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(54) **ASSEMBLY FOR DESINFECTING ROLLING OBJECTS**

(57) 1. Assembly (100) for disinfecting a stream of objects, comprising:
- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects; - an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space;
- a door opening for accessing the interior space;
- a door having a closed position, wherein the door in the closed position seals the door opening for preventing UVC radiation radiating from the interior space;
- a door sensor for sensing if the door is in a closed position; and
- a UVC radiation controller arranged for controlling exposure of the interior space to the UVC radiation based on the door sensor.

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ASSEMBLY FOR DESINFECTING ROLLING OBJECTS

FIELD OF THE INVENTION

The invention relates to the field of assemblies for disinfecting a stream of objects, such as rolling objects. The invention further relates to the field of methods for disinfecting a stream of objects, such as rolling objects.

BACKGROUND OF THE INVENTION

In relation to the fight against the Corona-virus, society attempts to prevent the spread of this virus with particular measures. One of these measures is to disinfect items used by different people.

Disinfectant is regularly used by shoppers for disinfecting e.g. shopping carts in supermarkets. Disinfecting a shopping cart with disinfectant has the disadvantage that typically not all parts of the shopping cart are disinfected. Furthermore, as the disinfectant is typically provided by the supermarket, the outside of the bottle of disinfectant typically provides a platform for distribution of the virus. Furthermore, maintaining enough distance at the location where the bottle with disinfectant is held, is hardly possible, causing spreading of the virus between shoppers due to their proximity.

SUMMARY OF THE INVENTION

An object of the invention is to mitigate one or more of the disadvantages as mentioned above.

According to a first aspect of the invention, an assembly for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;
- an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space;
- a door opening for accessing the interior space; and

- a door having a closed position, wherein the door in the closed position seals the door opening for preventing UVC radiation radiating from the interior space;

- a door sensor for sensing if the door is in a closed position; and

- a UVC radiation controller arranged for controlling exposure of the interior space to the UVC radiation based on the door sensor.

UVC radiation may be used for disinfecting objects. UVC radiation or ultraviolet C radiation is short-wave ultraviolet light. The UVC radiation disrupts the DNA base pairing, causing formation of pyrimidine dimers, and leads to the inactivation of bacteria, viruses, and protozoa. Objects exposed to UVC radiation may therefore be disinfected when the exposure is long enough and intense enough.

Due to the negative effects of UVC radiation exposure to animals, such as humans, the disinfecting of the object is done in a UVC shielded chamber. Still the chamber needs to have at least one opening for providing to be disinfected and retrieving disinfected objects of the stream of objects. The door sensor in combination with the UVC radiation controller provide the advantageous technical effect of preventing or at least limiting the change of not to be disinfected objects or even animals, such as humans, to enter the UVC shielded chamber and subsequently be exposed to UVC radiation.

The door may be sealingly arranged in the door opening for in the closed position sealing the UVC shielded chamber preventing, reducing, or minimizing UVC radiation to escape the interior of the UVC shielded chamber via the door opening. The door sensor may sense the position of the door in the door opening. The door sensor may in particular sense the door in the door opening being in a closed position. When the door is not anymore in the closed position, the UVC radiation controller will control, block, prevent, stop or limit the exposure of the interior space to UVC radiation from the UVC source. This will advantageously prevent, reduce, or limit the leaking of UVC radiation out of the interior space via the door opening.

In an embodiment of the assembly, the UVC radiation controller comprises a UVC shutter having a blocking state with respect to the UVC source for preventing the UVC radiation reaching the interior space. The UVC shutter is

typically advantageously placed in the blocking state when the UVC source radiates UVC radiation and the door sensor indicates that the door is not in the closed position.

In an embodiment of the assembly, the UVC radiation controller comprises a switch arranged for controlling the UVC radiation radiated from the UVC source. The switch is typically advantageously switched off, or indicates to the UVC source to switch off when the UVC source radiates UVC radiation and the door sensor indicates that the door is not in the closed position. The switch may be switching the power of the UVC source or may be switching a signal line to the UVC source signalling to stop the UVC radiation.

In an embodiment of the assembly, the assembly comprises a conveyer system arranged for conveying the object from an outside position outside the interior space to an inside position inside the interior space, at least when the interior space is not exposed to UVC radiation. The conveyer system cooperating with the door, the UVC radiation controller and door sensor advantageously may allow for a user to place the object at the outside position and leave the object to be dealt with by the assembly at an appropriate time, such as when conveying the object at the outside position when the interior space is not exposed to UVC radiation. This advantageously allows for one object to be set ready at the outside position while another object is disinfected inside the UVC shielded chamber.

In an embodiment of the assembly, the assembly comprises:

- a presence sensor for providing a presence indication based on presence of the object outside the UVC shielded chamber; and
- an integrity sensor for providing an integrity indication based on the object outside the UVC shielded chamber;

wherein the conveyer system is activatable when the presence indication indicates presence of the object, and when the integrity indication indicates integrity.

Due to the negative effects of UVC radiation exposure to animals, such as humans, the disinfecting of the object is done in a UVC shielded chamber. Still the chamber needs to have at least one opening for providing to be disinfected and retrieving disinfected objects of the stream of objects. The

presence sensor in combination with the integrity sensor provide the advantageous technical effect of preventing or at least limiting the change of not to be disinfected objects or even animals, such as humans, to enter the UVC shielded chamber and subsequently be exposed to UVC radiation.

The presence sensor is arranged for sensing the presence of an object outside the UVC shielded chamber. The integrity sensor is arranged for sensing the integrity of the object outside the UVC shielded chamber. The combination of the two sensors advantageously provides an indication if a valid and to be disinfected object is located outside the UVC shielded chamber awaiting disinfection inside the UVC shielded chamber.

In an embodiment of the assembly, the presence sensor and the integrity sensor are arranged for sensing the object located at the outside position. This may advantageously allow to check the presence and integrity at the same position outside the UVC shielded chamber.

In an embodiment of the assembly, the presence sensor comprises a metal sensor, NFC reader, and/or an optical sensor. The presence sensor may advantageously use characteristics of the object, such as comprising metal at specific location, having an NFC chip at a specific location and/or having an opaque part at a specific location, respectively. Other variants of presence sensor are within the scope of the invention.

In an embodiment of the assembly, the integrity sensor comprises a weight sensor, preferably wherein the weight sensor is arranged for sensing if the object is within a predefined weight range. An aspect of the assembly is that it will be prevented that animals, such as humans are exposed to UVC radiation as UVC radiation may cause harm, such as irreversible harm to the animal, such as the human. The animal or human will have a certain weight. If the presence sensor senses the presence of the object, the integrity sensor is used to determine that the object does not contain an animal, such as a human. This is especially advantageous together with a conveyer system for automatically conveying the object from an outside to an inside position. It is further noted in general that that animal, such as a human, may be a young aged animal, such as a child. The combination of a presence sensor and an integrity sensor

therefore prevents may especially prevent children ending up inside the UVC shielded chamber and subsequently being exposed to the UVC radiation.

In an embodiment of the assembly, the object comprises front wheels and rear wheels, and wherein the weight sensor is arranged to sense the weight of the front or rear wheels. By only weighing one set of wheels of the object, the assembly may advantageously be made shorter. By only weighing one set of wheels of the object, the assembly may advantageously be simplified. In an embodiment of the assembly, the object is a rolling object. The object is then easily transported from the outside position to the inside position of the assembly, especially advantageous in combination with the conveyer system for automated transport of the rolling object. In an embodiment of the assembly, the rolling object is a wheeled object.

In an embodiment of the assembly, the wheeled object is a shopping cart. The assembly with the presence and the integrity sensors may therefore advantageously prevent children seated in the shopping cart to be pushed or dragged into the UVC shielded chamber for subsequently exposing these children to UVC radiation. This embodiment is especially advantageous when combined with the conveyer system.

In an embodiment of the assembly, the assembly comprises a bypass button for bypassing the integrity sensor and/or the presence sensor. For example, a shop may contain shopping carts and shopping baskets. To disinfect the shopping baskets with the same assembly, an operator of the assembly may place shopping baskets inside the UVC shielded chamber directly for disinfecting. Furthermore, the shopping basket may also be placed inside shopping cart, such that a shopping basket together with a shopping cart is disinfected. Depending on the use of the door sensor, the presence sensor or the integrity sensor, or both may prevent unlocking the lock of the door or the UVC radiation controller blocking UVC radiation in the interior space. The bypass button therefore allows a bypass or override for unlocking the door, preventing blocking UVC radiation from the UVC controller, and/or activation of the conveyer system for allowing whatever is at an outside position to be conveyed to an inside position inside the UVC shielded chamber for disinfecting the whatever is in the interior space. In a further embodiment of the assembly, the bypass button

comprises a button lock, such that the bypass button is only operable when unlocking the button lock. This advantageously allows that the override is only used by an operator whom is knowledgeable about the dangers of the assembly and specifically the UVC radiation.

According to another aspect of the invention, a method for disinfecting a stream of objects, comprising:

- providing an object of the stream of objects outside an UVC shielded chamber having an interior space shaped and arranged for receiving the object, and an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space;

- providing a presence indication based on presence of the object outside the UVC shielded chamber;

- providing a lack of integrity indication based on the object outside the UVC shielded chamber;

- providing a door having a closed position, wherein the door in the closed position seals a door opening for preventing UVC radiation radiating from the interior space;

- sensing if the door is in a closed position;

- controlling exposure of the interior space to the UVC radiation based on the door sensor.

According to another aspect of the invention, an assembly for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;

- a presence sensor for providing a presence indication based on presence of the object outside the UVC shielded chamber;

- an integrity sensor for providing a lack of integrity indication based on the object outside the UVC shielded chamber;

- an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space;

- a door opening for accessing the interior space; and

- a door sealing the door opening for controlling access to the interior space and for preventing UVC radiation radiating from the interior space;

- a lock for locking the door in a closed position for preventing access to the interior space when the interior space is exposed to the UVC radiation, when the presence indication indicates absence of the object, or when the integrity indication indicates lack of integrity. The advantages and effects are as specified for the assembly.

The door may be sealingly arranged in the door opening for in the closed position sealing the UVC shielded chamber preventing, reducing, or minimizing UVC radiation to escape the interior of the UVC shielded chamber via the door opening. The lock may lock the door in the door opening in a particular position. The lock may in particular lock the door in the door opening in a closed position.

In an embodiment of the assembly, the assembly comprises a conveyer system arranged for conveying the object from an outside position outside the interior space to an inside position inside the interior space when the door allows access. The conveyer system cooperating with the door and lock advantageously may allow for a user to place the object at the outside position and leave the object to be dealt with by the assembly at an appropriate time, such as when the door is unlocked. This advantageously allows for one object to be set ready at the outside position while another object is disinfected inside the UVC shielded chamber.

