

[0031] The computerized controller 42 is also capable of transmitting data and messages communicating wirelessly via the antenna 29. The computerized controller 42 will perform system diagnostics periodically to ensure the machine is in service. Because it is anticipated that machines will be located at various locations of greatest need, communications with a central operator or technician is necessary to ensure timely maintenance. The technology for the exchange of operational status information via wireless communication or wireline has been previously disclosed in applications such as US2010/0268792.

[0032] These systems may be integrated or utilized wholly or partially in various embodiments to maintain communications amongst the machines in service and the operator or technician.

[0033] Next, the eyewear washing method is described with reference to FIGS. 5A & 5B. The method is executed by the computerized controller 42 by executing a program stored thereon when the machine is turned on. First, as shown in FIG. 5A, the computerized controller will determine whether or not the machine is in service (Step S10). If there is a fault in the machine (Step S10: No) the computerized controller 42 transmits an appropriate fault message (Step S30) to an operator or technician. If the machine is in service (Step S10: Yes), the machine prompts the user to insert payment (Step S20). If payment is not received (Step S20: No), the machine returns to ready mode (Step S10). If payment is received (Step S20: Yes), the display cabinet 2 opens (Step S40) and the user inserts his eyewear 1 into the support bracket 4 (Step S50).

[0034] If the user's hands or other objects remain in the machine (Step S60: No), the user is prompted via the speakers 45 and the touch screen 27 to remove hands or articles from the machine (Step S70). Once the user's hands are removed from the display cabinet 2 (Step S60: Yes), the cylindrical wash chamber 3 and the display cabinet 2 will close (Step S80). Referring to FIGS. 5A & 5B, the user selects either a manual mode of operation or an optional automatic mode of operation (Step S90). In the automatic mode (Step S100)(Step S90: Auto), the computerized controller 42 will oscillate the support bracket 4 and the eyewear 1 throughout as wash fluid 39 is sprayed onto the eyewear for a preset time period. If the manual mode (Step S110)(Step S90: Manual), the user guides the support bracket 4 with the trackball 28 to allow wash fluid 39 to come in contact with selected parts of the eyewear 1 over a preset time period.

[0035] The drying cycle (Step **S120**) follows the wash cycle. The computerized controller **42** automatically oscillates the support bracket **4** and the eyewear **1** and operates the blower **35** for a preset time period. The computerized controller turns off the blower and activates the two vent fans **12** which again operate for a preset period to complete the drying cycle (Step **S120**). After the drying cycle the cylindrical wash chamber **3** and the display cabinet **2** open (Step **S130**). The user removes the eyewear **1** from the machine (Step **S140**: Yes). If the user fails to remove his glasses (Step **S140**: No), the user is prompted via the speakers **45** and the touch screen **27** to remove hands and eyewear (Step **S150**). Once the user retrieves his eyewear the display cabinet **2** closes (Step **S160**). The computerized controller will determine if the machine remains in service. (Step **S10**) and the process is repeated.

[0036] The machine and accompanying method described in the embodiments above provide an improvement over the related art because the machine is readily available at locations of greatest need. Further, the machine and method are simple to use and allow the user the option to isolate wash fluid on the dirtiest part of the eyewear. The machine includes a display cabinet, cylindrical wash chamber, operations panel, and a control cabinet.

[0037] While various features have been described in conjunction with the examples outlined above, various alternatives, modifications, variations, and/or improvements of those features and/or examples may be possible. Accordingly, the examples, as set forth above, are intended to be illustrative. Various changes may be made without departing from the scope of the underlying inventive principles as defined in the claims.

[0038] For example, a version may be presented without the touch screen **27** or the payment center **46**. It is conceivable that, depending on the desired machine performance, the filter series **41** could be totally or partially bypassed or that other filtration methods may be employed. Also, because it is not critical to the operation, the display cabinet **2** could remain in the open position while the machine is operating.

Claims

1. An eyewear cleaning device, comprising:

a wash chamber (3);
 a support bracket (4) located within the wash chamber (3), the support bracket (4) being configured to support eyewear (1) within the wash chamber (3);
 at least one nozzle (5A,5B) located within the wash chamber (3) and configured to direct wash fluid (39) onto the eyewear when the eyewear (1) is supported by the support bracket (4);
 an input device (28) configured to receive input

from a user of the eyewear cleaning device; and
 a controller (42) configured to:

receive an input signal from the input device (28) indicating a change in the orientation of the support bracket (4); and
 based on the received input signal, change the orientation of the support bracket (4) relative to the at least one nozzle (5A,5B) while the nozzle is expelling wash fluid;

characterised in that:

the support bracket (4) comprises:

a support (20);
 two bars (19) protruding in generally opposite directions from the support (20), each of the two bars comprising a loop (22) disposed at one end of the bar, each of the loops being configured to allow the corresponding arm of the eyewear (1) is supported by the support bracket (4); and
 a bracket bar (21) oriented generally perpendicular to the bars (19) and configured to support a nosepiece of the eyewear when the eyewear is supported by the support bracket.

2. The eyewear cleaning device of claim 1, wherein the input device (28) comprises at least one of: a joystick, a directional keypad, a touchpad, and a touch screen; a gear assembly (25) is attached to the support bracket (4) wherein the gear assembly (25) is arranged to cause the support bracket to rotate;

and wherein
 the eyewear cleaning device is operable in a manual mode to allow a user to activate the gear assembly to rotate the support bracket (4) in response to the signal from the input device and to guide the support bracket (4) with the input device (28) to allow wash fluid (39) to come in contact with selected parts of the eyewear (1) over a preset time period.

3. The eyewear cleaning device of claim 1 or 2, wherein the bracket bar (21) further comprises:

a nose bridge holding assembly (18); and
 a resilient member (26), the resilient member being connected to the nose bridge holding assembly (18) and the support (20), the resilient member (26) configured to apply sufficient force to the eyewear to secure the eyewear on the support bracket against a force of the wash fluid when the eyewear cleaning device is in operation.

4. The eyewear cleaning device of claim 1 or 2, further comprising:

an internal space configured to accept a fluid reservoir (30) for holding the wash fluid; and
a filter system configured to filter the wash fluid.

5. The eyewear cleaning device of claim 4, wherein the filter system comprises a reverse osmosis filter.

6. The eyewear cleaning device of claim 4, further comprising:
the fluid reservoir (30) configured to hold the wash fluid.

