Claims

1. Cleaner for cleaning grippers (10) for the transport of ophthalmic lenses such as contact lenses, in particular soft contact lenses, or intraocular lenses, the cleaner comprising:

an exhaust air box (1) comprising

- at least one inlet opening (2) for allowing ambient air as well as lenses, lens parts, debris and fluid adhered to the grippers (10) to be sucked into an interior of the exhaust air box (1),
- an outlet opening (3) in fluid communication with the interior of the exhaust air box (1) for allowing exhaust air to be vented from the interior of the exhaust air box (1), the outlet opening (3) being capable of being connected to a vacuum source,

and

a cleaner head (4) arranged on the exhaust air box (1),

wherein the cleaner head (4) ~~and~~ comprising

- a plurality of receiver sleeves (5) for receiving the grippers (10) to be cleaned, each receiver sleeve (5) of the plurality of receiver sleeves (5) being arranged such that it is capable of being in fluid communication with the interior of the exhaust air box (1) through the at least one inlet opening (2),
- a plurality of shutters (6), wherein each individual shutter (6) of the plurality of shutters (6) is arranged to open or close the fluid communication of at least one receiver sleeve (5) of the plurality of receiver sleeves (5), in particular a pair of receiver sleeves (5) of the plurality of receiver sleeves (5), and the interior of the exhaust air box (1) through the at least one inlet opening (2), to enable, through the introduction of the grippers (10) into the receiver sleeves (5), an accelerated air flow through a space between an inner surface of the sleeve wall of the receiver sleeves (5) and an outer surface of the gripper wall of the grippers (10) and into the exhaust air box (1), for sucking any lenses, lens parts, debris and fluid adhering to the grippers (10) into the interior of the exhaust air box (1).

2. Cleaner according to claim 1, wherein the cleaner further comprises linear drives (7), in particular pneumatic linear drives, to operate the shutters (6).

3. Cleaner according to claim 1 or 2, wherein the exhaust air box (1) comprises a retainer sieve arranged in the interior of the exhaust air box (1) such as to be passed by the air sucked into the interior of the exhaust air box (1) through the at least one inlet opening (2) and to retain the lenses, lens parts and debris sucked into the interior of the exhaust air box (1) through the inlet opening (2), and wherein the exhaust air box (1) further comprises a maintenance lid (8) which can be opened for allowing access to the retainer sieve to remove from the retainer sieve the lenses, lens parts and debris retained by the retainer sieve.

4. Cleaner according to claim 3, wherein the cleaner further comprises sensors for sensing the position of each shutter (6) of the plurality of shutters (6), the pressure of the vacuum in the interior of the exhaust box (1) and the position of the maintenance lid (8).

5. Cleaner according to claim 4, wherein the cleaner comprises a controller for monitoring the sensor outputs as well as for operating the shutters (6).

6. Cleaner according to any one of the preceding claims, wherein the exhaust air box (1) further comprises a liquid separator for separating the liquid sucked into the interior of the exhaust air box (1), and a liquid outlet in fluid communication with the liquid separator, for discharging the liquid from the liquid separator.

7. Cleaner according to any one of the preceding claims, wherein the cleaner head (4) comprising the shutters (6) and the receiver sleeves (5) is made of one block.

8. Cleaning station comprising a cleaner according to any one of the preceding claims, a plurality of grippers (10) corresponding to the plurality of receiver sleeves (5) and a vacuum source connected to the outlet opening (3) of the exhaust air box (1),
wherein the ~~receiver sleeves (5) have a sleeve wall having an~~ inner surface of the sleeve wall of the receiver sleeve (5) surrounding an interior space of the sleeve (5) ~~which~~ is circular in cross section and has an inner diameter,
and wherein the ~~grippers (10) have a gripper wall having an~~ outer surface of the

gripper wall of the gripper (10) ~~which~~ is circular in cross section and has an outer diameter, and wherein the inner diameter is at most 2.5 times as large as the outer diameter, particularly at most 1.5 times as large as the outer diameter.

9. Cleaning station according to claim 8, wherein the cleaner comprises a sensor for sensing the pressure of the vacuum in the interior of the exhaust box (1) and a controller for monitoring the sensor output of the sensor for sensing the pressure of the vacuum in the interior of the exhaust air box (1) as well as for controlling the vacuum source.

10. Method of cleaning grippers for the transport of ophthalmic lenses, in particular contact lenses or intraocular lenses, the method comprising:
    - providing a cleaner according to any one of claims 1 to 7,
    - providing grippers (10) to be cleaned,
    - applying underpressure to the outlet opening (3) of the exhaust air box (1),
    - introducing the grippers (10) into the receiver sleeves (5) of the cleaner head (4),
    - operating the shutters (6) to open the fluid communications between the receiver sleeves (5) and the interior of the exhaust air box (1) through the inlet openings (2), in particular one after the other or pairwise, in order to apply suction to the grippers (10), thereby generating an accelerated air flow through the space between the inner surface of the sleeve wall of the receiver sleeves (5) and the outer surface of the gripper wall of the grippers (10) and into the exhaust air box (1), for sucking any lenses, lens parts, debris and fluid adhering to the grippers (10) into the interior of the exhaust air box (1), and
    - retracting the grippers (10) from the receiver sleeves (5).

11. Method according to claim 10, wherein first the underpressure is applied to the outlet opening (3) of the exhaust air box (1), and wherein a first shutter (6') of the shutters (6) is then operated to open a first one or a first pair of the fluid communications between a corresponding first one or a first pair of the receiver sleeves (5) and the interior of the exhaust air box (1) prior to introducing the grippers (10) into the receiver sleeves (5), and wherein the first shutter (6') is operated to close the first one or the first pair of fluid communications once a

first predetermined time interval has elapsed after the grippers (10) have been introduced into and have arrived at a final position in the receiver sleeves (5), and wherein subsequently the remaining shutters (6) other than the first shutter (6') are operated one after the other, each of the operated remaining shutters opening and closing a respective further one or a respective further pair of fluid communications between a respective further one or a respective further pair of the plurality of receiver sleeves (5) and the interior of the exhaust air box (1), wherein each of the remaining shutters (6) is operated to close the respective further one or the respective further pair of fluid communications once a second predetermined time interval has elapsed after the respective further one or the respective further pair of fluid communications has been opened.

~~12. Method according to claim 10 or claim 11, wherein applying suction to the gripper (10) includes allowing an air stream to flow between an inner surface of the sleeve wall of the respective receiver sleeve (5) and an outer surface of the gripper wall of the respective gripper (10) introduced into the respective receiver sleeve (5).~~

~~13.~~12. Method according to ~~any one of~~ claim~~s~~ 10 or ~~to 12~~11, wherein the air flow of the suction applied to the grippers (10) is in the range of 200 m^3/h to 450 m^3/h.

~~14.~~13. Method according to any one of claims 10 to ~~13~~12, wherein the grippers (10) comprise gripper heads (11), and wherein the grippers (10) are moved into the receiver sleeves (5) such that the gripper heads (11) cannot contact the shutters (6) when the shutters (6) are arranged to close the fluid communications.

~~15.~~14. Method according to any one of claims 10 to ~~14~~13, wherein operating the shutters (6) to open and close the fluid communications between the receiver sleeves (5) and the interior of the air box (1) is performed in a time interval in the range of 200 ms to 800 ms.