According to another aspect of the invention, a method for disinfecting a stream of objects, comprising:

- providing an object of the stream of objects outside an UVC shielded chamber having an interior space shaped and arranged for receiving the object, and an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space;
- providing a presence indication based on presence of the object outside the UVC shielded chamber;
- providing a lack of integrity indication based on the object outside the UVC shielded chamber;
- sealingly locking a door in a door opening for controlling access to the interior

space and for preventing UVC radiation radiating from the interior space, when the interior space is exposed to the UVC radiation, when the presence indication indicates absence of the object, or when the integrity indication indicates lack of integrity;

- unlocking the door when the interior space is not exposed to UVC radiation, when the presence indication indicates the presence of the object, and when the integrity indication indicates integrity. The advantages and effects are as specified for the assembly.

According to another aspect of the invention, an assembly for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;
- an UVC source arranged for exposing the interior space for disinfecting the object with UVC radiation;
- a door opening for accessing the interior space;
- a door sealing the door opening for controlling access to the interior space and for preventing UVC radiation radiating from the interior space; and
- a conveyer system arranged for conveying the object from an outside position outside the interior space to an inside position inside the interior space when the door allows access. The conveyer system advantageously allows for a user to place the object at the outside position and leave the object to be dealt with by the assembly at an appropriate time. This advantageously allows for one object to be set ready at the outside position while another object is disinfected inside the UVC shielded chamber.

In an embodiment of the assembly, the object comprises a horizontal bar; and the conveyer system comprises at least one protrusion arranged for cooperating with the object for grabbing the object during conveying. This advantageously allows for a simple solution of dragging the object from the outside position to the inside position inside the UVC shielded chamber for disinfecting the object.

In an embodiment of the assembly, the conveyer system is arranged such that the at least one protrusion traverses the same trajectory from the outside position to the inside position and vice versa. As the protrusion is

travelling up and down the same trajectory, the protrusion is always extending in the same direction, typically upwards. This in turn allows the conveyer system to be lower to the ground as no space needs to be present between the conveyer system and the ground for letting the protrusion pass in between. This lower conveyer system advantageously allows the protrusion to be higher, while the total system is not becoming higher. The lower conveyer system with the relatively high protrusion will advantageously be more suited for conveying a larger variety of objects.

In an embodiment of the assembly, the conveyer system is arranged such that the at least one protrusion is collapsible when traversing the trajectory from the inside position to the outside position. This advantageously allows for the protrusion while travelling up and down the same trajectory to pass the object in one direction, and hook and drag an object in the other direction.

In an embodiment of the assembly, the conveyer system is also arranged for conveying the object from the inside position to an exit position outside the interior space. This advantageously allows for the assembly to automatically convey objects from its interior space to an exit position.

In an embodiment of the assembly, the exit position is the outside position. This advantageously allows a simple conveyer system and also to have a minimum floor space occupied by the assembly.

In an embodiment of the assembly, the exit position is different from the outside position. This advantageously allows transit or feed-through of objects. This advantageously separates a disinfected side of the assembly from a not disinfected side of the assembly, thus reducing the risk of contamination of already disinfected objects.

In an embodiment of the assembly, the exit position and the outside position are arranged on opposite sides of the UVC shielded chamber, preferably wherein the UVC shielded chamber has the shape of a tunnel, more preferably wherein the outside position, the inside position, and the exit position are in line. This advantageously allows to setup an object disinfecting line.

In an embodiment of the assembly, the assembly comprises:

- an exit door opening for providing an exit from the interior space; and
- an exit door arranged in the exit door opening for controlling access to the

interior space and for preventing UVC radiation radiating from the interior space. The UVC radiation is advantageously prevented from escaping from the UVC shielded chamber when the interior space is exposed to UVC radiation.

In an embodiment of the assembly, the conveyer system is also arranged for conveying the object from an inside position inside the interior space to an exit position outside the interior space when the exit door allows access. This embodiment advantageously allows to automatically convey the disinfected object. In a further embodiment, the assembly comprises a second presence sensor at the inside position for sensing if a disinfected object is present and needs to be conveyed to the exit position after disinfection. This embodiment provides the advantage of not unnecessarily activating the conveyer system or this part of the conveyer system. This embodiment therefore may reduce energy consumption of the assembly.

In an embodiment of the assembly, the object comprises a/the horizontal bar; and the conveyer system comprises at least one other protrusion arranged for cooperating with the object for grabbing the object during conveying from the inside position to the exit position. The protrusion of the conveyer system may advantageously cooperate with the horizontal bar of the object for simplifying the conveyer system.

In an embodiment of the assembly, the conveyer system comprises a first conveyer device and a second conveyer device; the first conveyer device comprises the at least one protrusion, and the second conveyer device comprises the at least one other protrusion; the first conveyer device and the second conveyer device are arranged to convey objects of the stream of objects independently, simultaneously and/or synchronously. The two parts of the conveyer system advantageously allows to convey first a disinfected object from the inside position to the exit position, while second a to be disinfected object is conveyed from the outside position to the inside position. This advantageously may allow to make the assembly smaller. Furthermore, this advantageously allows to only activate the second conveyer device if a disinfected object is ready to be conveyed form the inside position to the exit position. Furthermore, this advantageously allows to only activate the first conveyer device if a to be

disinfected object is ready to be conveyed from the outside position to the inside position.

In an embodiment of the assembly, the assembly comprises an object buffer for buffering one or more objects from the stream of objects; wherein the object buffer is arranged for providing single objects from its buffer to the outside position; and/or wherein the object buffer is arranged for buffering single objects from the UVC shielded chamber. This advantageously allows for multiple objects to wait in a queue or buffer for being disinfected without an operator placing objects at the outside position one-after-the-other.

In an embodiment of the assembly, the object is a rolling object. The object is then easily transported from the outside position to the inside position of the assembly, especially advantageous in combination with the conveyer system for automated transport of the rolling object. In an embodiment of the assembly, the rolling object is a wheeled object.

In an embodiment of the assembly, the wheeled object is a shopping cart. The assembly with the presence and the integrity sensors may therefore advantageously prevent children seated in the shopping cart to be pushed or dragged into the UVC shielded chamber for subsequently exposing these children to UVC radiation. This embodiment is especially advantageous when combined with the conveyer system.

According to another aspect of the invention, an assembly for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;
- an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object ;
- a door opening for accessing the interior space; and
- a swinging door sealing the door opening for controlling access to the interior space and for preventing UVC radiation radiating from the interior space. A swinging door advantageously allows for the object to push the swinging door open when the object is conveyed from an outside position to an inside position, thereby make control, such as a motor, for opening the swinging door redundant or superfluous.

In an embodiment of the assembly, the swinging door swings into the interior space for allowing access. This advantageously allows the object to push the swinging door. This further typically prevents the assembly to extend beyond the floor area of the assembly.

In an embodiment of the assembly, the door comprises a first door segment and a second door segment both arranged for swinging. The door being subdivided in two door segments allows the door segments to advantageously make a smaller swing compared to one single swinging door, such that less force is required to push the swinging door open. In a further embodiment, the door is subdivided in two symmetric door segments, preferably also symmetrically arranged, allows the door segments to advantageously push the door segments open with the object, while the object is not or substantially not deviating from its path as the counter forces of the swinging door segments are advantageously equal or substantially equal.

In an embodiment of the assembly, the first door segment is rotationally arranged around a first rotational axis; the second door segment is rotationally arranged around a second rotational axis; and the object passes between the rotational axes when being conveyed into the interior space. The rotational swinging door segments are advantageously swinging in a horizontal plane, thus having vertical rotational axis, for simplifying installation of the assembly, simplifying the swinging door construction in the assembly. In a further embodiment of the assembly, the first axis and the second axis are both in use arranged vertically. The vertical is typically defined relative to the ground or a base plate of the assembly arranged on the ground when in use.

In an embodiment of the assembly, the swinging doors in a closed position form a V-shape. This advantageously allows the swinging doors to make a smaller arc for limiting the swing of the door. The V-shape also advantageously causes the swinging doors to bounce less when closing the swinging doors after the object has passed through the doors. This is especially the case when the assembly also advantageously comprises two springs, or biased door hinges each biasing one of the swinging door segments in the closed position.

In an embodiment of the assembly, the swinging doors each comprise a frontal surface, wherein each frontal surface is a flat surface. This allows the

object to advantageously push against the swinging door without hooking onto or into the swinging door for getting stuck. This allows the object to advantageously smoothly push the swinging door open when passing through.

In an embodiment of the assembly, the first door segment comprises a first sealing edge arranged opposite of the first rotational axis; the second door segment comprises a second sealing edge arranged opposite of the second rotational axis; and in the closed position the first sealing edge and the second sealing edge contact each other for forming a UVC radiation seal. In a further embodiment the contacting sealing edges are advantageously overlapping each other for forming the UVC radiation seal.

In an embodiment of the assembly, the first sealing edge comprises a first resilient elongated flap; and/or the second sealing edge comprises a second resilient elongated flap. The resilient elongated flap advantageously reduces bouncing of the swinging door segments after the object has passed through the swinging door segments and the swinging door segments are moving towards the closed position. The resilient elongated flap also improves the UVC radiation sealing function of the swinging door segments.

In an embodiment of the assembly, the first door segment comprises a first elongated notch arranged for receiving a side of the first resilient elongated flap; and/or

wherein the second door segment comprises a second elongated notch arranged for receiving a side of the second resilient elongated flap. The respective elongated notch simplifies installation and construction of the swinging door. The elongated notch also provides a smooth step in the front surface of the door segment, such that the object may push against the door segment without being hooked onto or into the door segment.

In an embodiment of the assembly, the object is a rolling object. The object is then easily transported from the outside position to the inside position of the assembly, especially advantageous in combination with the conveyer system for automated transport of the rolling object. In an embodiment of the assembly, the rolling object is a wheeled object.

In an embodiment of the assembly, the wheeled object is a shopping cart. The assembly with the presence and the integrity sensors may therefore

advantageously prevent children seated in the shopping cart to be pushed or dragged into the UVC shielded chamber for subsequently exposing these children to UVC radiation. This embodiment is especially advantageous when combined with the conveyer system.

