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(54) **TREATMENT MACHINE FOR RECEPTACLES AND METHOD OF OPERATING A TREATMENT MACHINE**

(57) A treatment machine (1) for treating receptacles (2) is described. The treatment machine (1) comprises at least a first and a second treatment apparatus (12, 14) each configured to carry out a respective treatment of the receptacles (2). The second treatment apparatus (14) is configured to receive or to feed the receptacles (2) from or to the first treatment apparatus (12). At least the second treatment apparatus (14) comprises an isolation chamber provided with an opening (33, 34), a control device (36) configured to modify an actual area of the opening (33, 34) and an air-blade device for creating an airflow at the opening (33, 34).

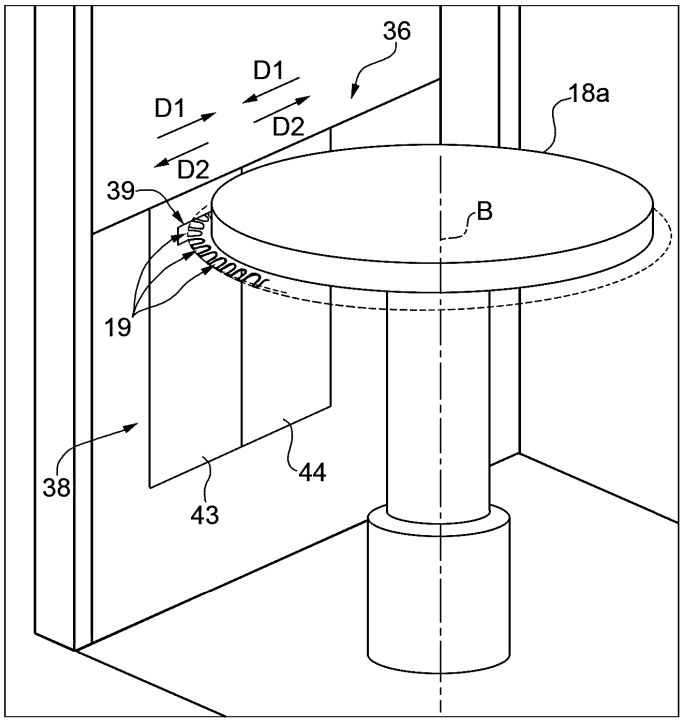

FIG.3

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Description

[0001] The present invention relates to a treatment machine for treating receptacles, in particular bottles and/or preforms.

[0002] In particular, the present invention relates to a treatment machine for carrying out at least a first treatment and at least a second treatment, wherein at least the second treatment is carried out, in use, in a (sterile) isolation chamber. Even more in particular, the present invention relates to a treatment machine for at least filling the receptacles with a pourable product, in particular a pourable food product, in a sterile environment.

[0003] Advantageously, the present invention also relates to a method of operating a treatment machine for treating receptacles.

[0004] Treatment machines for treating receptacles are known, such as for example bottles, containers or the like, in particular for filling the receptacles with a pourable product, specifically a pourable food product, preferably in a sterile environment.

[0005] It is known that such treatment machines comprise a treatment apparatus configured to fill at least the receptacles with a pourable product. A typical treatment apparatus comprises an isolation chamber to define a determined environment, a conveyor device for advancing the receptacles along a conveying path and a filling device arranged at least partially inside the isolation chamber and configured to fill receptacles with the pourable product.

[0006] It is also known that such treatment machines comprise a further treatment apparatus arranged upstream of the above-mentioned treatment apparatus. In use, the latter receives the receptacles from the further treatment apparatus.

[0007] A typical further treatment apparatus comprises a moulding unit adapted to obtain the receptacles from respective preforms and/or a labelling unit configured to apply labels to receptacles, prior to their filling.

[0008] Independently, a typical further treatment apparatus comprises at least a further conveyor device configured to advance the receptacles along a further conveying path. The further conveyor device comprises a plurality of respective retention elements configured to hold a respective receptacle during the conveying thereof along the further conveying path.

[0009] It is also known that the isolation chamber comprises an inlet opening that enables the receptacles, and partially the first retention elements, to enter the isolation chamber so as to allow, in use, the passage of the receptacles to the conveyor device of the filling apparatus.

[0010] It is also known that the treatment machine requires cleaning steps during which at least portions of the treatment machine are cleaned. In particular cleaning of the treatment apparatus is known, in order to guarantee the hygienic conditions required during the filling process. This requires the use of effective cleaning agents, which could, however, be too aggressive for some parts of the treatment machine (for example, the labelling unit or the blowing unit).

[0011] For this reason it is, for example, necessary to mount a plate for closing the inlet opening during the cleaning of the treatment apparatus. In order to enable the mounting of the plate it is necessary to disassemble the parts of the further conveyor device that protrude into the isolation chamber.

[0012] However, these preparatory steps, which are carried out prior to the cleaning step, require significant time of qualified technicians.

[0013] Therefore, the need is felt in the sector to further improve the treatment machines and the method for operating these machines, in order to facilitate and speed up the cleaning of the treatment machines.

[0014] In the sector the need is also felt to further improve the treatment machines and of their operating method in order to decrease the need of operations by qualified technicians which, in some regions, are difficult to find.

[0015] The aim of the present invention is to design a treatment machine for receptacles, which allows, in a simple and cost-effective manner, to overcome at least one of the drawbacks mentioned above.

[0016] In particular, the aim of the present invention is to produce a treatment machine for receptacles that enables an easier and rapid cleaning.

[0017] In particular, a further aim of the present invention is to produce a treatment machine that requires fewer operations by qualified technicians.

[0018] An aim of the present invention is also to obtain a method of operating a treatment machine for receptacles, which allows, in a simple and cost-effective manner, to overcome at least one of the drawbacks mentioned above.

[0019] In particular, the aim of the present invention is to provide a method of operating a treatment machine for receptacles that enables an easier and rapid cleaning.

[0020] In particular, a further aim of the present invention is the prearrangement of a method of operating a treatment machine that requires fewer operations by qualified technicians.

[0021] The aforementioned aims are achieved by the present invention, since it relates to a treatment machine for receptacles and to a method of operating a treatment machine as defined in the relative independent claims. Alternative preferred embodiments are protected in the respective dependent claims.