7. The eyewear cleaning device of claim 6, further comprising:
a drain (10) disposed below the support bracket (14) and configured to collect used wash fluid, the used wash fluid being wash fluid that has exited the at least one nozzle.

8. The eyewear cleaning device of claim 7, further comprising:
a wash fluid conveyance system configured to:

transport wash fluid from the fluid reservoir (30) to the at least one nozzle (5A,5B);
transport the collected used wash fluid from the drain (10) to the filter system; and
transport filtered wash fluid from the filter system to the fluid reservoir (30).

9. The eyewear cleaning device of claim 8, wherein the fluid conveyance system comprises a pump (32) configured to deliver the wash fluid to each of the at least one nozzles in a pressure range between 200 and 1000 psi.

10. The eyewear cleaning device of claim 1 or 2, further comprising:

a payment center configured to accept at least one of cash or electronic payment;
wherein the controller (42) is configured to:

receive a signal from the payment center indicating that the payment has been accepted;

cause a door of the wash chamber to open;
cause a door of the wash chamber to close;
control a wash fluid conveyance system to supply the wash fluid to the at least one nozzle; and

change the orientation of the support bracket relative to the at least one nozzle in response to the received input signal while the wash fluid conveyance system is sup-

plying the wash fluid to the at least one nozzle.

11. The eyewear cleaning device of claim 1 or 2, wherein:

the received input signal indicates a selection of an automatic mode; and
in response to the selection of the automatic mode, the controller changes the orientation of the support bracket by automatically causing the support bracket to oscillate relative to the at least one nozzle.

12. The eyewear cleaning device of claim 1 or 2, wherein the at least one nozzle (5A,5B) comprises a first (5A) and a second nozzle (5B), the first nozzle (5A) configured to direct fluid at a front surface of the eyewear when the eyewear is supported by the support bracket, the second nozzle (5B) configured to direct fluid at a rear surface of the eyewear when the eyewear is supported by the support bracket.

13. The eyewear cleaning device of claim 1 or 2, further comprising:

a diffuser configured to dry the eyewear when the eyewear is supported by the support bracket; and
an exhaust configured to exhaust residual moisture from the wash chamber.

14. A method for operating an eyewear cleaning device, comprising:

supporting eyewear (1) within a wash chamber (3) on a support bracket (4), the support bracket (4) being configured to support eyewear within the wash chamber, and the support bracket (4) comprising a support (20); two bars (19) protruding in generally opposite directions from the support (20), each of the two bars comprising a loop (22) disposed at one end of the bar, each of the loops being configured to allow the corresponding arm of the eyewear to pass through the loop when the eyewear (1) is supported by the support bracket (4); and a bracket bar (21) oriented generally perpendicular to the bars (19) and configured to support a nosepiece of the eyewear when the eyewear is supported by the support bracket;
directing wash fluid (39) onto the eyewear with at least one nozzle (5A,5B) located within the wash chamber (3) when the eyewear is supported by the supporting bracket (4);
receiving an input signal from an input device (28) that is manipulated by a user of the eyewear cleaning device, the input signal indicating a

change in the orientation of the support bracket;
and
based on the input signal activating a gear assembly to rotate the support bracket (4) to change the orientation of the support bracket (4) relative to the at least one nozzle based on the received input signal while the nozzle (5A,5B) is expelling wash fluid.

Patentansprüche

1. Brillenreinigungsvorrichtung, umfassend:

eine Waschkammer (3);
eine Haltekonsole (4), die sich innerhalb der Waschkammer (3) befindet, wobei die Haltekonsole (4) zum Halten einer Brille (1) innerhalb der Waschkammer (3) ausgelegt ist;
mindestens eine Düse (5A, 5B), die sich innerhalb der Waschkammer (3) befindet und dazu ausgelegt ist, Waschflüssigkeit (39) auf die Brille zu richten, wenn die Brille (1) durch die Haltekonsole (4) gehalten wird;
eine Eingabevorrichtung (28), die dazu ausgelegt ist, Eingaben von einem Benutzer der Brillenreinigungsvorrichtung zu empfangen; und
eine Steuervorrichtung (42), die dazu ausgelegt ist:
ein Eingangssignal aus der Eingabevorrichtung (28) zu empfangen, das eine Änderung der Ausrichtung der Haltekonsole (4) angibt; und
basierend auf dem empfangenen Eingangssignal die Ausrichtung der Haltekonsole (4) relativ zu der mindestens einen Düse (5A, 5B) zu ändern, während die Düse Waschflüssigkeit ausstößt;

dadurch gekennzeichnet, dass:

die Haltekonsole (4) umfasst:

einen Haltesockel (20);
zwei Stangen (19), die in im Allgemeinen entgegengesetzten Richtungen vom Haltesockel (20) vorstehen, wobei jede der beiden Stangen eine Öse (22) aufweist, die an einem Ende der Stange angeordnet ist, wobei jede der Ösen so ausgelegt ist, dass der entsprechende Bügel der Brille durch die Öse hindurchgeführt werden kann, wenn die Brille (1) durch die Haltekonsole (4) gehalten wird; und
eine Konsolenstange (21), die im Allgemeinen rechtwinklig zu den Stangen (19) ausgerichtet und so ausgelegt ist, dass sie einen Nasensteg der Brille trägt, wenn die Brille durch die Haltekonsole gehalten wird.

2. Brillenreinigungsvorrichtung gemäß Anspruch 1,

wobei die Eingabevorrichtung (28) mindestens eines der folgenden Elemente umfasst: einen Joystick, ein Richtungstastenfeld, ein Touchpad und einen Touchscreen;

eine Getriebearordnung (25) an der Haltekonsole (4) befestigt ist, wobei die Getriebearordnung (25) dazu angeordnet ist, die Haltekonsole in Drehung zu versetzen;

und wobei

die Brillenreinigungsvorrichtung in einem manuellen Modus betreibbar ist, um es einem Benutzer zu ermöglichen, die Getriebearordnung zu aktivieren, um die Haltekonsole (4) als Reaktion auf das Signal aus der Eingabevorrichtung zu drehen und die Haltekonsole (4) mit der Eingabevorrichtung (28) zu führen, damit die Waschflüssigkeit (39) über einen voreingestellten Zeitraum mit ausgewählten Teilen der Brille (1) in Kontakt kommt.