According to another aspect of the invention, an assembly for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;
- an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object;
- a door opening for accessing the interior space;
- a door sealing the door opening for controlling access to the interior space and for preventing UVC radiation radiating from the interior space, having a closed position; and
- a UVC shutter comprising a blocking state with respect to the UVC source for preventing the UVC radiation reaching the interior space and an exposing state for allowing the UVC radiation to irradiate the interior space, the UVC shutter functionally coupled to the door for the UVC shutter assuming its blocking state when the door is free from its sealing position. The UVC shutter advantageously allows the UVC sources to be switched on constantly while the UVC shutter allows the door to be open and still the interior space is not exposed to UVC radiation. The UVC radiation source typically needs a relatively long time to start up. This assembly allows to shorten the time an object is inside the interior space as the shutter is much faster removed for exposing the object than the UVC source starting up. This assembly therefore has the technical effect of having more throughput of disinfected objects. The UVC source is typically more negatively affected by switching the source on and off compared to have the source constantly on while there are periods of not using the assembly for disinfecting objects. This assembly may advantageously be combined with a buffer storing objects to be disinfected and wherein the buffer is configured to accumulate multiple objects before presenting these objects to the assembly. The buffer may comprise a controller for controlling the number of objects inside the buffer and only presenting objects at the outside position outside the UVC

shielded chamber, such that the UVC source is only switched on and/or off for longer periods of time. This embodiment advantageously prolongs the lifetime of the UVC source as it reduces the on-off switching in combination with reducing the total amount of on time of the UVC radiation source. The controller may further comprise a timer or switch for switching on during operational hours, such as during shopping hours. The controller may further comprise a neural network for learning the loading behaviour of the buffer for further optimizing the balance between on-off switching and on-time of the UVC source, such that this balance increases the mean time between failure and thus improves dependability of the assembly.

In an embodiment of the assembly, the UVC source has an elongated shape having a longitudinal axis; the UVC shutter is rotationally arranged around the longitudinal axis. This advantageously simplifies the structure of the assembly. Typically, the UVC source is provided in an elongated shape, the shutter is advantageously shaped to closely fit around the UVC source. This fitting around the UVC source should not be too tight as the UVC source still has to be cooled, for example by air around the UVC source. The air cooling the UVC source may circulate around or along the UVC source by natural convection or forced convection.

In an embodiment of the assembly, the UVC shutter comprises an inner surface facing the UVC source, wherein the inner surface is non-reflective to the UVC radiation, such dispersing UVC radiation, preferably absorbing the UVC radiation. This advantageously prevents hot spots or focus spots of UVC radiation in the compartment created when the shutter is in a closed position.

In an embodiment of the assembly, the interior space is lined with UVC radiation mirroring surfaces, preferably wherein the top and side walls of the interior space are lined with UVC radiation mirroring surfaces. The mirrors cause all radiation not falling on the object or reflected by the object to be advantageously reused by mirroring this UVC radiation, preferably back towards the object. As a further result of the mirroring, the object is advantageously exposed from more angles then only the UVC source or UVC sources. This exposing of the object under more angles has the effect of disinfecting the object more and/or also in difficult to reach corners of the object. The mirroring has also

the effect of reducing the change of a location or spot of the object not being exposed to UVC radiation during disinfecting. The floor plate of the interior space may be non-reflecting, such as a matte material, for preventing or at least reducing UVC radiation from being reflected under the door and out of the interior space. Although UVC radiation may escape the interior space from underneath the door, the amount of UVC radiation escaping should be such that harmful effects on an animal, such as a human, are minimized or prevented, preferably these harmful effects should be absent when exposed to the residual or escaped UVC radiation over a longer period of time.

In an embodiment of the assembly, the assembly comprises a replacement indicator configured for indicating if the accumulated time the UVC source was radiating the UVC radiation exceeds a time threshold. Through this indicator, the operator may advantageously be noticed that the UVC source is close to failure. The assembly is typically part of an essential process. If the disinfecting of objects is not possible anymore, the larger process where the assembly is part of, will cease. As an example, if shopping carts in a supermarket cannot be disinfected anymore, shoppers will not be able to use the shopping carts anymore, as disinfecting is required during the Corona-crises. When the indicator is active, the operator may then already order or get a replacement part for the UVC source, or even already replace the replacement part of the UVC source. The standstill of the larger process due to failure of the assembly may advantageously prevented or reduced by the indicator.

In an embodiment of the assembly, the assembly comprises:

- an internal presence sensor for sensing the presence of the object in the interior space;
- a UVC radiation sensor for sensing UVC radiation in the interior space; and
- a malfunction indicator configured for indicating if the object in the interior space is not exposed to UVC radiation based on the internal presence sensor and the UVC radiation sensor. As the UVC shielded chamber is arranged such that UVC radiation cannot escape from the chamber, it may be difficult for the operator to ascertain that the object is disinfected or properly disinfected. Therefore, it would be advantageous to have an outside indicator to actually

communicate back to the operator that the UVC source is radiating UVC radiation for disinfecting the object in the interior space.

In an embodiment of the assembly, the object is a rolling object. The object is then easily transported from the outside position to the inside position of the assembly, especially advantageous in combination with the conveyer system for automated transport of the rolling object. In an embodiment of the assembly, the rolling object is a wheeled object.

In an embodiment of the assembly, the wheeled object is a shopping cart. The assembly with the presence and the integrity sensors may therefore advantageously prevent children seated in the shopping cart to be pushed or dragged into the UVC shielded chamber for subsequently exposing these children to UVC radiation. This embodiment is especially advantageous when combined with the conveyer system.

According to another aspect of the invention, an assembly for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;
- an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space;
- an exit door opening for exiting the interior space;
- a conveyer system arranged for conveying the object from an inside position inside the interior space to an exit position outside the interior space, at least when the interior space is not exposed to UVC radiation;
- an object brake arranged to the exit position cooperating with the conveyer system and the object for adding the disinfected object when conveyed to the exit position to a stream of disinfected objects. The objects typically have a low friction with the ground, such as are wheeled objects. Further the objects are typically objects that slide together or slide in each other. The sliding together has typically a higher friction than the ground friction, such as is typically the case with shopping carts. The object brake according to the invention, temporarily provides a higher ground friction, such that the friction of the sliding together may advantageously be overcome.

In an embodiment of the assembly, the assembly comprises an exit door having a closed position, wherein the exit door in the closed position seals the exit door opening for preventing UVC radiation radiating from the interior space. This embodiment advantageously prevents, limits or reduces the amount of UVC radiation radiated from the exit door opening.

In an embodiment of the assembly, the assembly comprises:

- an exit door sensor for sensing if the exit door is in a closed position; and
- a UVC radiation controller arranged for controlling exposure of the interior space to the UVC radiation based on the exit door sensor. This embodiment advantageously prevents, limits or reduces the amount of UVC radiation in the interior space when the exit door is not in the closed position, such as in the open position.

In an embodiment of the assembly,

the object comprises front wheels and/or rear wheels; and

the object brake comprises a front object brake and/or a rear object brake for cooperating with the front wheels and/or the rear wheels, respectively. This embodiment advantageously provides cooperation between the brake object and the wheels of the object.

In an embodiment of the assembly, the object brake comprises a threshold, doorstep, doorsill and/or step. This embodiment advantageously provides concrete implementations of the object brake.

According to another aspect of the invention, an assembly according to any of the independent embodiments combined with one or more of the depended embodiments. This combination may increase or improve the effect mentioned already for one or both of the embodiments. Alternatively, this combination may increase or improve a new effect not explicitly mentioned but associable with the combination.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be apparent from and elucidated further with reference to the embodiments described by way of example in the following description and with reference to the accompanying drawings, in which:

Figure 1 schematically shows a first perspective view of the assembly;

Figure 2 schematically shows a second perspective view of the assembly;

Figure 3 schematically shows a horizontal cross-section of the assembly;

Figure 4 schematically shows a vertical cross-section of the assembly;

Figure 5A schematically shows a vertical cross-section view of the UVC source of the assembly;

Figure 5B schematically shows a vertical cross-section view of the UVC source of the assembly;

Figure 6 schematically shows a horizontal cross-section view of a detail of the door segments of the assembly;

Figure 7A schematically shows a perspective view of a detail of the conveyer system of the assembly;

Figure 7B schematically shows a perspective view of a detail of the conveyer system of the assembly;

Figure 8 schematically shows a second perspective view of the assembly; and

Figure 9 schematically shows a perspective view of a detail of the conveyer system of the assembly.

The figures are purely diagrammatic and not drawn to scale. In the figures, elements which correspond to elements already described may have the same reference numerals.

LIST OF REFERENCE NUMERALS

10	stream of objects
11, 11', 11'', 11''', 11'''', 11'''''	objects
12	horizontal bar
100	assembly
105	base plate
106	entry ramp
107	exit ramp
110	central module

119	exit position
120	outside position
121	inside position
122	UVC shielded chamber
123	interior space
124	UVC source
125, 125’	UVC source tube
126	UVC frame
127	shutter
128	UVC shield
129	suspension element
130	presence sensor
131	integrity sensor
160, 160’	door module
164	door opening
165	door
166	first door segment
167	second door segment
168	first door segment sensor
169	second door segment sensor
170	first distal door segment end
171	second distal door segment end
172	first elongated notch
173	second elongated notch
174	first resilient elongated flap
175	second resilient elongated flap
176	first sealing edge
177	second sealing edge
180	conveyer system
181	first conveyer device
182	second conveyer device
185, 185’	protrusions first conveyer device

186, 186’	protrusions second conveyer device
187	rear object brake
188	front object brake
r1	rotational axis first door segment
r2	rotational axis second door segment
D	direction of conveying objects
III	cross-section for figure 3
IV	cross-section for figure 4
V	cross-section for figure 5
VI	cross-section for figure 6
VII	cross-section for figure 7

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Figure 1 schematically shows a first perspective view of the assembly 100. The assembly may comprise a central module 110, a first door module 160, and a second door module 160’. The first door module is arranged at the entrance of the central module. The second door module is arranged at the exit of the central module.

Figure 1 further shows a stream of shopping carts 10, comprising the individual shopping carts 11, 11’, 11’’, 11’’’, 11’’’’, 11’’’’’. The assembly may comprise a conveyer system 180 arranged for individually conveying, transporting or dragging the shopping carts into the UVC shielded chamber for disinfecting the individual shopping carts. The assembly may comprise a base plate 105, whereupon the stream of objects passes over. The assembly may further comprise an entry ramp 106, such that the stream of shopping carts may be easily pushed onto the base plate.

The assembly comprises a door opening 164, and a door 165 arranged in the door opening. The door may be in a closed position. In the closed position, the door blocks the UVC radiation or reduces the amount of UVC radiation leaking from the UVC shielded chamber, more specific the interior space of the UVC shielded chamber. The door in the closed position should at least reduce the amount of UVC radiation leaking through the door opening to a

non-harmful level, preferably when exposed to the residual or escaped UVC radiation over a longer period of time. In the open position, the door allows access for shopping carts to the interior space. The first door module or entry door module 160 is arranged to the entry of the UVC shielded chamber. The second door module or exit module 160' is arranged to the exit of the UVC shielded chamber.