[0022] For a better understanding of the present invention, one preferred embodiment thereof is described in the following, purely by way of non-limiting example and with reference to the enclosed drawings, in which:

- Figure 1 shows in a schematic manner and in a top view, a treatment machine for treating receptacles according to the present invention, with parts removed for clarity;
- Figure 2 shows in perspective view a detail of the

treatment machine of Figure 1 controlled in a first configuration, with parts removed for clarity; and

- Figure 3 shows in perspective view a detail of the treatment machine of Figure 1 controlled in a second configuration, with parts removed for clarity;
- Figure 4 is a rear view of a detail of the treatment machine of Figure 1 controlled in the first configuration, with parts removed for clarity; and
- Figure 5 is a front view of a detail of the treatment machine of Figure 1 controlled in the second configuration, with parts removed for clarity.

[0023] With reference to Figure 1, a treatment machine for treating receptacles, such as for example bottles, containers or the like, is designated overall with 1.

[0024] The following description will refer, without any limitation, to bottles 2, in particular made of a thermoplastic polymer such as, for example, polyethylene terephthalate. However, the receptacles may also be made of a different material such as, for example, glass, composite material, metal material, a multilayer material and the like.

[0025] Each bottle 2 extends along a longitudinal axis A and comprises a hollow body 3 that delimits an internal space 4 of the bottle 2 itself.

[0026] The hollow body 3 is delimited by a bottom wall 5, substantially perpendicular to the axis A, and by a neck 6 opposite to the bottom wall 5 and in particular extending coaxially to the axis A. The neck 6 delimits a pouring opening opposite to the bottom wall 5 to enable the filling and the emptying of a pourable product, in particular a pourable food product, such as for example, carbonated liquids (for example, sparkling water, non-alcoholic beverages and beer), still beverages (for example, natural water, fruit juices, wine), emulsions, suspensions, high viscosity liquids and beverages containing pulp. The hollow body 3 also comprises a side wall 7 connecting the bottom wall 4 and the neck 5 together.

[0027] The treatment machine 1 comprises at least:

- a first treatment apparatus 12 configured to carry out at least a first treatment on the bottles 2 and/or to produce the bottles 2 from respective precursors, in particular from preforms 13 in polymeric material; and
- a second treatment apparatus 14 configured to receive the bottles 2 from the first treatment apparatus 12 at a receiving station 15 and to carry out at least a second treatment (different from the first treatment) on the bottles 2.

[0028] In the non-limiting embodiment illustrated in Figure 1, first treatment apparatus 12 comprises a moulding unit 16 adapted to obtain bottles 2 from the respective preforms 13, in particular by blow-moulding of preforms 13 themselves, and/or a labelling unit 17 adapted to apply labels to bottles 2

[0029] In the specific case illustrated, labelling unit 17 is configured to receive bottles 2 from the moulding unit 16 and to feed bottles 2 to second treatment apparatus 14.

[0030] In an alternative embodiment, first treatment apparatus 12 could comprise a further treatment unit such as, for example, a conditioning unit adapted to sterilise and/or disinfect bottles 2 and/or a conveyor unit.

[0031] With particular reference to Figure 1, first treatment apparatus 12 comprises a plurality of first conveyor devices 18a and 18b each being configured to advance bottles 2 along a respective conveying path P.

[0032] In particular, first conveyor devices 18a and 18b are arranged in succession and define, as a whole, an advancing path of bottles 2 (in other words, each first conveying path P defines a respective portion of the advancing path).

[0033] In the non-limiting embodiment illustrated, first treatment apparatus 12 comprises a plurality of star-wheel conveyors, each of which being rotatable around a respective rotation axis B and defining a respective conveyor device 18a.

[0034] In the non-limiting embodiment illustrated, the first treatment apparatus 12 also comprises one or more carousel conveyors rotatable around a respective rotation axis C, each defining a respective conveyor device 18b.

[0035] With particular reference to Figures 2 and 3, each first conveyor device 18a and 18b comprises a plurality of first retention elements 19 (illustrated with respect to the conveyor device 18a), each of which is configured to hold a respective bottle 2 during the advancing thereof along the respective conveying path P, in particular so that the respective longitudinal axes A have a horizontal orientation. Some examples of retention elements 19 are clamps, pedestals, respective portions of a conveyor belt, etc.

[0036] According to some non-limiting embodiments and with particular reference to Figure 1, moulding unit 16 comprises a plurality of blowing assemblies 20 coupled to a respective carousel conveyor 18b and configured to produce bottles 2 from preforms 3. In particular, each respective first retention element 19 is associated with and/or is comprised by a respective blowing assembly 20.

[0037] According to some non-limiting embodiments, labelling unit 16 comprises a labelling assembly 21 arranged adjacent to a respective carousel conveyor 18b and configured to feed and apply the labels to and at a labelling station 22. In particular, the respective first retention elements of the respective carousel conveyor 18b are configured to determine, during the application of the respective labels, a rotation of bottles 2 around the respective longitudinal axis A.

[0038] In the non-limiting embodiment illustrated, bottles 2 are conveyed, in use, by a respective first conveyor device, in particular a respective star-wheel conveyor 18a, arranged adjacent to second treatment apparatus 14 at receiving station 15.

[0039] In a non-limiting embodiment not illustrated, the first conveyor device being arranged adjacent to second treatment device 14, may be a carousel conveyor 18b or a linear conveyor or of another type.

[0040] According to some non-limiting embodiments, first treatment apparatus 12 comprises a first isolation chamber 23, in particular for treating bottles 2 in a given environment.

[0041] Preferably but not necessarily, first treatment apparatus 12 comprises a first conditioning device for controlling the environment of first isolation chamber 23. For instance, the first conditioning device may be configured to determine an airflow within first isolation chamber 23.

[0042] According to some non-limiting embodiments, first treatment apparatus 12 also comprises a feeding unit 24 configured to feed preforms 3 to moulding unit 16.

[0043] With particular reference to Figure 1, second treatment apparatus 14 also comprises a second isolation chamber 29 configured to allow a treatment of bottles 2 in a controlled environment, and in particular in a manner isolated from an external environment.

[0044] Preferably but not necessarily, isolation chamber 29 is configured to delimit a sterile environment.