3. Brillenreinigungsvorrichtung gemäß Anspruch 1 oder 2, wobei die Konsolenstange (21) ferner umfasst:

eine Nasensteghalteanordnung (18); und
ein elastisches Element (26), wobei das elastische Element mit der Nasensteghalteanordnung (18) und dem Haltesockel (20) verbunden ist, wobei das elastische Element (26) dazu ausgelegt ist, eine ausreichende Kraft auf die Brille auszuüben, um die Brille an der Haltekonsole gegen eine Kraft der Waschflüssigkeit zu sichern, wenn die Brillenreinigungsvorrichtung in Betrieb ist.

4. Brillenreinigungsvorrichtung gemäß Anspruch 1 oder 2, ferner umfassend:

einen Innenraum, der dazu ausgelegt ist, einen Flüssigkeitsbehälter (30) zur Aufnahme der Waschflüssigkeit aufzunehmen; und
ein Filtersystem, das zum Filtern der Waschflüssigkeit ausgelegt ist.

5. Brillenreinigungsvorrichtung gemäß Anspruch 4, wobei das Filtersystem einen Umkehrosmosefilter umfasst.

6. Brillenreinigungsvorrichtung gemäß Anspruch 4, ferner umfassend: den zum Aufnehmen der Waschflüssigkeit ausgelegten Flüssigkeitsbehälter (30).

7. Brillenreinigungsvorrichtung gemäß Anspruch 6, ferner umfassend:

einen Abfluss (10), der unterhalb der Haltekonsole (14) angeordnet und dazu ausgelegt ist, verbrauchte

Waschflüssigkeit aufzufangen, wobei die verbrauchte Waschflüssigkeit eine Waschflüssigkeit ist, die aus der mindestens einen Düse ausgetreten ist.

8. Brillenreinigungsvorrichtung gemäß Anspruch 7, ferner umfassend:
Waschflüssigkeitsfördersystem, das dazu ausgelegt ist:

Waschflüssigkeit aus dem Flüssigkeitsbehälter (30) an die mindestens eine Düse (5A, 5B) zu transportieren;
die aufgefangene verbrauchte Waschflüssigkeit aus dem Abfluss (10) an das Filtersystem zu transportieren; und
die gefilterte Waschflüssigkeit aus dem Filtersystem an den Flüssigkeitsbehälter (30) zu transportieren.

9. Brillenreinigungsvorrichtung gemäß Anspruch 8, wobei das Flüssigkeitsfördersystem eine Pumpe (32) umfasst, die dazu ausgelegt ist, die Waschflüssigkeit an jede der mindestens einen Düse in einem Druckbereich zwischen 200 und 1000 psi zu fördern.

10. Brillenreinigungsvorrichtung gemäß Anspruch 1 oder 2, ferner umfassend:

ein Zahlungszentrum, das dazu ausgelegt ist, mindestens eines von Bargeld oder einer elektronischen Zahlung anzunehmen;
wobei die Steuervorrichtung (42) dazu ausgelegt ist:

ein Signal aus dem Zahlungszentrum zu empfangen, das angibt, dass die Zahlung angenommen wurde;
eine Tür der Waschkammer zum Öffnen zu bringen;
eine Tür der Waschkammer zum Schließen zu bringen;
ein Waschflüssigkeitsfördersystem zu steuern, um die Waschflüssigkeit an die mindestens eine Düse zu leiten; und
die Ausrichtung der Haltekonsole relativ zu der mindestens einen Düse als Reaktion auf das empfangene Eingabesignal zu steuern, während das Waschflüssigkeitsfördersystem die Waschflüssigkeit der mindestens einen Düse zuführt.

11. Brillenreinigungsvorrichtung gemäß Anspruch 1 oder 2, wobei:

das empfangene Eingabesignal eine Auswahl einer automatischen Betriebsart angibt; und
als Reaktion auf die Auswahl der automatischen Betriebsart die Steuervorrichtung die Ausrich-

tung der Haltekonsole ändert, indem sie die Haltekonsole automatisch zum Schwingen relativ zu der mindestens einen Düse bringt.

12. Brillenreinigungsvorrichtung gemäß Anspruch 1 oder 2, wobei die mindestens eine Düse (5A, 5B) eine erste (5A) und eine zweite Düse (5B) umfasst, wobei die erste Düse (5A) dazu ausgelegt ist, Flüssigkeit auf eine vordere Oberfläche der Brille zu richten, wenn die Brille durch die Haltekonsole gehalten wird, und die zweite Düse (5B) dazu ausgelegt ist, Flüssigkeit auf eine hintere Oberfläche der Brille zu richten, wenn die Brille durch die Haltekonsole gehalten wird.

13. Brillenreinigungsvorrichtung gemäß Anspruch 1 oder 2, ferner umfassend:
einen Diffusor, der dazu ausgelegt ist, die Brille zu trocknen, wenn die Brille durch die Haltekonsole gehalten wird; und
eine Absaugvorrichtung, die dazu ausgelegt ist, Restfeuchtigkeit aus der Waschkammer abzusaugen.

14. Verfahren zum Betreiben einer Brillenreinigungsvorrichtung, umfassend:

Halten einer Brille (1) in einer Waschkammer (3) auf einer Haltekonsole (4), wobei die Haltekonsole (4) dazu ausgelegt ist, eine Brille in der Waschkammer zu halten, und die Haltekonsole (4) einen Haltesockel (20) umfasst; zwei Stangen (19), die in allgemein entgegengesetzte Richtungen von dem Haltesockel (20) vorstehen, wobei jede der beiden Stangen eine Öse (22) umfasst, die an einem Ende der Stange angeordnet ist, wobei jede der Ösen so ausgelegt ist, dass der entsprechende Bügel der Brille durch die Öse hindurchgeführt werden kann, wenn die Brille (1) durch die Haltekonsole (4) gehalten wird; und eine Konsolenstange (21), die im Allgemeinen rechtwinklig zu den Stangen (19) ausgerichtet und dazu ausgelegt ist, einen Nasensteg der Brille zu halten, wenn die Brille durch die Haltekonsole gehalten wird;
Richten von Waschflüssigkeit (39) auf die Brille mit mindestens einer Düse (5A, 5B), die sich innerhalb der Waschkammer (3) befindet, wenn die Brille durch die Haltekonsole (4) gehalten wird;

Empfangen eines Eingabesignals aus einer Eingabevorrichtung (28), die durch einen Benutzer der Brillenreinigungsvorrichtung betätigt wird, wobei das Eingabesignal eine Änderung der Ausrichtung der Haltekonsole angibt; und
basierend auf dem Eingabesignal Aktivieren einer Getriebearrangement zum Drehen der Haltekonsole (4), um die Ausrichtung der Haltekon-

sole (4) relativ zu der mindestens einen Düse basierend auf dem empfangenen Eingabesignal zu ändern, während die Düse (5A, 5B) Waschflüssigkeit ausstößt.