Figure 2 schematically shows a second perspective view of the assembly. Additional to the elements or parts described for Figure 1, the assembly may comprise protrusions 185, 185'. The assembly may convey, transport or drag an object, such as a shopping cart, into the interior space in a direction D. The direction D is thus also the direction the protrusions will travel when conveying, transporting or dragging the object. The protrusions are typically biased in an upright position. The biasing may be by a counter weight around a rotational axis, by a spring, and/or by any other means. When the protrusions travel in the opposite direction of D, thus back from the interior space to the outside position 120, the protrusion may collapse when encountering e.g. a horizontal bar of an object, such as a shopping cart. This collapsing when traveling in the reverse or opposite direction has the advantage that the protrusions may after passing the horizontal bar, com in the upright or vertical position again, and hook behind the horizontal bar of the object for thereafter in the opposite direction not collapsing and thus dragging the object. Figure 2 further shows a dashed horizontal surface III indicating the cross-section of Figure 3 with arrows indicating the viewing direction. Figure 2 further shows a dashed circle VII indicating the detail of Figure 7A and Figure 7B.

The door may comprise a first door segment 166 and a second door segment 167. The door segments are shown in a closed position. The first door segment has a rotational axis r1. The second door segment has a rotational axis r2.

Figure 3 schematically shows a horizontal cross-section of the assembly 100. The assembly may comprise a base plate 105, an entry ramp 106, and an exit ramp 107. The ramps have the effect that objects, specifically rolling objects may smoothly be placed and leave the base plate.

The assembly may comprise a presence sensor 130, and an integrity sensor 131, typically arranged to an outside position 120 for sensing presence and integrity of an object located at the outside position. The presence sensor and the integrity sensor may be integrated or arranged to the base plate. The presence sensor may be optical for sensing an opaque part of the object. The presence sensor may be a metal detector for detecting an object holding metal, such as a metal shopping cart. The integrity sensor may be a weight sensor for sensing if the weight of the item placed on the integrity sensor is within the range specified for the object. To simplify the integrity sensor, for example only the front wheels of a wheel comprising object may be weighted.

The assembly may comprise a central module 110, a first door module 160, and a second door module 160'. The assembly comprises a door opening 164, and a door 165 arranged in the door opening. The door 165 may comprise a first door segment 166, and a second door segment 167. The door and thus the door segments are shown in a closed position. The position of the door may be sense a door sensor 168, 169, more specific a first door sensor 168 may sense the position of the first door segment 166, and a second door sensor 169 may sense the second door segment 167.

The assembly comprises an UVC shielded chamber 122 having an interior space 123. The UVC shielded chamber comprises a UVC source 124 arranged on the inside of the chamber or to the interior space. The UVC source is arranged such that when radiating UVC radiation, the UVC radiation is radiated into the interior space.

The assembly may comprise a conveyer system 180. The conveyer system may comprise a first conveyer device 181, and a second conveyer device 182. The first conveyer device may convey an object from an outside position 120 to an inside position 121. The first conveyer device may comprise protrusions 185, 185' for grabbing or hooking onto the to be conveyed object. The second conveyer device may convey an object from an inside position 121 to an exit position 119. The second conveyer device may comprise protrusions 186, 186' for grabbing or hooking onto the to be conveyed object. The conveyer system, or both conveyer devices, convey objects in a direction D.

Figure 3 further shows a dashed line IV indicating the cross-section of Figure 4 with arrows indicating the viewing direction.

Figure 4 schematically shows a vertical cross-section of the assembly. The assembly may be fitted with multiple UVC sources 124 for irradiating the object from multiple sides. Figure 4 further shows the first door segment 166 and the second door segment 167 of the second door module 167. The vertical rotational axis r1 of the first door segment is shown. The vertical rotational axis r2 of the second door segment is shown.

Figure 4 further shows the base plate 105, and the conveyer system 180. Figure 4 further shows a dashed circle V indicating the cross-section detail of Figure 5A and Figure 5B. Figure 4 further shows a dashed line VI indicating the cross-section detail of Figure 6 with the viewing direction indicated with arrows.

Figure 5A schematically shows a vertical cross-section view of the UVC source of the assembly. The UVC source may comprise UVC source tubes 125, 125'. The UVC source may further comprise a UVC frame 126 for holding the UVC source tubes in place. The UVC source may further comprise a UVC shield 128 shielding or blocking the UVC radiation. The UVC shield may comprise a reflecting surface for reflecting the UVC radiation. The UVC source may comprise a shutter 127. The shutter is shown in the open position. In the open position the UVC radiation from the UVC source tubes may irradiate the interior space of the UVCD chamber. The shutter in an open position is typically positioned such that the UVC source tubes may radiate UVC radiation under an arc of almost 180. The opening of the shutter such far provides the advantage that the UVC source may be placed close to the to be disinfected object. A further advantageous effect may that the position of the UVC source inside the interior space becomes less critical, while the object is still disinfected according to specifications.

Figure 5B schematically shows a vertical cross-section view of the UVC source of the assembly. Figure 5B shows the same cross-section as Figure 5A except for the shutter position. The shutter is shown in the closed position. The shutter now blocks or significantly reduces the amount of UVC radiation that is reaching the interior space.

Figure 6 schematically shows a horizontal cross-section view of a detail of the door segments of the assembly. Shown is a part of the conveyer system 180, below a part of the door 165. The door comprises a first door segment 166, and a second door segment 167. The first door segment comprises a first sealing edge 176 distally arranged relative to the rotational axis r1. The second door segment comprises a second sealing edge 177 distally arranged relative to the rotational axis r2. The first door segment comprises a first elongated notch 172 at a distal end 170 relative to the rotational axis r1. The second door segment comprises a second elongated notch 173 at a distal end 171 relative to the rotational axis r2. The notches are typically arranged in a vertical direction and parallel to the respective rotational axis. The first door segment further comprises a first elongated resilient flap 174 having one side arranged in the first elongated notch and radially extending. The second door segment further comprises a second elongated resilient flap 175 having one side arranged in the second elongated notch and radially extending. In a closed position of the door, the resilient flaps contact each such that the resilient flaps bent. This bending of the resilient flaps causes a bias in the resilient flaps improving the contact between the resilient flaps for improving the sealing of the door preventing or at least reducing the amount of UVC radiation that can escape from the UVC shielded chamber.

In an embodiment of the door, each door segment comprises biasing means, such as springs, for biasing the door segments in a closed position. In combination with the resilient flaps, this embodiment provides the advantage of automated closing of the door and biasing the door segments for providing the improved seal with the resilient flaps.

In an embodiment of the door, the door segments in a closed position have a V-shape, improving the contacting of the resilient flaps for improving the sealing function of the door.

Figure 7A schematically shows a perspective view of a detail of the conveyer system 180 of the assembly. The conveyer system may comprise a first conveyer device 181. In an alternative embodiment, the conveyer system is undividable, for example at the protrusions 185, 185' and the protrusions 186, 186' are linked by one chain controlling and dragging both sets of protrusions at

the same time providing the advantage of a less complex assembly as well as a less complex control of this assembly.

Figure 7A further shows part of the ramp 106 and the base plate 105. Figure 7A further shows part of the object 11 to be conveyed, such as a shopping cart. The object comprises a horizontal bar 12. The conveyer system comprises two protrusions 185, 185' extending vertically. Figure 7A further shows the location of the integrity sensor 131. Figure 7A further indicates the location of the presence sensor. The presence sensor senses the presence of an object at an outside position outside the UVC shielded chamber. The integrity sensor checks the integrity of the object present at the outside position. Only after the presence sensor and the integrity sensor confirming respectively the presence and the integrity of the object, the object is conveyed into the UVC shielded chamber by the conveyer system for disinfecting the object inside the UVC shielded chamber. The conveyer system may let the protrusions travel in a direction D. And when the protrusions travel in this direction, the object will be dragged along by the protrusions.

Figure 7B schematically shows a perspective view of a detail of the conveyer system of the assembly. Figure 7B shows the protrusions 185, 185' travelling opposite direction D. When the protrusions encounter the horizontal bar of the object, the protrusions will collapse as the protrusions will rotate around a horizontal axis typically lower relative to the horizontal bar.

The combination of the protrusions collapsing when travelling in a direction opposite to direction D, and remaining vertical when travelling in a direction D allows for the protrusions to travel up and down the same trajectory while conveying objects.

Figure 8 schematically shows a second perspective view of the assembly 100. Figure 8 shows the exit of the assembly with a stream of objects at the exit position 119. Figure 8 further shows a dashed circle IX indicating the cross-section detail of Figure 9.

Figure 9 schematically shows a perspective view of a detail of the conveyer system of the assembly. The object may comprise front wheels 13 and rear wheels 14. The assembly may comprise an object brake. The object brake may comprise a front object brake 188 and a rear object brake 187. The object

brake is arranged to the exit position 119. Further, the disinfected objects are conveyed in a direction D by the conveyer system 180.

The assembly typically comprises a controller for controlling the functioning of the assembly. The controller typically links the conveyer system, such as the first conveyer device and the second conveyer device; the door lock, such as the first door segment lock, and the second door segment lock; the door sensors, such as the first door segment sensor, and the second door segment sensor, arranged for sensing the position of the door or door segments; UVC source sensor arranged for sensing if the UVC source is on; UVC source status sensor arranged for sensing if the UVC source is close to failure; indicator for indicating the status of the assembly, such as failure of the UVC source, multiple objects in interior space, and/or replace UVC source; the presence sensor for sensing presence at the outside position; the internal presence sensor for sensing presence at the inside position; the integrity sensor for sensing integrity at the outside position and/or shutter position sensor. The controller may be implemented centralized or distributed. The controller may be implemented with the use of a PCL, an FPGA, a CPU, a GPU, and/or a DSP.

Examples, embodiments or optional features, whether indicated as non-limiting or not, are not to be understood as limiting the invention as claimed.

It should be noted that the figures are purely diagrammatic and not drawn to scale. In the figures, elements which correspond to elements already described may have the same reference numerals.

The term “substantially” herein, such as in “substantially all emission” or in “substantially consists”, will be understood by the person skilled in the art. The term “substantially” may also include embodiments with “entirely”, “completely”, “all”, etc. Hence, in embodiments the adjective substantially may also be removed. Where applicable, the term “substantially” may also relate to 90% or higher, such as 95% or higher, especially 99% or higher, even more especially 99.5% or higher, including 100%. The term “comprise” includes also embodiments wherein the term “comprises” means “consists of”.

The term "functionally" will be understood by, and be clear to, a person skilled in the art. The term “substantially” as well as “functionally” may also include embodiments with “entirely”, “completely”, “all”, etc. Hence, in

embodiments the adjective functionally may also be removed. When used, for instance in “functionally parallel”, a skilled person will understand that the adjective “functionally” includes the term substantially as explained above. Functionally in particular is to be understood to include a configuration of features that allows these features to function as if the adjective “functionally” was not present. The term “functionally” is intended to cover variations in the feature to which it refers, and which variations are such that in the functional use of the feature, possibly in combination with other features it relates to in the invention, that combination of features is able to operate or function. For instance, if an antenna is functionally coupled or functionally connected to a communication device, received electromagnetic signals that are receives by the antenna can be used by the communication device. The word “functionally” as for instance used in “functionally parallel” is used to cover exactly parallel, but also the embodiments that are covered by the word “substantially” explained above. For instance, “functionally parallel” relates to embodiments that in operation function as if the parts are for instance parallel. This covers embodiments for which it is clear to a skilled person that it operates within its intended field of use as if it were parallel.