[0045] According to some preferred embodiments, treatment apparatus 14 also comprises a conditioning unit configured to control the environment within second isolation chamber 29. In particular, the conditioning unit is configured to define a given sterile airflow and/or to control the pressure within isolation chamber 29.

[0046] With particular reference to Figure 1, treatment apparatus 14 is configured to treat bottles 2 within isolation chamber 29, in particular in order to at least fill bottles 2 with the pourable product, and preferably to also apply caps onto bottles 2 after their filling.

[0047] According to some preferred embodiments, second treatment apparatus 14 comprises a plurality of second conveyor devices 30a and 30b, each of which being configured to convey bottles 2 along a respective second conveying path Q; in particular, each conveyor device 30a and 30b is arranged within isolation chamber 29. In particular, conveyor devices 30a and 30b are arranged in succession to one another and define, as a whole, a second advancing path (namely, each second conveying path Q defines a respective portion of the second advancing path).

[0048] Preferably but not necessarily, second treatment apparatus 14 comprises a plurality of star-wheel conveyors, each of which being rotatable around a respective rotation axis E and defining a respective conveyor device 30a.

[0049] Preferably but not necessarily, second treatment apparatus 14 also comprises one or more carousel conveyors, each of which being rotatable around a respective rotation axis F and defines a respective conveyor device 30b.

[0050] Preferably but not necessarily, each conveyor device 30b is interposed between one or more star-wheel conveyors 30a.

[0051] Preferably but not necessarily, each conveyor device 30a and 30b comprises a plurality of second retention elements, each of which is configured to retain a respective bottle 2 during the advancing thereof along the respective second conveying path Q, in particular so that the longitudinal axes A have a horizontal orientation. Some examples of second retention elements are clamps, pedestals, respective portions of a conveyor belt, etc.

[0052] According to some non-limiting preferred embodiments, second treatment apparatus 14 comprises at least a filling device 31 configured to fill bottles 2 with the pourable product.

[0053] Preferably but not necessarily, second filling device 31 is associated with a respective conveyor device 30b and comprises a plurality of filling assemblies coupled to the respective conveyor device 30b and are configured to fill bottles 2 during their advancement along the respective second conveying path Q.

[0054] According to some non-limiting preferred embodiments, second treatment apparatus 14 also comprises at least a capping machine 32 configured to apply caps onto bottles 2 after their filling.

[0055] Preferably but not necessarily, capping machine 32 is associated with a respective conveyor device 30b and comprises a plurality of capping assemblies coupled to the respective conveyor device 30b and being configured to apply and fix caps onto bottles 2 during their advancement along the respective second conveying path Q.

[0056] According to some non-limiting preferred embodiments, a conveyor device 30a or 30b, in the specific case illustrated a conveyor device 30a, is arranged so as to receive bottles 2 from first treatment apparatus 12, in particular from conveyor device 18a (or 18b) which, in turn, is configured to feed bottles 2 to the second treatment apparatus 14 at receiving station 15.

[0057] According to some embodiments not illustrated, treatment machine 1 may also comprise a third treatment apparatus configured to carry out at least a third treatment on bottles 2. In particular, the third treatment apparatus is configured to receive the bottles 2 from the second treatment apparatus.

[0058] For instance, the third treatment apparatus may be configured to prepare bottles 2 for distribution and/or to divide bottles 2 into respective groups of bottles and/or to apply labels (in particular, in the case where the first and/or the second treatment apparatuses 12 and 14 are not provided with a respective labelling unit 17) and/or to apply further decorations and/or information.

[0059] The third treatment apparatus comprises one or more third conveyor devices having a plurality of third retention elements for holding the bottles. Some examples of third retention elements are clamps, respective portions of a conveyor belt, pedestals, etc.

[0060] With particular reference to Figures 1 to 5, second isolation chamber 29 comprises an (inlet) opening

33 configured to enable the insertion of bottles 2, in particular bottles 2 to be filled, into second isolation chamber 29.

[0061] According to some non-limiting preferred embodiments, isolation chamber 29 also comprises an (outlet) opening 34 configured to enable the removal of bottles 2, in particular filled bottles 2, from isolation chamber 29.

[0062] Preferably but not necessarily, at least opening 33, in particular also opening 34, extend along a first axis G and along a second axis I perpendicular to the first axis G. In particular, axis G and axis I are transversal to the first and/or to the second advancing path.

[0063] In the non-limiting embodiment illustrated, opening 33 has a rectangular shape.

[0064] According to some non-limiting preferred embodiments, isolation chamber 29 comprises at least a plurality of side walls 35 and a top wall connected to side walls 35. In particular, side walls 35 are transversely orientated towards a resting surface on which treatment machine 1 rests, and the top wall is transversally orientated towards side walls 35.

[0065] Preferably but not necessarily, a respective side wall 35 has opening 33 and/or a respective side wall 35 has opening 34.

[0066] It may be noted that, according to the embodiment illustrated, receiving station 15 is positioned in isolation chamber 29. In an alternative embodiment not illustrated, the receiving station 15 may be positioned outside of isolation chamber 29, in particular in isolation chamber 23.

[0067] In particular, in order to allow a conveying of bottles 2 from treatment apparatus 12 to treatment apparatus 14, it is necessary that the respective retention elements 19 protrude at receiving station 15 at least partially into isolation chamber 29 and/or that the respective second retention elements protrude at least partially at receiving station 15 outside of the isolation chamber 29.

[0068] Advantageously, treatment apparatus 14 also comprises at least a control device 36 associated with opening 33 or 34. Preferably but not necessarily, treatment apparatus 14 comprises a first and a second control device 36, one of which is associated with opening 33 and the other with opening 34.

[0069] With reference to Figures 2 to 5, each control device 36 is controllable between a first configuration (see Figures 2 and 4) and a second configuration (see Figures 3 and 5) in which the respective control device 36 is configured to control the respective opening 33 or 34 such as to have, respectively, a relative first opening area and a relative second opening area smaller than the first opening area.