Revendications

1. Dispositif de nettoyage d'article de lunetterie, comprenant :

une chambre de lavage (3) ;
une équerre support (4) située à l'intérieur de la chambre de lavage (3), l'équerre support (4) étant configurée pour supporter un article de lunetterie (1) à l'intérieur de la chambre de lavage (3) ;
au moins une buse (5A, 5B) située à l'intérieur de la chambre de lavage (3) et configurée pour projeter du fluide de lavage (39) en direction de l'article de lunetterie lorsque l'article de lunetterie (1) est supporté par l'équerre support (4) ;
un dispositif d'entrée (28) configuré pour recevoir une entrée d'un utilisateur du dispositif de nettoyage d'article de lunetterie ; et
une unité de commande (42) configurée pour :

recevoir un signal d'entrée depuis le dispositif d'entrée (28) indiquant un changement de l'orientation de l'équerre support (4) ; et
sur la base du signal d'entrée, changer l'orientation de l'équerre support (4) par rapport à l'au moins une buse (5A, 5B) tandis que la buse expulse du fluide de lavage ;

caractérisé en ce que :

l'équerre support (4) comprend :

un support (20) ;
deux barres (19) faisant saillie dans des directions généralement opposées à partir du support (20), chacune des deux barres comprenant une anse (22) disposée à une extrémité de la barre, chacune des anses étant configurée pour permettre le passage de la branche correspondante de l'article de lunetterie à travers l'anse lorsque l'article de lunetterie (1) est supporté par l'équerre support (4) ; et
une barre d'équerre (21) orientée généralement perpendiculairement aux barres (19) et configurée pour supporter une arcade de l'article de lunetterie lorsque l'article de lunetterie est supporté par l'équerre support.

2. Dispositif de nettoyage d'article de lunetterie selon la revendication 1, dans lequel le dispositif d'entrée

(28) comprend au moins un élément parmi : un manche à balai, un pavé de touches de direction, un pavé tactile et un écran tactile ;

un ensemble d'engrenages (25) est fixé à l'équerre support (4), l'ensemble d'engrenages (25) étant agencé de manière à provoquer la rotation de l'équerre support ;
et
lequel dispositif de nettoyage d'article de lunetterie est utilisable dans un mode manuel pour permettre à un utilisateur d'activer l'ensemble d'engrenages pour animer l'équerre support (4) d'un mouvement de rotation en réponse au signal provenant du dispositif d'entrée et pour guider l'équerre support (4) au moyen du dispositif d'entrée (28) pour permettre à du fluide de lavage (39) d'entrer au contact de parties sélectionnées de l'article de lunetterie (1) sur une période de temps prédéfinie.

3. Dispositif de nettoyage d'article de lunetterie selon la revendication 1 ou 2, dans lequel la barre d'équerre (21) comprend en outre :

un ensemble de maintien de pont nasal (18) ; et
un organe élastique (26), l'organe élastique étant lié à l'ensemble de maintien de pont nasal (18) et au support (20), l'organe élastique (26) étant configuré pour exercer une force suffisante sur l'article de lunetterie pour immobiliser l'article de lunetterie sur l'équerre support à l'encontre d'une force du fluide de lavage lorsque le dispositif de nettoyage d'article de lunetterie est en fonctionnement.

4. Dispositif de nettoyage d'article de lunetterie selon la revendication 1 ou 2, comprenant en outre :

un espace interne configuré pour accueillir un réservoir de fluide (30) destiné à contenir le fluide de lavage ; et
un système filtrant configuré pour filtrer le fluide de lavage.

5. Dispositif de nettoyage d'article de lunetterie selon la revendication 4, dans lequel le système filtrant comprend un filtre par osmose inverse.

6. Dispositif de nettoyage d'article de lunetterie selon la revendication 4, comprenant en outre : le réservoir de fluide (30) configuré pour contenir le fluide de lavage.

7. Dispositif de nettoyage d'article de lunetterie selon la revendication 6, comprenant en outre : un drain (10) disposé sous l'équerre support (14) et configuré pour recueillir du fluide de lavage usé, le

fluide de lavage usé étant du fluide de lavage qui est sorti de l'au moins une buse.

8. Dispositif de nettoyage d'article de lunetterie selon la revendication 7, comprenant en outre : 5
un système d'acheminement de fluide de lavage configuré pour :
- transporter du fluide de lavage depuis le réservoir de fluide (30) jusqu'à l'au moins une buse (5A, 5B) ; 10
transporter le fluide de lavage usé recueilli depuis le drain (10) jusqu'au système filtrant ; et transporter du fluide de lavage filtré depuis le système filtrant jusqu'au réservoir de fluide (30). 15
9. Dispositif de nettoyage d'article de lunetterie selon la revendication 8, dans lequel le système d'acheminement de fluide comprend une pompe (32) configurée pour refouler le fluide de lavage jusqu'à chacune de l'au moins une buses dans une plage de pression allant de 200 à 1000 psi. 20
10. Dispositif de nettoyage d'article de lunetterie selon la revendication 1 ou 2, comprenant en outre : 25
un centre de paiement configuré pour accepter un paiement en espèces et/ou électronique ; dans lequel l'unité de commande (42) est configurée pour : 30
- recevoir un signal depuis le centre de paiement indiquant que le paiement a été accepté ; 35
déclencher l'ouverture d'une trappe de la chambre de lavage ;
déclencher la fermeture d'une trappe de la chambre de lavage ;
commander à un système d'acheminement de fluide de lavage d'alimenter l'au moins une buse en fluide de lavage ; et 40
changer l'orientation de l'équerre support par rapport à l'au moins une buse en réponse au signal d'entrée reçu tandis que le système d'acheminement de fluide de lavage alimente l'au moins une buse en fluide de lavage. 45
11. Dispositif de nettoyage d'article de lunetterie selon la revendication 1 ou 2, dans lequel : 50
- le signal d'entrée reçu indique une sélection d'un mode automatique ; et
en réponse à la sélection du mode automatique, l'unité de commande change l'orientation de l'équerre support en faisant automatiquement osciller l'équerre support par rapport à l'au moins une buse. 55

12. Dispositif de nettoyage d'article de lunetterie selon la revendication 1 ou 2, dans lequel l'au moins une buse (5A, 5B) comprend une première (5A) et une deuxième buse (5B), la première buse (5A) étant configurée pour projeter du fluide en direction d'une surface avant de l'article de lunetterie lorsque l'article de lunetterie est supporté par l'équerre support, la deuxième buse (5B) étant configurée pour projeter du fluide en direction d'une surface arrière de l'article de lunetterie lorsque l'article de lunetterie est supporté par l'équerre support.