Furthermore, the terms first, second, third and the like in the description and in the claims, are used for distinguishing between similar elements and not necessarily for describing a sequential or chronological order. It is to be understood that the terms so used are interchangeable under appropriate circumstances and that the embodiments of the invention described herein are capable of operation in other sequences than described or illustrated herein.

The devices or apparatus herein are amongst others described during operation. As will be clear to the person skilled in the art, the invention is not limited to methods of operation or devices in operation.

It should be noted that the above-mentioned embodiments illustrate rather than limit the invention, and that those skilled in the art will be able to design many alternative embodiments without departing from the scope of the appended claims. In the claims, any reference signs placed between parentheses shall not be construed as limiting the claim. Use of the verb "to

comprise" and its conjugations does not exclude the presence of elements or steps other than those stated in a claim. The article "a" or "an" preceding an element does not exclude the presence of a plurality of such elements. The invention may be implemented by means of hardware comprising several distinct elements, and by means of a suitably programmed computer. In the device or apparatus claims enumerating several means, several of these means may be embodied by one and the same item of hardware. The mere fact that certain measures are recited in mutually different dependent claims does not indicate that a combination of these measures cannot be used to advantage.

The invention further applies to an apparatus or device comprising one or more of the characterising features described in the description and/or shown in the attached drawings. The invention further pertains to a method or process comprising one or more of the characterising features described in the description and/or shown in the attached drawings.

The various aspects discussed in this patent can be combined in order to provide additional advantages. Furthermore, some of the features can form the basis for one or more divisional applications.

EMBODIMENTS I

1. Assembly (100) for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;

- an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space;

- a door opening for accessing the interior space;

- a door having a closed position, wherein the door in the closed position seals the door opening for preventing UVC radiation radiating from the interior space;

- a door sensor for sensing if the door is in a closed position; and

- a UVC radiation controller arranged for controlling exposure of the interior space to the UVC radiation based on the door sensor.

2. Assembly according to the preceding embodiment, wherein the UVC radiation controller comprises a UVC shutter having a blocking state with respect to the UVC source for preventing the UVC radiation reaching the interior space.

3. Assembly according to any of the preceding embodiments, wherein the UVC radiation controller comprises a switch arranged for controlling the UVC radiation radiated from the UVC source.

4. Assembly according to any of the preceding embodiments, comprising:

- a conveyer system arranged for conveying the object from an outside position outside the interior space to an inside position inside the interior space, at least when the interior space is not exposed to UVC radiation.

5. Assembly according to the preceding embodiment, comprising:

- a presence sensor for providing a presence indication based on presence of the object outside the UVC shielded chamber; and

- an integrity sensor for providing an integrity indication based on the object outside the UVC shielded chamber;

wherein the conveyer system is activatable when the presence indication indicates presence of the object, and when the integrity indication indicates integrity.

6. Assembly according to the preceding embodiment, wherein the presence sensor and the integrity sensor are arranged for sensing the object located at the outside position.

7. Assembly according to any of the preceding embodiments 5-6, wherein the presence sensor comprises a metal sensor, NFC reader, and/or an optical sensor.

8. Assembly according to any of the preceding embodiments 5-7, wherein the integrity sensor comprises a weight sensor, preferably wherein the weight sensor is arranged for sensing if the object is within a predefined weight range.

9. Assembly according to the preceding embodiment, wherein the object comprises front wheels and rear wheels, and wherein the weight sensor is arranged to sense the weight of the front or rear wheels.

10. Assembly according to any of the preceding embodiments, wherein the object is a rolling object.

11. Assembly according to the preceding embodiment, wherein the rolling object is a wheeled object.

12. Assembly according to the preceding embodiment, wherein the wheeled object is a shopping cart.

13. Assembly according to any of the preceding embodiments, comprising a bypass button for bypassing the integrity sensor and/or presence sensor.

14. Assembly according to any of the preceding embodiments, wherein the bypass button comprises a button lock, such that the bypass button is only operable when unlocking the button lock.

15. Method for disinfecting a stream of objects, comprising:

- providing an object of the stream of objects outside an UVC shielded chamber having an interior space shaped and arranged for receiving the object, and an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space;
- providing a presence indication based on presence of the object outside the UVC shielded chamber;
- providing a lack of integrity indication based on the object outside the UVC shielded chamber;
- providing a door having a closed position, wherein the door in the closed position seals a door opening for preventing UVC radiation radiating from the interior space;
- sensing if the door is in a closed position;
- controlling exposure of the interior space to the UVC radiation based on the door sensor.

EMBODIMENTS II

1. Assembly (100) for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;
- an UVC source arranged for exposing the interior space for disinfecting the object with UVC radiation;
- a door opening for accessing the interior space;
- a door sealing the door opening for controlling access to the interior space and for preventing UVC radiation radiating from the interior space; and
- a conveyer system arranged for conveying the object from an outside position outside the interior space to an inside position inside the interior space when the door allows access.

2. Assembly according to the preceding embodiment,
wherein the object comprises a horizontal bar; and
wherein the conveyer system comprises at least one protrusion arranged for cooperating with the object for grabbing the object during conveying.

3. Assembly according to the preceding embodiment, wherein the conveyer system is arranged such that the at least one protrusion traverses the same trajectory from the outside position to the inside position and vice versa.

4. Assembly according to the preceding embodiment, wherein the conveyer system is arranged such that the at least one protrusion is collapsible when traversing the trajectory from the inside position to the outside position.

5. Assembly according to the preceding embodiment, wherein the conveyer system is also arranged for conveying the object from the inside position to an exit position outside the interior space.

6. Assembly according to the preceding embodiment, wherein the exit position is the outside position.

7. Assembly according to the preceding embodiment 5, wherein the exit position is different from the outside position.

8. Assembly according to the preceding embodiment, wherein the exit position and the outside position are arranged on opposite sides of the UVC shielded chamber, preferably wherein the UVC shielded chamber has the shape of a tunnel, more preferably wherein the outside position, the inside position, and the exit position are in line.

9. Assembly according to any of the preceding embodiments 7-9, comprising:
- an exit door opening for providing an exit from the interior space; and
- an exit door arranged in the exit door opening for controlling access to

the interior space and for preventing UVC radiation radiating from the interior space.

10. Assembly according to the preceding embodiment, wherein the conveyer system is also arranged for conveying the object from an inside position inside the interior space to an exit position outside the interior space when the exit door allows access.

11. Assembly according to the preceding embodiment,

wherein the object comprises a/the horizontal bar; and

wherein the conveyer system comprises at least one other protrusion arranged for cooperating with the object for grabbing the object during conveying from the inside position to the exit position.

12. Assembly according to the preceding embodiment,

wherein the conveyer system comprises a first conveyer device and a second conveyer device;

wherein the first conveyer device comprises the at least one protrusion, and the second conveyer device comprises the at least one other protrusion;

wherein the first conveyer device and the second conveyer device are arranged to convey objects of the stream of objects independently, simultaneously and/or synchronously.

13. Assembly according to any of the preceding embodiments 8-13, comprising an object buffer for buffering one or more objects from the stream of objects;

wherein the object buffer is arranged for providing single objects from its buffer to the outside position; and/or

wherein the object buffer is arranged for buffering single objects from the UVC shielded chamber.

14. Assembly according to any of the preceding embodiments, wherein the object is a rolling object.

15. Assembly according to the preceding embodiment, wherein the rolling object is a wheeled object.

16. Assembly according to the preceding embodiment, wherein the wheeled object is a shopping cart.

EMBODIMENTS III

1. Assembly (100) for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;

- an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object ;

- a door opening for accessing the interior space; and

- a swinging door sealing the door opening for controlling access to the interior space and for preventing UVC radiation radiating from the interior space.

2. Assembly according to the preceding embodiment, wherein the swinging door swings into the interior space for allowing access.

3. Assembly according to any of the preceding embodiments, wherein the door comprises a first door segment and a second door segment both arranged for swinging.

4. Assembly according to the preceding embodiment,

wherein the first door segment is rotationally arranged around a first rotational axis;

wherein the second door segment is rotationally arranged around a second rotational axis; and

wherein the object passes between the rotational axes when being conveyed into the interior space.

5. Assembly according to the preceding embodiment, wherein the first axis and the second axis are both in use arranged vertically.

6. Assembly according to any of the preceding embodiments 4-5, wherein the swinging doors in a closed position form a V-shape.

7. Assembly according to any of the preceding embodiments 4-6, wherein the swinging doors each comprise a frontal surface, wherein each frontal surface is a flat surface.

8. Assembly according to any of the preceding embodiments 4-7,

wherein the first door segment comprises a first sealing edge arranged opposite of the first rotational axis;

wherein the second door segment comprises a second sealing edge arranged opposite of the second rotational axis; and

wherein in the closed position the first sealing edge and the second sealing edge contact each other for forming a UVC radiation seal.

9. Assembly according to the preceding embodiment,

wherein the first sealing edge comprises a first resilient elongated flap; and/or

wherein the second sealing edge comprises a second resilient elongated flap.

10. Assembly according to the preceding embodiment,

wherein the first door segment comprises a first elongated notch arranged for receiving a side of the first resilient elongated flap; and/or

wherein the second door segment comprises a second elongated notch arranged for receiving a side of the second resilient elongated flap.

11. Assembly according to any of the preceding embodiments, wherein the object is a rolling object.

12. Assembly according to the preceding embodiment, wherein the rolling object is a wheeled object.

13. Assembly according to the preceding embodiment, wherein the wheeled object is a shopping cart.

EMBODIMENTS IV

1. Assembly (100) for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;

- an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object;

- a door opening for accessing the interior space;

- a door sealing the door opening for controlling access to the interior space and for preventing UVC radiation radiating from the interior space, having a closed position; and

- a UVC shutter comprising a blocking state with respect to the UVC source for preventing the UVC radiation reaching the interior space and an exposing state for allowing the UVC radiation to irradiate the interior space, the UVC shutter functionally coupled to the door for the UVC shutter assuming its blocking state when the door is free from its sealing position.

2. Assembly according to the preceding embodiment,

wherein the UVC source has an elongated shape having a longitudinal axis;

wherein the UVC shutter is rotationally arranged around the longitudinal axis.

3. Assembly according to the preceding embodiment, wherein the UVC shutter comprises an inner surface facing the UVC source, wherein the inner surface is non-reflective to the UVC radiation, preferably absorbing the UVC radiation.

4. Assembly according to any of the preceding embodiments, wherein the interior space is lined with UVC radiation mirroring surfaces, preferably wherein the top and side walls of the interior space are lined with UVC radiation mirroring surfaces.