[0070] In particular, each control device 36 is configured to modify an effective area of the respective opening 33 or 34. The effective area is the area of the respective opening 33 or 34 that enables access to the isolation chamber 29 from the outside of the latter. In particular, the effective area of opening 33 or 34 is smaller in the case where the corresponding control device 36 is controlled in the second configuration with respect to the case where the corresponding control device 36 is controlled in the first configuration.

[0071] In greater detail, each first opening area enables (at receiving station 15) a passage of bottles 2 into or out of isolation chamber 29 and at least a partial passage of first retention elements 19 or of third retention elements into isolation chamber 29 and/or of the respective second retention elements out of isolation chamber 29; the respective second opening area enables a partial passage of first retention elements 19 or of the third retention elements into isolation chamber 29 and/or of the respective second retention elements out of isolation chamber 29, while a passage of bottles 2 is blocked (namely, the second opening area does not enable the passage of bottles 2). In particular, each control device 36 is configured to partially close the respective opening 33 or 34 when it is controlled in the second configuration.

[0072] In other words, each control device 36 is configured to control the respective effective area between a maximum value (when it is controlled in the first configuration) and a minimum value (when it is controlled in the second configuration).

[0073] Advantageously, treatment machine 1, in particular treatment apparatus 14, comprises at least one or more air-blade devices 37 each one configured to create a respective airflow, in particular of sterile air, at the respective opening 33 and/or 34 and transverse to conveying path P and/or to conveying path Q. In particular, at least an air-blade device 37 is associated with opening 33, and even more in particular another one is associated with opening 34.

[0074] In particular, each air-blade device 37 can be activated to create, in use, the airflow or can be deactivated to prevent the creation of the airflow.

[0075] According to some non-limiting preferred embodiments, the treatment machine 1 comprises a control unit configured to control the operation of the treatment machine 1 itself.

[0076] According to some non-limiting preferred embodiments, treatment machine 1 can be controlled, in particular by the control unit, in at least a production configuration, in which treatment machine 1 is configured to treat bottles 2, in particular to at least fill bottles 2, and a cleaning configuration, in which treatment machine 1, in particular treatment apparatus 14, even more in particular treatment apparatus 14 and treatment apparatus 12, is/are configured to be exposed to a cleaning and/or to a disinfection and/or to a sterilisation step.

[0077] In particular, each control device 36 is, in use, controlled in the first configuration and in the second configuration when treatment machine 1 is, in use, controlled in the production configuration and in the cleaning configuration, respectively, and/or air-blade device 37 is, in use, deactivated and activated when treatment machine 1 is controlled, in use, in the production configuration and in the cleaning configuration, respectively.

[0078] In this manner, it is possible to decrease the respective actual area of opening 33 and/or 34 when treatment machine 1 is controlled in the cleaning configuration. This means that the effective area that could enable the outflow of cleaning agents (and/or disinfection and/or sterilisation agents) from isolation chamber 29 is minimised. Furthermore, the presence of an airflow furthermore reduces the possibility that portions of the cleaning agents are distributed in an uncontrolled manner outside of isolation chamber 29.

[0079] According to some non-limiting preferred embodiments, each control device 36 comprises a respective door 38 provided with a passage slit 39 configured to enable the passage of first retention elements 19 or of the third retention elements and/or of the respective second retention elements. In particular, door 38 is movable between at least an inactive position and an active position and door 38 is, in use, controlled in the inactive position and in the active position in order to control control device 36 in the first configuration and in the second configuration, respectively.

[0080] In particular, each door 38 is configured to cover the respective opening 33 or 34 in the active configuration and to leave uncovered only a passage defined by the respective passage slit 39.

[0081] According to some non-limiting embodiments, each door 38 is mounted on a respective side wall 35, in particular the one that carries the opening 33 or 34.

[0082] According to some non-limiting embodiments, door 38 is positioned in isolation chamber 29.

[0083] According to the non-limiting embodiment illustrated, each door 38 comprises a first portion 43 and a second portion 44, each of which is in particular coupled in a mobile manner to the respective side wall 35.

[0084] In particular, in use, each first portion 43 and the respective second portion 44 are arranged adjacent and in (sealing) contact with one another when, in use, the respective door 38 is arranged in the respective active position and are spaced from one another when, in use, the respective door 38 is controlled in the respective inactive position.

[0085] According to some non-limiting preferred embodiments, each first portion 43 and the respective second portion 44 are movable with respect to one another.

[0086] Preferably but not necessarily, each first portion 43 and each second portion 44 are movable between a first limit position and a second limit position.

[0087] In particular, each first portion 43 and each second portion 44 are movable in a relative first direction D1 and in a relative second direction D2 opposite to direction D1 to be arranged respectively from the respective first limit position to the respective second position and from the respective second position to the respective first position. In particular, each direction D1 and D2 is transverse to the first advancing path and/or to the second advancing path. Even more in particular, each direction D1 and D2 is parallel to the respective opening 33 or 34.

[0088] Preferably but not necessarily, each first portion 43 and the respective second portion 44 are adjacent and in contact with one another when, in use, they are in the respective second limit positions (see Figures 3 and 5), and in particular each first portion 43 and the respective second portion 44 are spaced from one another when, in use, they are in the respective first limit positions (see Figures 2 and 4) .

[0089] According to some non-limiting preferred embodiments, each portion 43 and each portion 44 comprise a respective section 45 of the respective passage slit 39.

[0090] According to some alternative embodiments not illustrated, each door 38 comprises a single mobile portion.

[0091] According to some non-limiting preferred embodiments, the second treatment apparatus 14 comprises one or more actuator devices 46, each of which is operatively connected to a respective door 38, in particular to the respective portions 43 and 44, in order to control the respective door 38 between the relative active position and the relative inactive position.

[0092] In particular, each actuator device 46 comprises at least two (linear) actuators 47, one of which is operatively connected to the respective portion 43 and the other to the respective portion 44 to move portions 43 and 44 between the respective first and second limit positions.

[0093] Preferably but not necessarily, each actuator device 46, in particular the respective actuators, are mounted on the respective side wall 35 that carries the respective opening 33 or 34.

[0094] According to some non-limiting preferred embodiments, each actuator device 46, in particular the respective actuators 47, are arranged in the isolation chamber 29.

[0095] According to some non-limiting preferred embodiments, each door 38 also comprises adjustment means 48, in particular for plates, configured to vary the extension, in particular the width, of the respective passage slit 39.