13. Dispositif de nettoyage d'article de lunetterie selon la revendication 1 ou 2, comprenant en outre :

un diffuseur configuré pour sécher l'article de lunetterie lorsque l'article de lunetterie est supporté par l'équerre support ; et
une évacuation configurée pour évacuer l'humidité résiduelle de la chambre de lavage.

14. Procédé de fonctionnement d'un dispositif de nettoyage d'article de lunetterie, comprenant :

le support d'un article de lunetterie (1) à l'intérieur d'une chambre de lavage (3) sur une équerre support (4), l'équerre support (4) étant configurée pour supporter un article de lunetterie à l'intérieur de la chambre de lavage, et l'équerre support (4) comprenant un support (20) ; deux barres (19) faisant saillie dans des directions généralement opposées à partir du support (20), chacune des deux barres comprenant une anse (22) disposée à une extrémité de la barre, chacune des anses étant configurée pour permettre le passage de la branche correspondante de l'article de lunetterie à travers l'anse lorsque l'article de lunetterie (1) est supporté par l'équerre support (4) ; et une barre d'équerre (21) orientée généralement perpendiculairement aux barres (19) et configurée pour supporter une arcade de l'article de lunetterie lorsque l'article de lunetterie est supporté par l'équerre support ;
la projection de fluide de lavage (39) en direction de l'article de lunetterie au moyen d'au moins une buse (5A, 5B) située à l'intérieur de la chambre de lavage (3) lorsque l'article de lunetterie est supporté par l'équerre support (4) ;
la réception d'un signal d'entrée depuis un dispositif d'entrée (28) qui est manipulé par un utilisateur du dispositif de nettoyage d'article de lunetterie, le signal d'entrée indiquant un changement de l'orientation de l'équerre support ; et
sur la base du signal d'entrée, l'activation d'un ensemble d'engrenages pour animer l'équerre support (4) d'un mouvement de rotation afin de changer l'orientation de l'équerre support (4) par

rapport à l'au moins une buse sur la base du signal d'entrée reçu tandis que la buse (5A, 5B) expulse du fluide de lavage.

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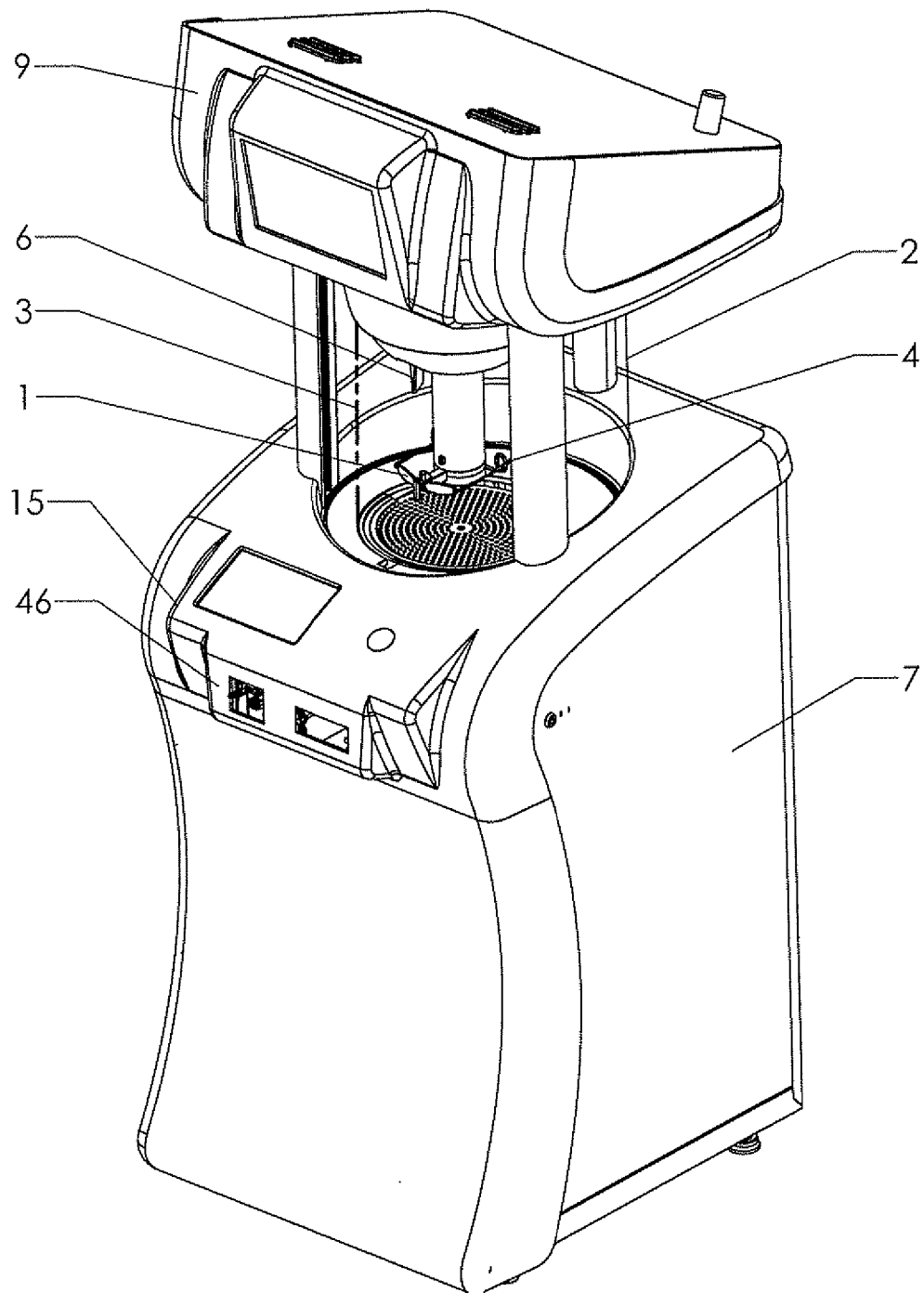