5. Assembly according to any of the preceding embodiments, comprising a replacement indicator configured for indicating if the accumulated time the UVC source was radiating the UVC radiation exceeds a time threshold.

6. Assembly according to the preceding embodiment, comprising:

- an internal presence sensor for sensing the presence of the object in the interior space;

- a UVC radiation sensor for sensing UVC radiation in the interior space; and

- a malfunction indicator configured for indicating if the object in the interior space is not exposed to UVC radiation based on the internal presence sensor and the UVC radiation sensor.

7. Assembly according to any of the preceding embodiments, wherein the object is a rolling object.

8. Assembly according to the preceding embodiment, wherein the rolling object is a wheeled object.

9. Assembly according to the preceding embodiment, wherein the wheeled object is a shopping cart.

EMBODIMENTS V

1. Assembly (100) for disinfecting a stream of objects, comprising:

- an UVC shielded chamber having an interior space shaped and arranged for receiving an object of the stream of objects;

- an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space;

- an exit door opening for exiting the interior space;

- a conveyer system arranged for conveying the object from an inside position inside the interior space to an exit position outside the interior space, at least when the interior space is not exposed to UVC radiation;

- an object brake arranged to the exit position cooperating with the conveyer system and the object for adding the disinfected object when conveyed to the exit position to a stream of disinfected objects.

2. Assembly according to the preceding embodiment, comprising an exit door having a closed position, wherein the exit door in the closed position seals the exit door opening for preventing UVC radiation radiating from the interior space.

3. Assembly according to the preceding embodiment, comprising:

- an exit door sensor for sensing if the exit door is in a closed position; and

- a UVC radiation controller arranged for controlling exposure of the interior space to the UVC radiation based on the exit door sensor.

4. Assembly according to any of the preceding embodiments,

wherein the object comprises front wheels and/or rear wheels; and

wherein the object brake comprises a front object brake and/or a rear object brake for cooperating with the front wheels and/or the rear wheels, respectively.

5. Assembly according to any of the preceding embodiments, wherein the object brake comprises a threshold, doorstep, doorsill and/or step.

EMBODIMENTS VI

1. Assembly according to any of the preceding independent embodiments combined with one or more of the preceding depended embodiments.

CONCLUSIES

1. Samenstel (100) voor het desinfecteren van een stroom objecten, omvattende:

- een UVC-afgeschermde kamer met een binnenruimte die is gevormd en ingericht om een object van de stroom van objecten op te nemen; - een UVC-bron die is ingericht om de binnenruimte bloot te stellen aan UVC-straling voor het desinfecteren van het object wanneer het object in de binnenruimte wordt geplaatst;

- een deuropening voor toegang tot de binnenruimte; en

- een deur met een gesloten positie, waarbij de deur in de gesloten positie de deuropening afdicht voor het voorkomen dat UVC-straling vanuit de binnenruimte uitstraalt;

- een deursensor voor het detecteren of de deur zich in een gesloten positie bevindt; en

- een UVC-stralingsregelaar die is ingericht voor het regelen van de blootstelling van de binnenruimte aan de UVC-straling op basis van de deursensor.

2. Samenstel volgens de voorgaande uitvoeringsvorm, waarbij de UVC-stralingsregelaar een UVC-sluiter omvat met een blokkerende toestand ten opzichte van de UVC-bron voor het voorkomen dat de UVC-straling de binnenruimte bereikt.

3. Samenstel volgens een van de voorgaande uitvoeringsvormen, waarbij de UVC-stralingsregelaar een schakelaar omvat die is ingericht voor het regelen van de door de UVC-bron uitgestraalde UVC-straling.

4. Samenstel volgens een van de voorgaande uitvoeringsvormen, omvattende:

- een transportsysteem dat is ingericht voor het transporteren van het object van een buitenpositie buiten de binnenruimte naar een binnenpositie binnen de binnenruimte ten minste wanneer de binnenruimte niet wordt blootgesteld aan UVC-straling.

5. Samenstel volgens de voorgaande uitvoeringsvorm, omvattend:

- een aanwezigheidssensor voor het geven van een aanwezigheidsindicatie gebaseerd op de aanwezigheid van het object buiten de met UVC-afgeschermde kamer; en

- een integriteitssensor voor het verschaffen van een integriteitsindicatie gebaseerd op het object buiten de UVC-afgeschermde kamer;

waarbij het transportsysteem activeerbaar is wanneer de aanwezigheidsindicatie de aanwezigheid van het object aangeeft, en wanneer de integriteitsindicatie integriteit aangeeft.

6. Samenstel volgens de voorgaande uitvoeringsvorm, waarbij de aanwezigheidssensor en de integriteitssensor zijn ingericht voor het waarnemen van het op de buitenpositie gelegen object.

7. Samenstel volgens een van de voorgaande uitvoeringsvormen 5-6, waarbij de aanwezigheidssensor een metalen sensor, een NFC-lezer en/of een optische sensor omvat.

8. Samenstel volgens een van de voorgaande uitvoeringsvormen 5-7, waarbij de integriteitssensor een gewichtssensor omvat, bij voorkeur waarin de gewichtssensor is ingericht om te detecteren of het object zich binnen een vooraf bepaald gewichtsbereik bevindt.

9. Samenstel volgens de voorgaande uitvoeringsvorm, waarbij het object voorwielen en achterwielen omvat, en waarbij de gewichtssensor is ingericht om het gewicht van de voor- of achterwielen te meten.

10. Samenstel volgens een van de voorgaande uitvoeringsvormen, waarbij het object een rollend object is.

11. Samenstel volgens de voorgaande uitvoeringsvorm, waarbij het rollende object een verrijdbaar object is.

12. Samenstel volgens de voorgaande uitvoeringsvorm, waarbij het verrijdbare object een winkelwagentje is.

13. Samenstel volgens een van de voorgaande uitvoeringsvormen, omvattende een bypass-knop voor het omzeilen van de integriteitssensor en/of aanwezigheidssensor.

14. Samenstel volgens een van de voorgaande uitvoeringsvormen, waarbij de bypass-knop een knopvergrendeling omvat, zodat de bypass-knop alleen bedienbaar is bij het ontgrendelen van de knopvergrendeling.

15. Werkwijze voor het desinfecteren van een stroom objecten, omvattende:

- het verschaffen van een object van de stroom van objecten buiten een UVC-afgeschermde kamer met een binnenruimte die is gevormd en ingericht voor het ontvangen van het object, en een UVC-bron die is ingericht voor het blootstellen van de binnenruimte aan UVC-straling voor het desinfecteren van het object wanneer het object binnen de binnenruimte is;
- het verschaffen van een aanwezigheidsindicatie gebaseerd op de aanwezigheid van het object buiten de UVC-afgeschermde kamer;
- het verschaffen van een gebrek aan integriteitsindicatie gebaseerd op het object buiten de UVC-afgeschermde kamer;
- het afdichtend vergrendelen van een deur in een gesloten positie, waarbij de deur in de gesloten positie de deuropening afdicht voor het voorkomen dat UVC-straling vanuit de binnenruimte wordt uitgestraald;
- het waarnemen of de deur zich in een gesloten positie bevindt;
- het regelen van de blootstelling van de binnenruimte aan de UVC-straling op basis van de deursensor.

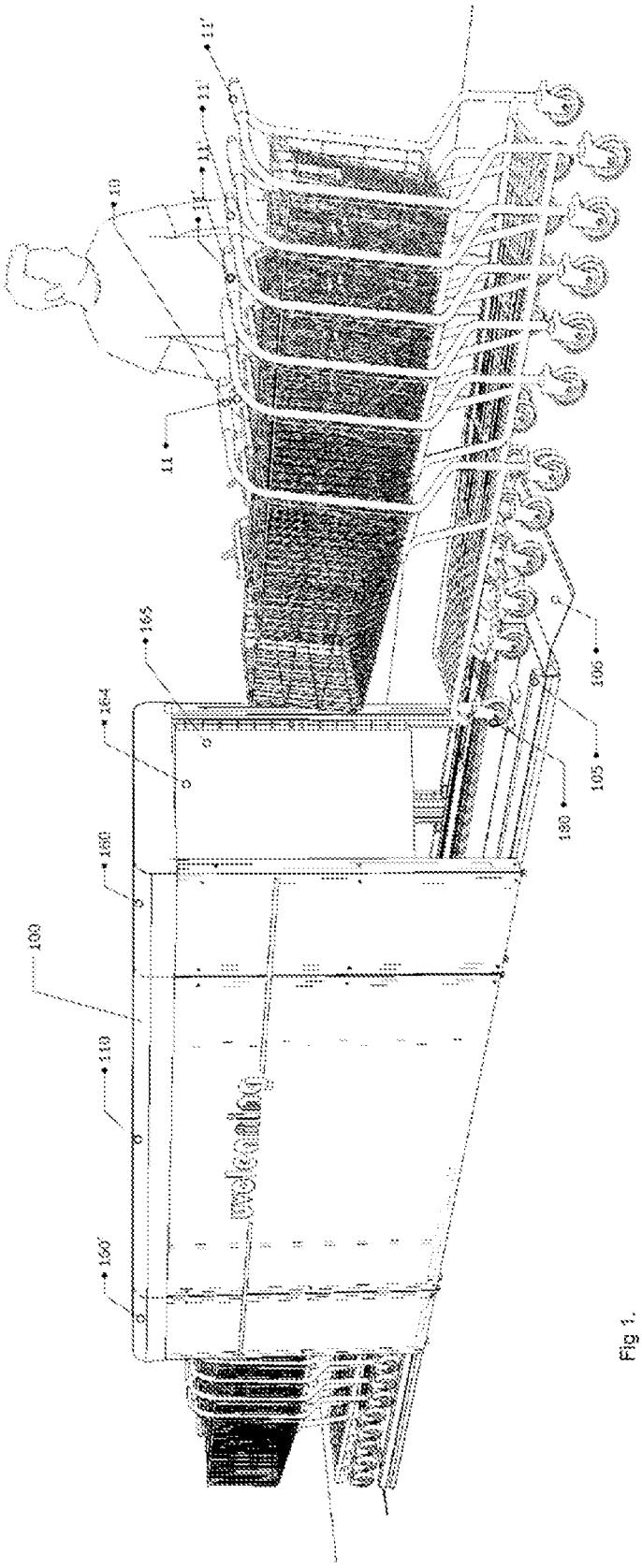


Fig 1.