[0096] With particular reference to Figures 4 and 5 (not illustrated in Figures 2 and 3), each air-blade device 37 is configured to create an airflow in a direction towards a resting surface on which the treatment machine 1 rests.

[0097] According to some non-limiting preferred embodiments, each air-blade device 37 comprises at least an ejector element 49 arranged adjacent to the respective opening 33 or 34 and is configured to define a respective airflow. In particular, the respective ejector element 49 is arranged in isolation chamber 29.

[0098] Preferably but not necessarily, each air-blade device 37 also comprises another ejector element 49 arranged adjacent to the respective opening 33 or 34 and outside of the isolation chamber 29.

[0099] According to some preferred embodiments, each ejector element 49 has a tubular shape.

[0100] According to some non-limiting preferred embodiments, each ejector element 49 is arranged adjacent, in particular above, the respective passage slit 39 when the respective door 38 is, in use, controlled in the

respective active position.

[0101] In use, the treatment machine 1 is controlled, in particular by the control unit, in the production configuration to carry out at least a first treatment (by the treatment apparatus 12) and at least a second treatment (by the treatment apparatus 14) or in the cleaning configuration to carry out at least a cleaning and/or disinfection and/or sterilisation step during which at least portions, in particular at least the treatment apparatus 14, are cleaned and/or disinfected and/or sterilised.

[0102] In particular, when the treatment machine 1 is controlled in the production configuration, the bottles 2 are at least filled with the pourable product. Even more in particular, labels and caps are applied to the bottles 2. Preferably but not necessarily, also the bottles 2 are produced from preforms 13.

[0103] In particular, when the treatment machine 1 is controlled in the washing configuration, at least the treatment apparatus 14 is cleaned and/or disinfected and/or sterilised.

[0104] The operation of treatment machine 1 comprises at least a first control step and at least a second control step. In particular, the first control step and the second control step can be carried out simultaneously and/or separately.

[0105] During the first control step, each control device 36 is controlled, in particular in a selective and independent manner, between the respective first configuration and the respective second configuration.

[0106] During the second control step each air-blade device 37 is activated or deactivated, in particular in a selective and independent manner, to create, or not, the airflow.

[0107] According to some non-limiting preferred embodiments, during the first control step, each control device 36 is controlled in the first configuration and in the second configuration when the treatment machine 1 is controlled in the production configuration and in the cleaning configuration, respectively.

[0108] According to some embodiments, during the first control step, each door 38 is positioned in the inactive position and in the active position to control the respective control device 36 in the first configuration and in the second configuration, respectively, in particular to obtain the first opening area and the second opening area, respectively.

[0109] Preferably but not necessarily, during the first control step, the respective portions 43 and 44 are positioned in the respective first or second limit position to control the respective doors 38 in the respective inactive and active positions, respectively.

[0110] Preferably but not necessarily, during the first control step, each door 38 is controlled in the respective inactive position and in the respective active position by the respective actuator device 46. In particular, each actuator 47 moves the respective portion 43 or the respective portion 44 between the respective first and the respective second limit positions.

[0111] According to some non-limiting preferred embodiments, during the second control step, each air-blade device 37 is deactivated and activated when the treatment machine 1 is controlled in the production configuration and in the cleaning configuration, respectively.

[0112] In particular, during the second control step, each air-blade device 37 creates a respective airflow towards the resting surface.

[0113] Preferably but not necessarily, each airflow is emitted from the respective ejector element 49.

[0114] From an examination of the characteristics of the treatment machine 1 and the method of operating thereof according to the present invention, the advantages that it allows to obtain are obvious.

[0115] In particular, by the prearrangement of the control devices 36 and of the air-blade devices 37, the need to carry out disassembly and assembly operations prior to activation of a cleaning step and the uncontrolled distribution of cleaning agents from the isolation chamber 29, are avoided. In this manner, it is possible shorten the down times of the production due to the need to carry out a cleaning cycle of the treatment machine 1.

[0116] Another advantage resides in the fact that the actuation of the control devices 36 and of the air-blade devices 37 does not require the operation of highly qualified personnel.

[0117] A further advantage resides in the fact that each actuator device 46 is arranged in the isolation chamber 29 also guaranteeing a cleaning of the latter.

[0118] Another advantage resides in the fact of providing directions for the air flows towards a resting surface. In this manner, it is guaranteed that the cleaning agents, at a lower portion of the treatment machine 1, are collected.

[0119] It is clear that modifications and variations can be made to the treatment machine 1 and to the method of operating described and illustrated herein, without departing from the scope defined by the claims.

Claims

1. A treatment machine (1) for treating, in particular for at least filling, receptacles, in particular bottles (2), even more in particular bottles (2) made of thermoplastic material, comprising:

   - a first treatment apparatus (12) configured to carry out at least a first treatment of the receptacles (2) and/or to produce the receptacles (2) from respective precursors (13); and
   - a second treatment apparatus (14) configured to receive or feed the receptacles (2) from or to the first treatment apparatus (12) at a receiving station (15) and to carry out at least a second treatment of the receptacles (2) ;

   wherein the first treatment apparatus (12) comprises at least a first conveyor device (18a, 18b)