FIG.1

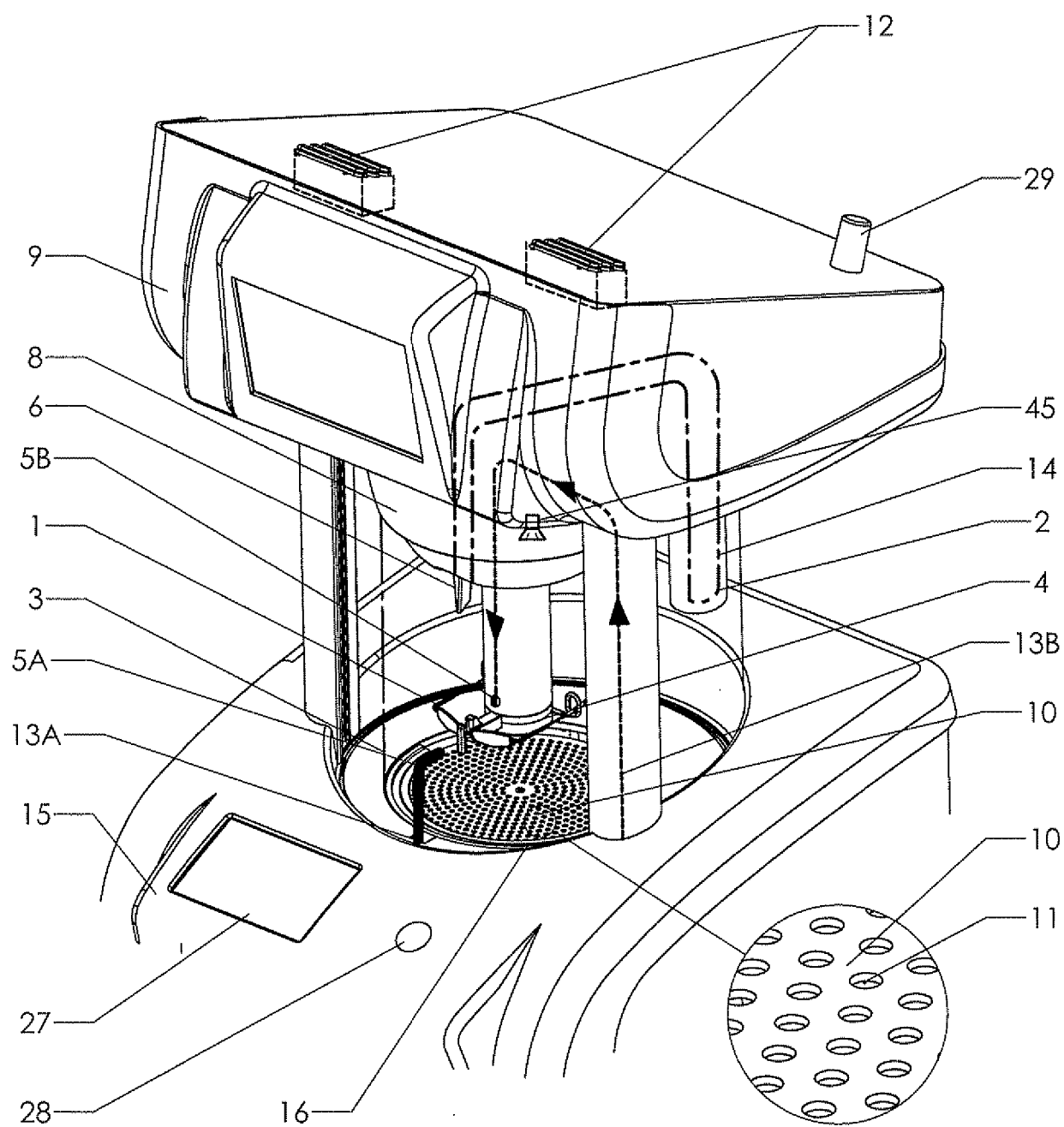


FIG. 2

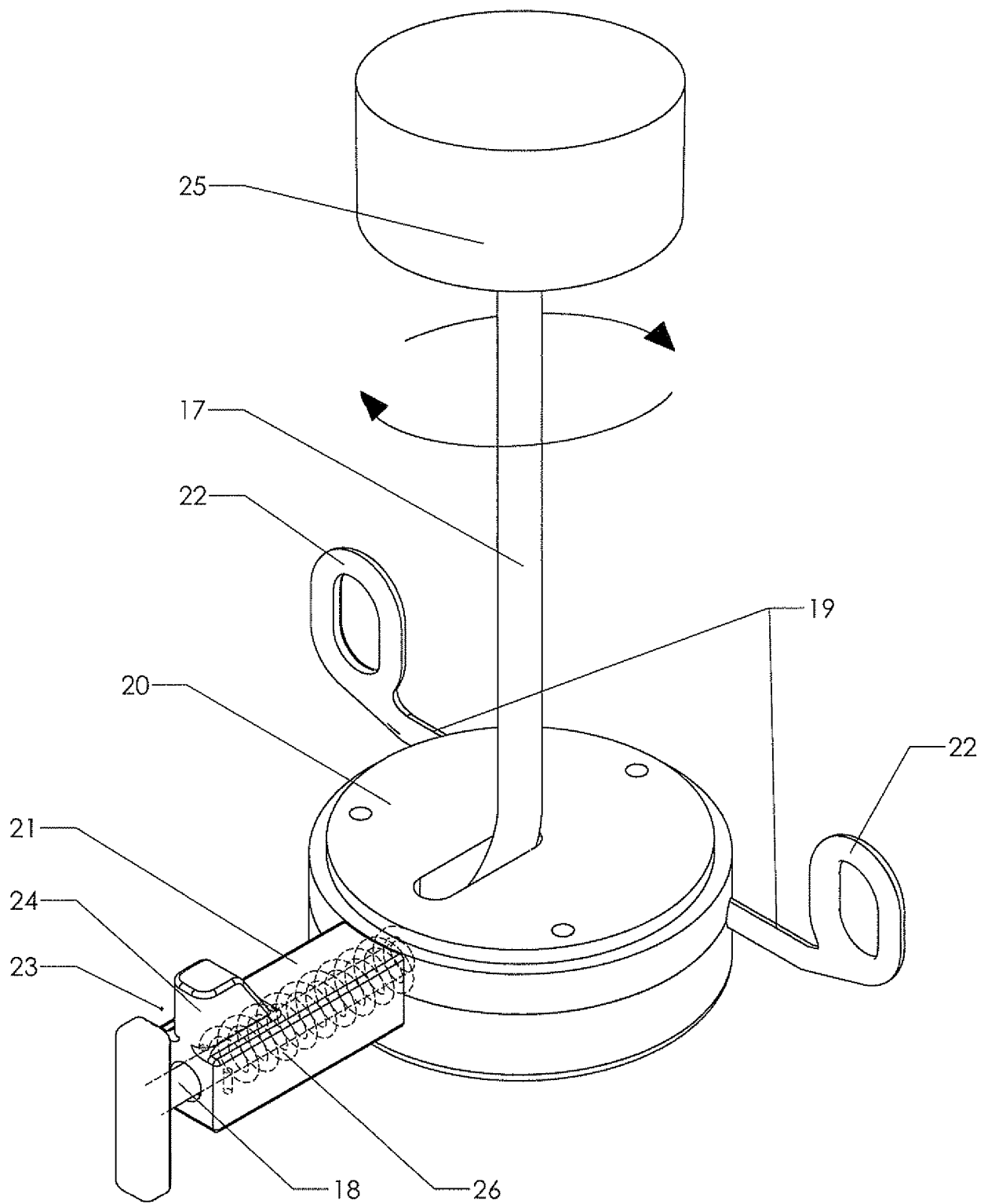


FIG.3