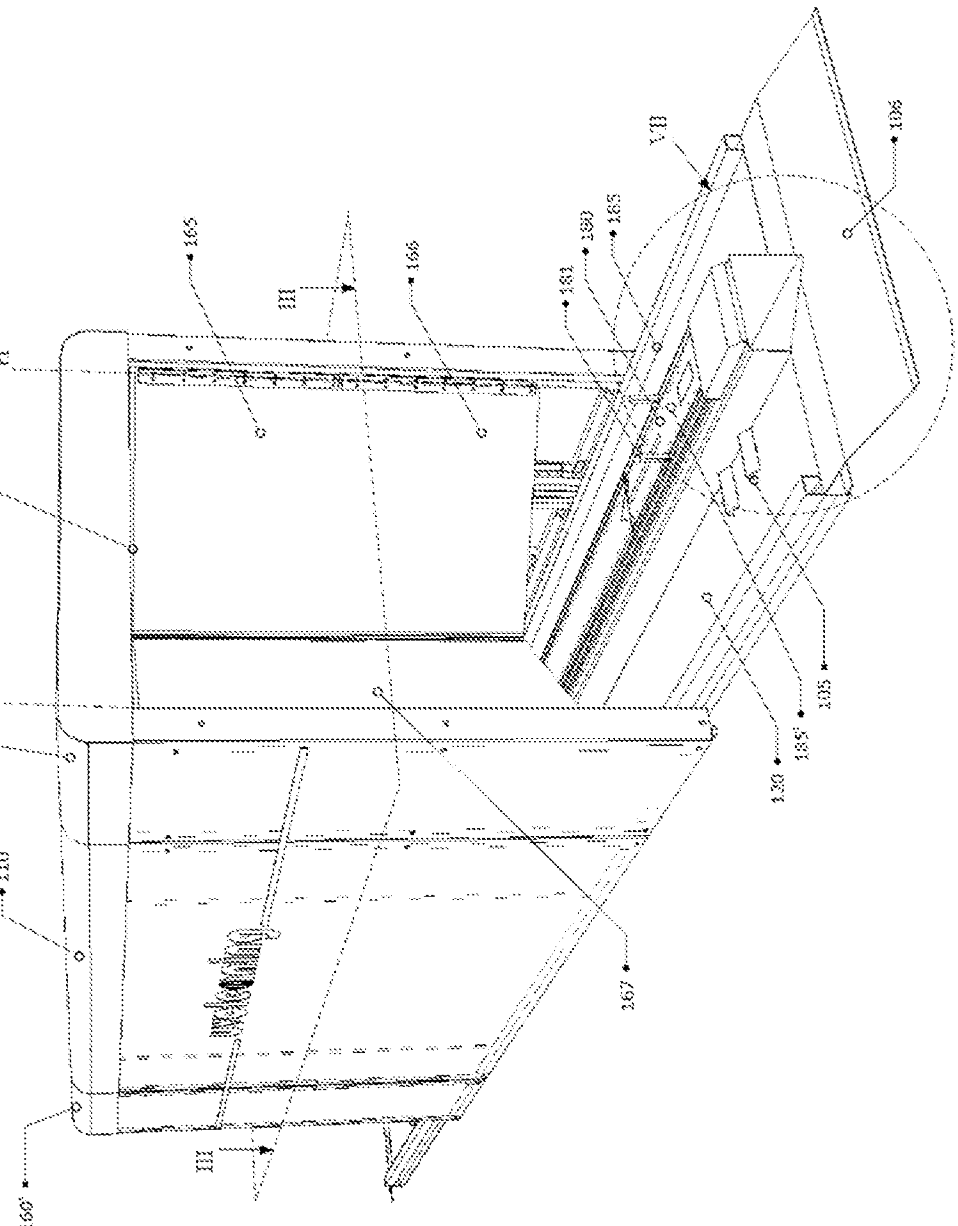

100
110
160
160'
164
165
166
167
r1
r2
III
III
VII
180
181
183
185
185'
130
186

Fig 2.

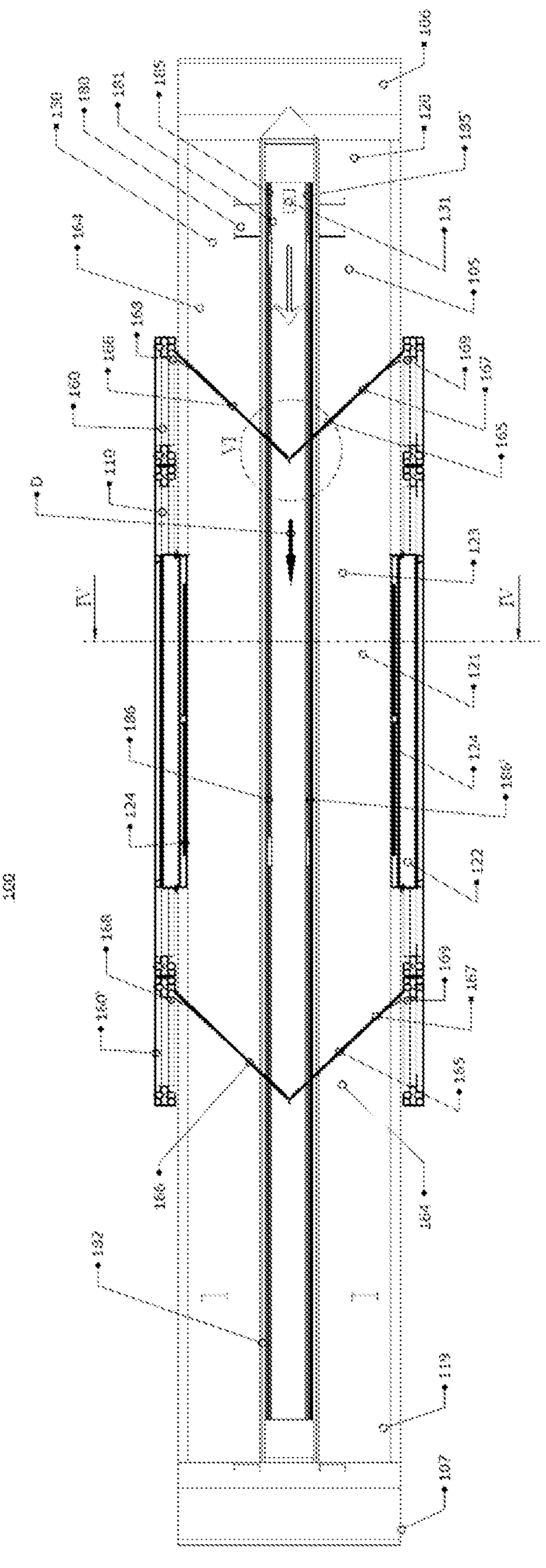


Fig 3.

Fig 4.

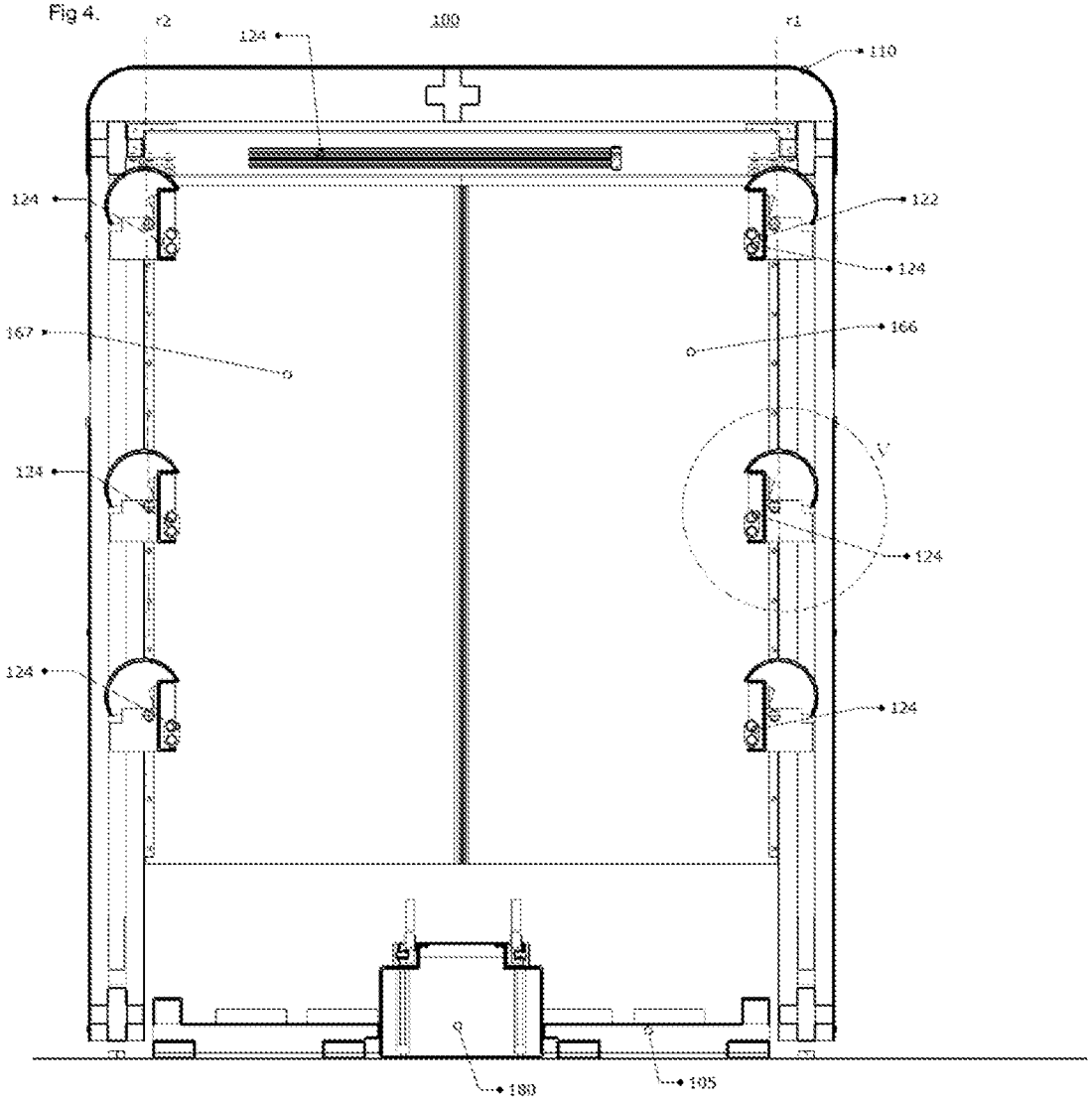


Fig 5A.