configured to convey the receptacles (2) along a respective first conveying path (P) and having one or more first retention elements (19) for holding the receptacles during their advancement along the first conveying path (P);
wherein the second treatment apparatus (14) comprises at least a second conveyor device (30a, 30b) configured to convey the receptacles (2) along a second conveying path (Q) and having one or more second retention elements for holding the receptacles during the conveying thereof along the second conveying path (Q);
wherein each second retention element is configured to receive or convey, in use, a respective receptacle (2) from or to a respective first retention element (19) at the receiving station (15);
wherein the second treatment apparatus (14) comprises at least an isolation chamber (29), provided with at least an opening (33, 34) to enable the insertion or the removal of the receptacles (2) into or from the isolation chamber (29) itself, a treatment device (31, 32), at least partially arranged in the isolation chamber (29) and configured to carry out the second treatment, and a control device (36) associated with the opening (33, 34);
wherein the control device (36) is controllable between a first configuration and a second configuration in which the control device (36) is configured to control the opening (33, 34) so as to have, respectively, a first opening area and a second opening area smaller than the first opening area;
wherein the first opening area enables a passage of the receptacles (2) into or out of the isolation chamber (29) and at least a partial passage of the first retention elements (19) into the isolation chamber (29) and/or of the second retention elements out of the isolation chamber (29);
wherein the second opening area enables a partial passage of the first retention elements (19) into the isolation chamber (29) and/or of the second retention elements out of the isolation chamber (29);
wherein the treatment machine (1) further comprises at least an air-blade device (37) configured to create an airflow at the opening (33, 34) and transverse to the first conveying path (P) and/or to the second conveying path (Q);
wherein the control device (36) comprises a door (38) provided with a passage slit (39) configured to enable the passage of the first retention elements (19) and/or of the second retention elements;
wherein the door (38) is movable between at least an inactive position and an active position;
wherein the door (38) is, in use, controlled in the inactive position and in the active position to control, in use, the control device (36) in the first configuration and in the second configuration, respectively;
wherein the door (38) comprises a first portion (43) and a second portion (44);
wherein, with the door (38) arranged in the active position, the first portion (43) and the second portion (44) are arranged adjacent and in contact with one another; and
wherein, with the door (38) arranged in the inactive position, the first portion (43) and the second portion (44) are spaced apart from one another.

2. Treatment machine according to claim 1, being controllable at least in a production configuration, in which the treatment machine (1) is configured to treat the receptacles (2), and in a cleaning configuration, in which the treatment machine (2) is configured to be exposed to a cleaning and/or to a disinfection and/or to a sterilisation step;
wherein the control device (36) is, in use, controlled in the first configuration and in the second configuration when the treatment machine (1) is, in use, controlled in the production configuration and in the cleaning configuration, respectively; and/or
wherein the air-blade device (37) is, in use, deactivated and activated when the treatment machine (1) is controlled, in use, in the production configuration and in the cleaning configuration, respectively.

3. The treatment machine according to claim 1 or 2, wherein the air-blade device (37) comprises at least an ejector element (49) arranged adjacent to the opening (33, 34), in particular arranged in the isolation chamber (29).

4. The treatment machine according any of the previous claims, wherein the second treatment apparatus (14) comprises an actuator device (46) operatively connected to the door (38) to control the door (38) between the active position and the inactive position.

5. The treatment machine according to claim 4, wherein the actuator device (46) is arranged in the isolation chamber (29) .

6. The treatment machine according to any one of the preceding claims, wherein the second treatment apparatus (14) comprises at least a filling device (31) configured to fill the receptacles (2) with a pourable product.

7. A method of operating a treatment machine (1) according to any one of the preceding claims; said method comprising at least:

- a first control step, during which the control device (36) is controlled between the first configuration and the second configuration; and
- a second control step, during which the air-blade device (37) is activated or deactivated to create, or not, the airflow;

wherein the control device (36) comprises a door (38) provided with a passage slit (39) configured to enable the passage of the first retention elements (19) and/or of the second retention elements;

wherein, during the first control step, the door (38) is positioned in an inactive position and in an active position to control the control device (36) in the first configuration and in the second configuration, respectively;

wherein the door (38) comprises a first portion (43) and a second portion (44), each of which is movable between a first limit position and a second limit position;

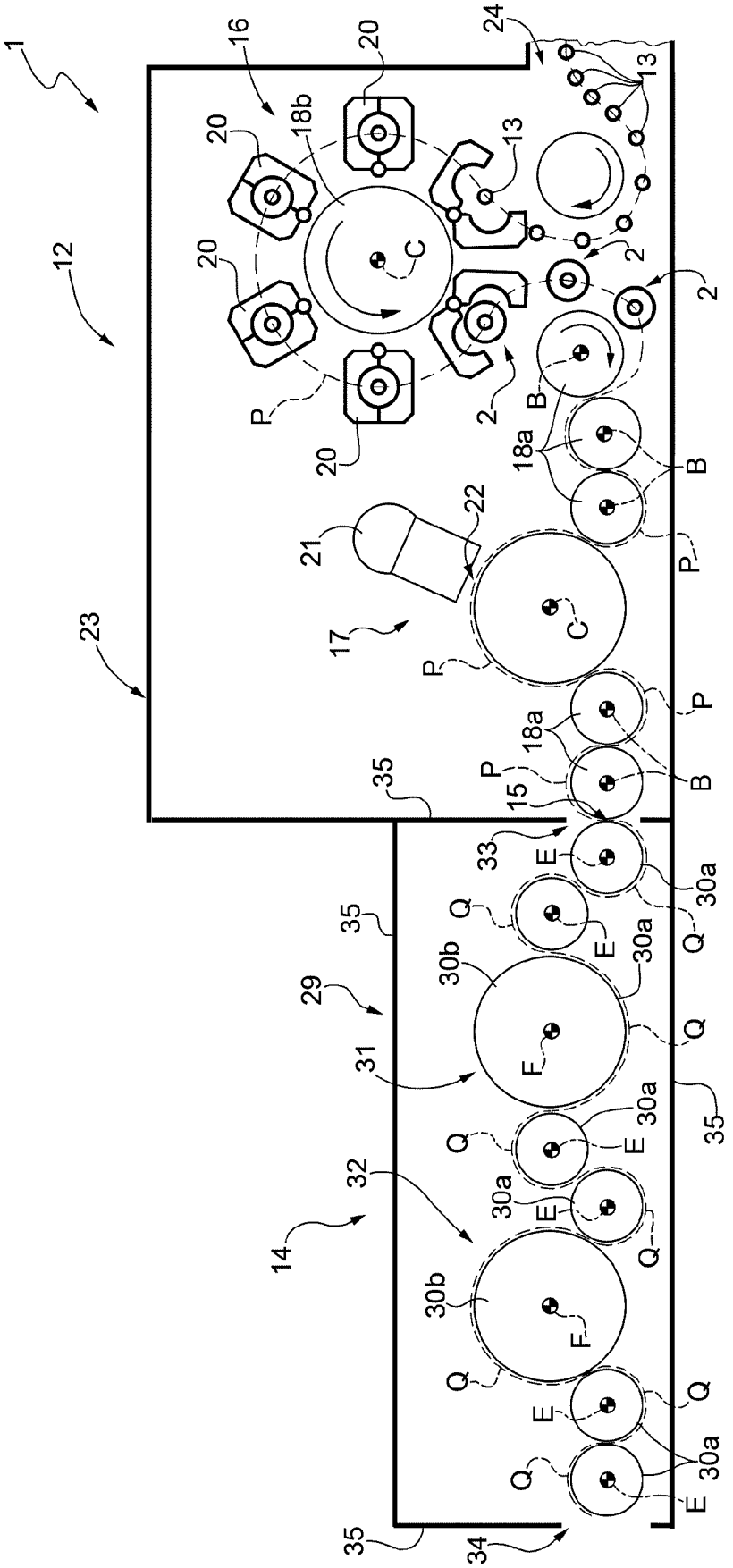
wherein, during the first control step, to control the door (38) in the active position, the first portion (43) and the second portion (44) are arranged in the respective second limit positions, in which the first portion (43) and the second portion (44) are arranged adjacent and in contact with one another; and