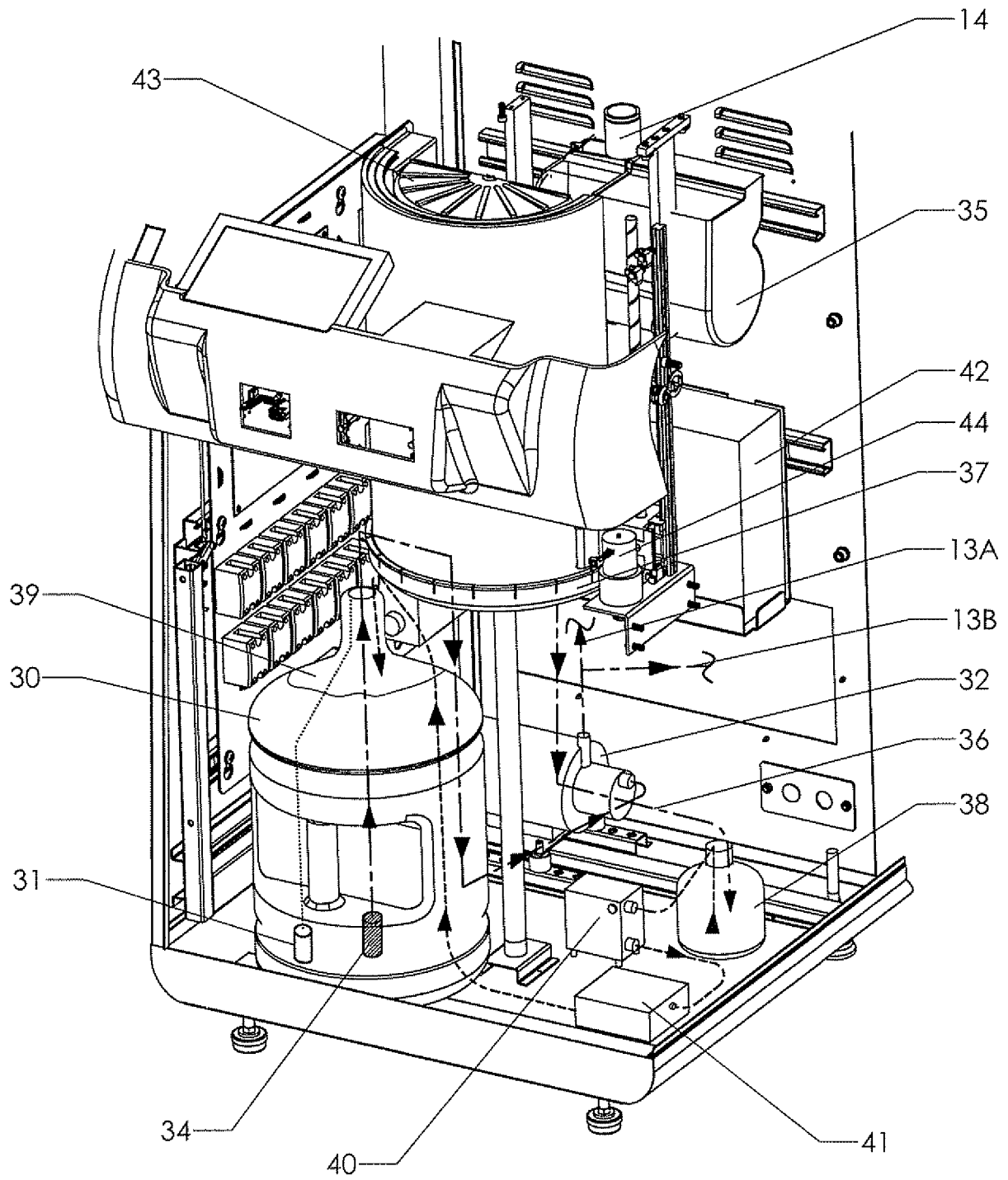


FIG.4

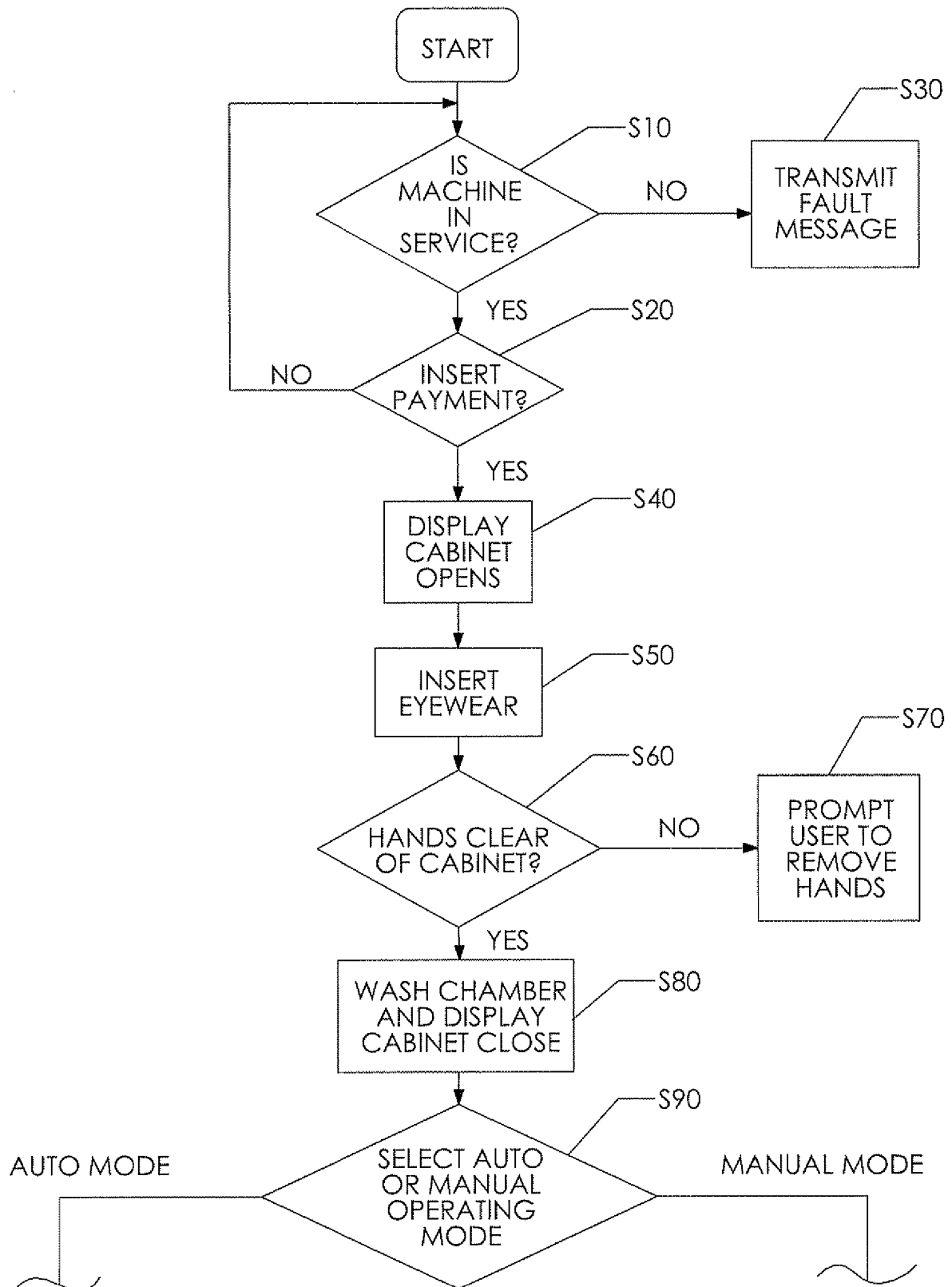


FIG.5A

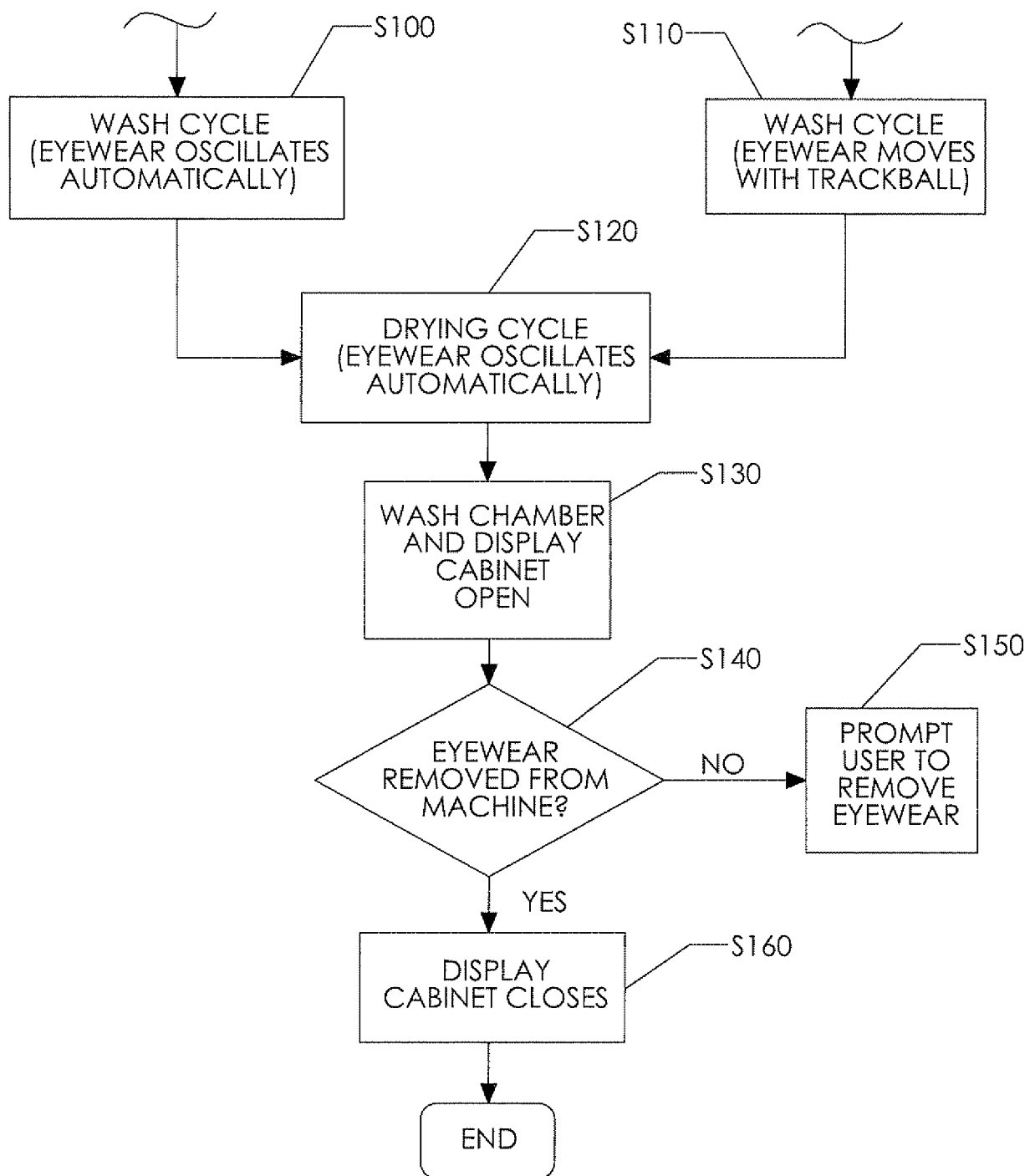


FIG.5B

REFERENCES CITED IN THE DESCRIPTION

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