wherein, during the first control step, to control the door (38) in the inactive position, the first portion (43) and the second portion (44) are arranged in the respective first limit positions and spaced from one another.

8. The method according to claim 7, wherein the treatment machine (1) is controlled in a production configuration, in which the treatment machine (1) treats the receptacles (2), or in a cleaning configuration, in which the treatment machine (1) is exposed to a cleaning and/or to a disinfection and/or to a sterilisation step;

wherein, during the first control step, the control device (36) is controlled in the first configuration and in the second configuration when the treatment machine (1) is controlled in the production configuration and in the cleaning configuration, respectively; and/or

wherein, during the second control step, the air-blade device (37) is deactivated and activated when the treatment machine (1) is controlled, in use, in the production configuration and in the cleaning configuration, respectively.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Q
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30b
31
F
32
14
34

FIG.1

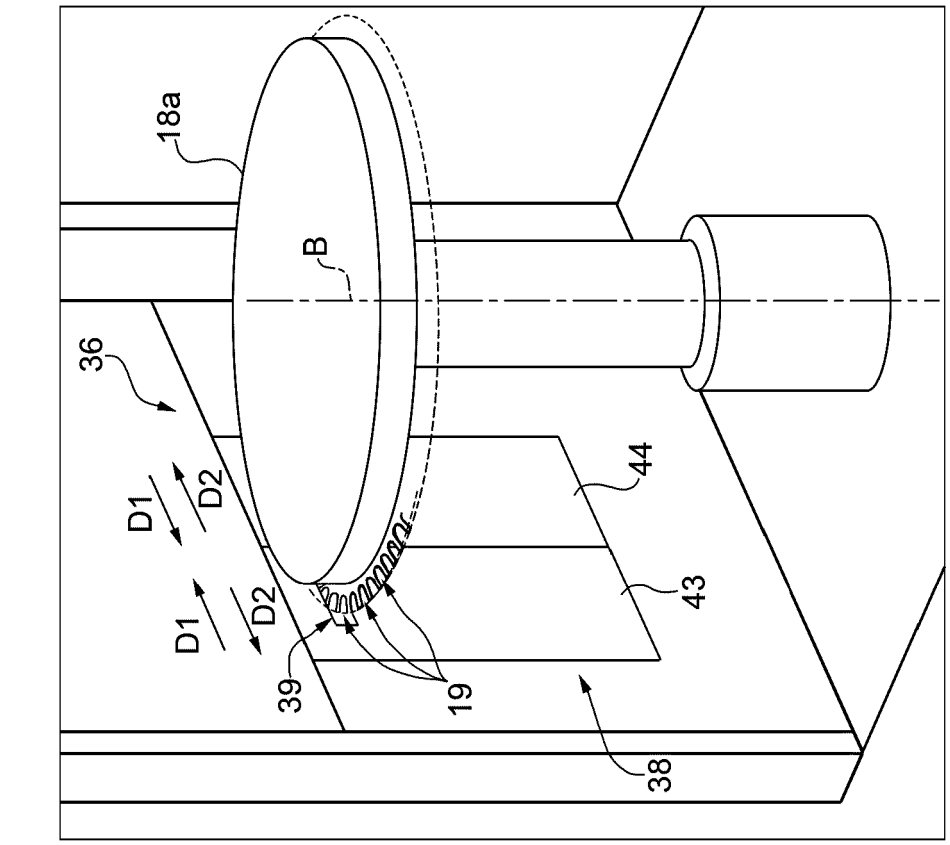
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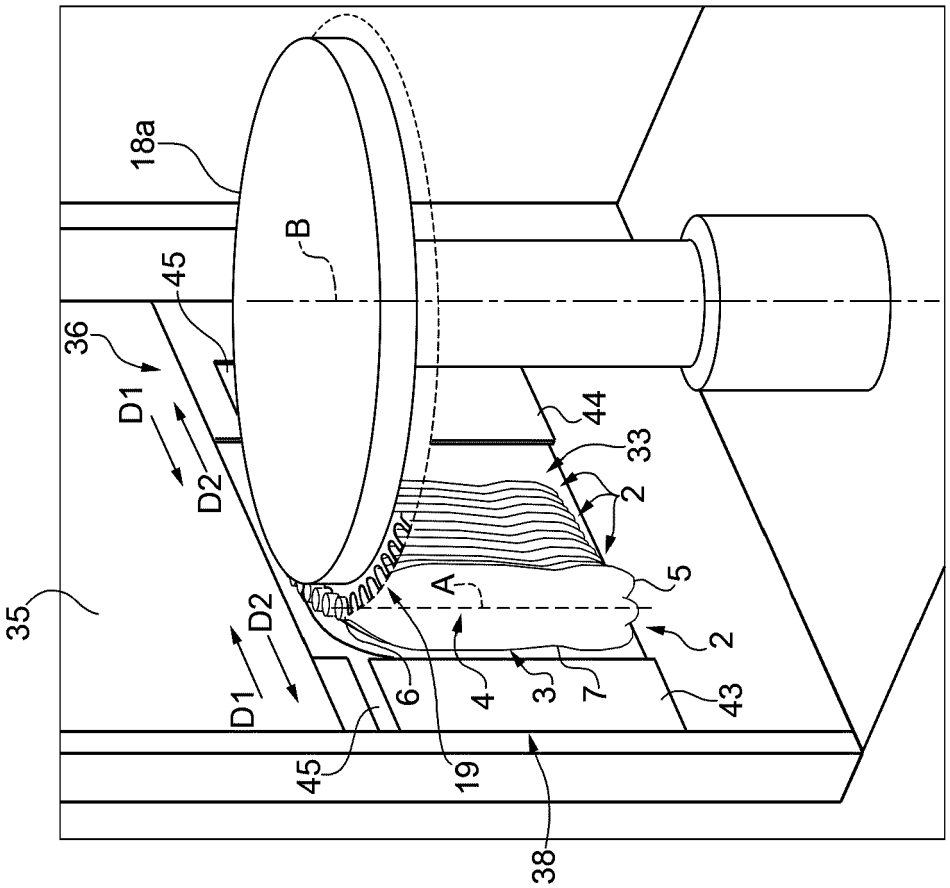
FIG.3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38

FIG.2

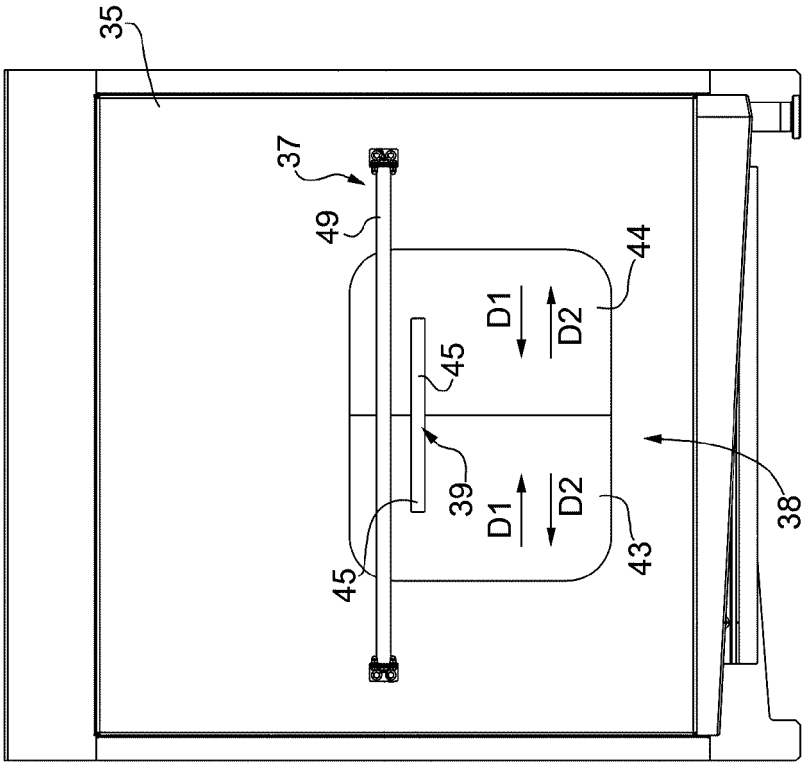

FIG.5

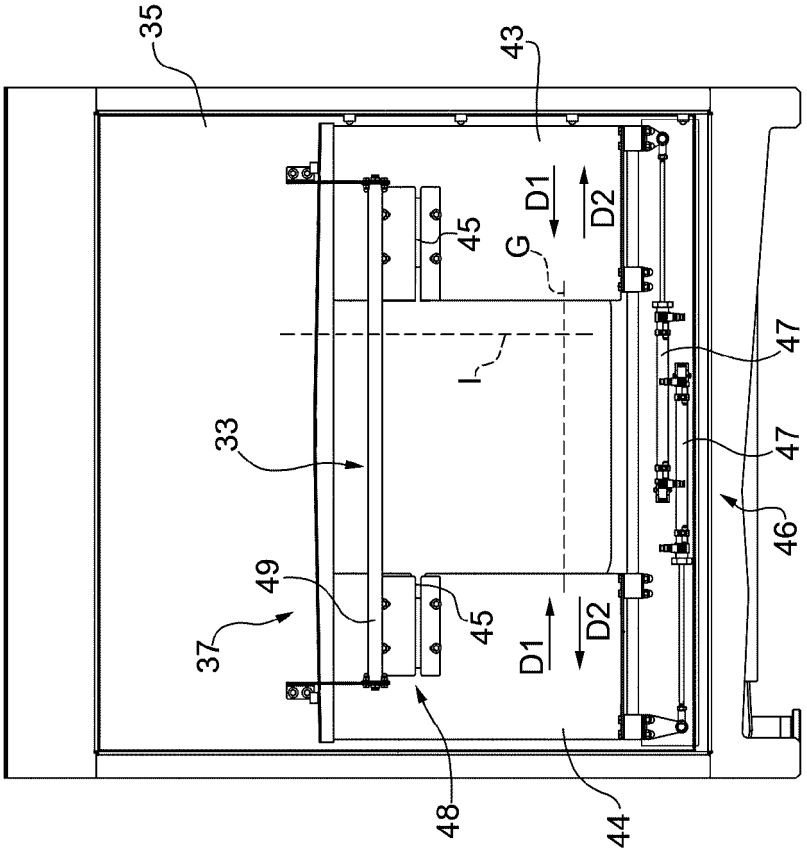

FIG.4

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EUROPEAN SEARCH REPORT

Application Number
EP 20 19 8855

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	WO 2019/048249 A1 (KRONES AG [DE]) 14 March 2019 (2019-03-14) * page 30, line 32 - page 31, line 7 * * page 33, line 5 - line 19 * * page 34, line 8 - line 22; figures 1-7 *	1-8	INV. B67C7/00
A	US 3 911 640 A (RAUSING HANS A) 14 October 1975 (1975-10-14) * column 4, line 18 - line 33; figure 1 *	1-8	
A	WO 2010/081759 A1 (SIDEL PARTICIPATIONS [FR]; QUETEL FRANCOIS [FR]; DEMARE JEROME [FR]) 22 July 2010 (2010-07-22) * abstract; figures 1-10 *	1-8	
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			B67C

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	29 March 2021	Wartenhorst, Frank

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29-03-2021

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