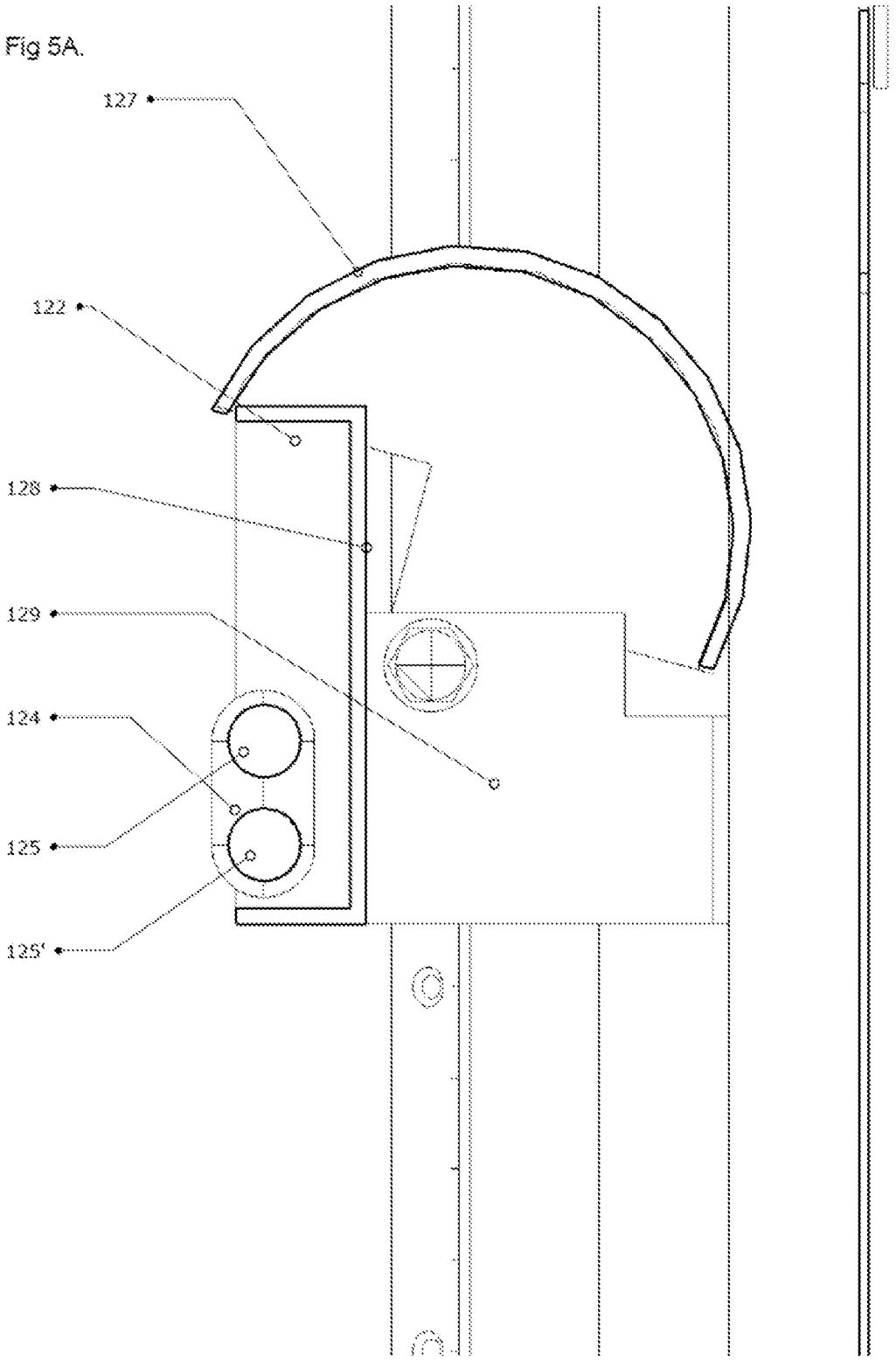
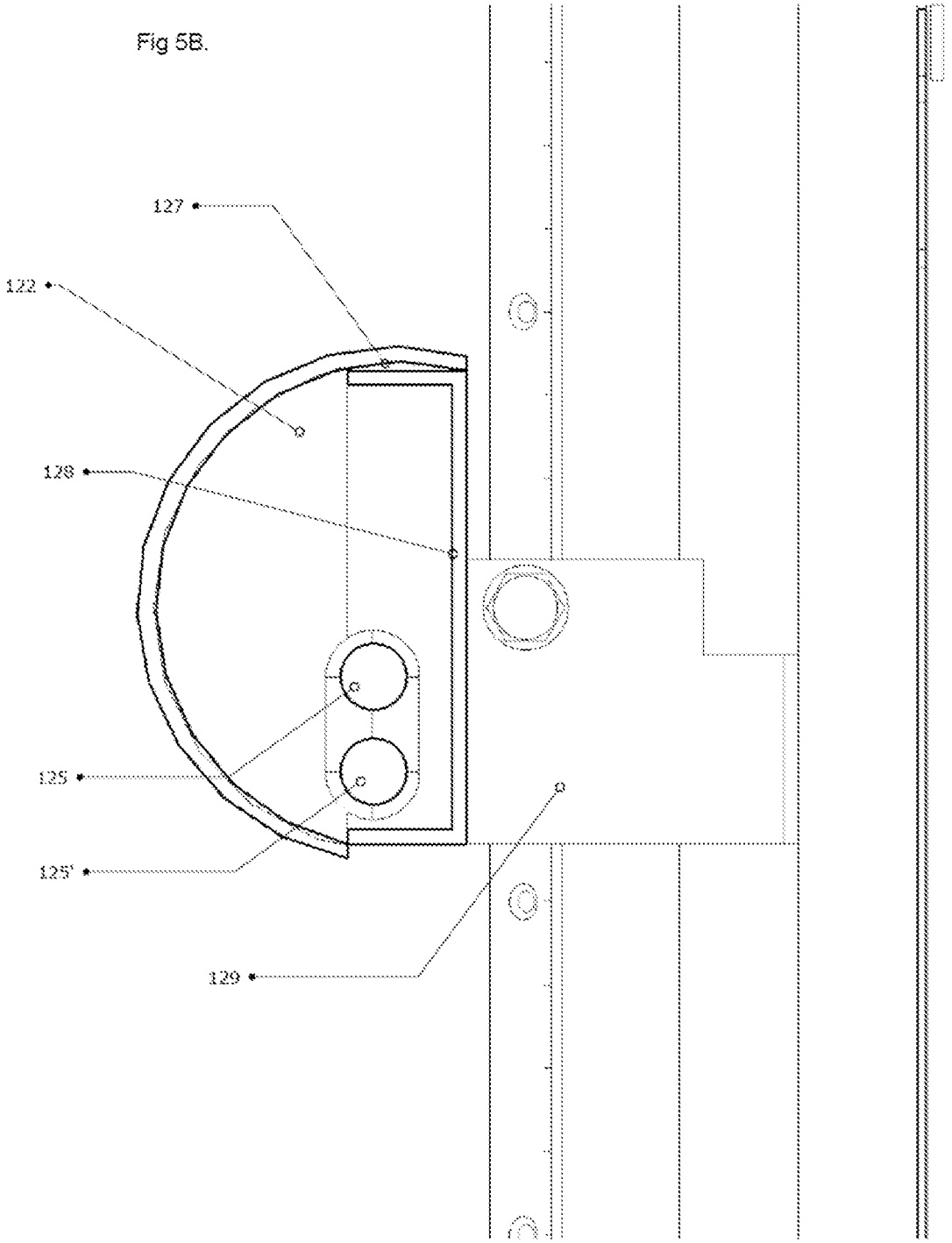


Fig 5B.



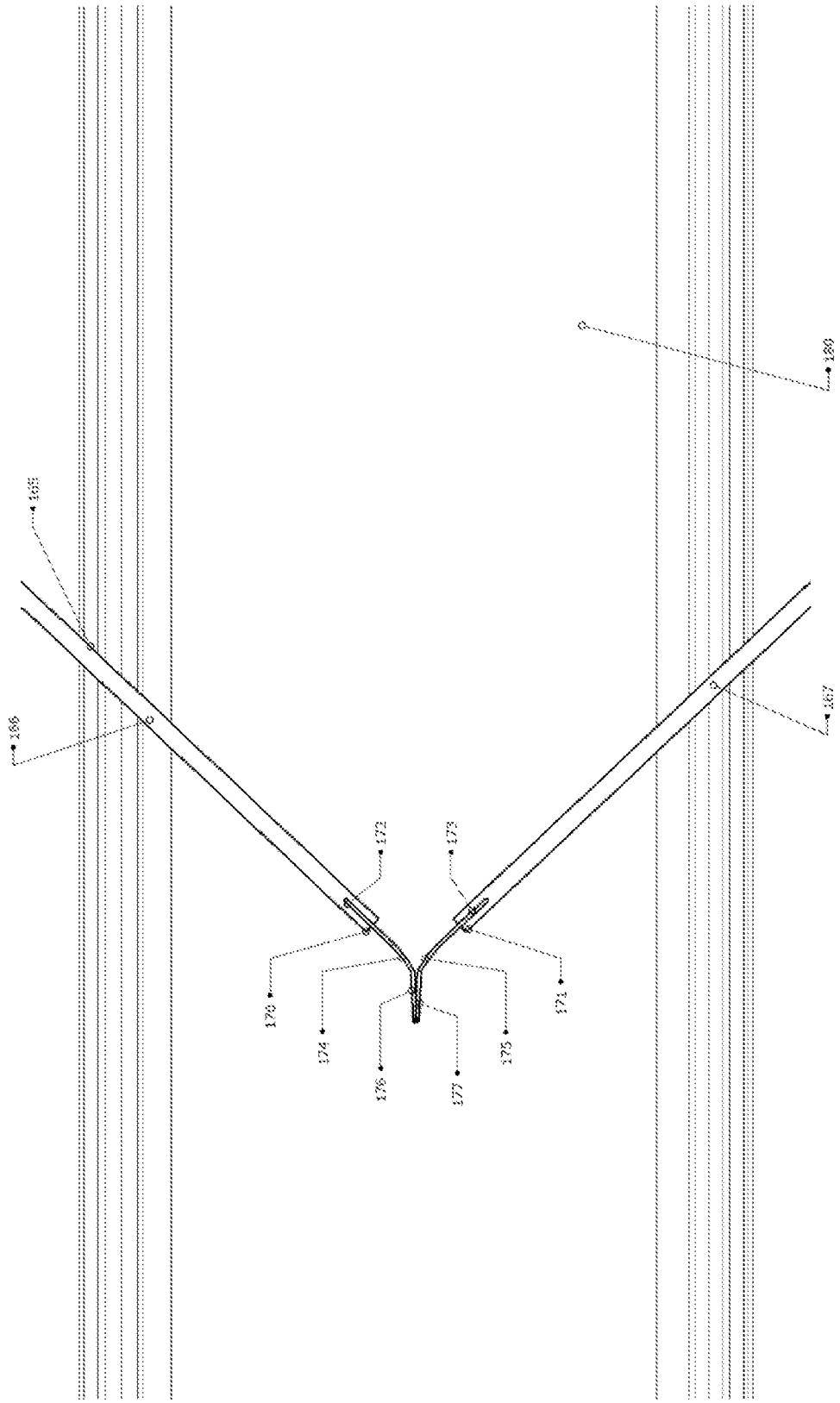


Fig. 6

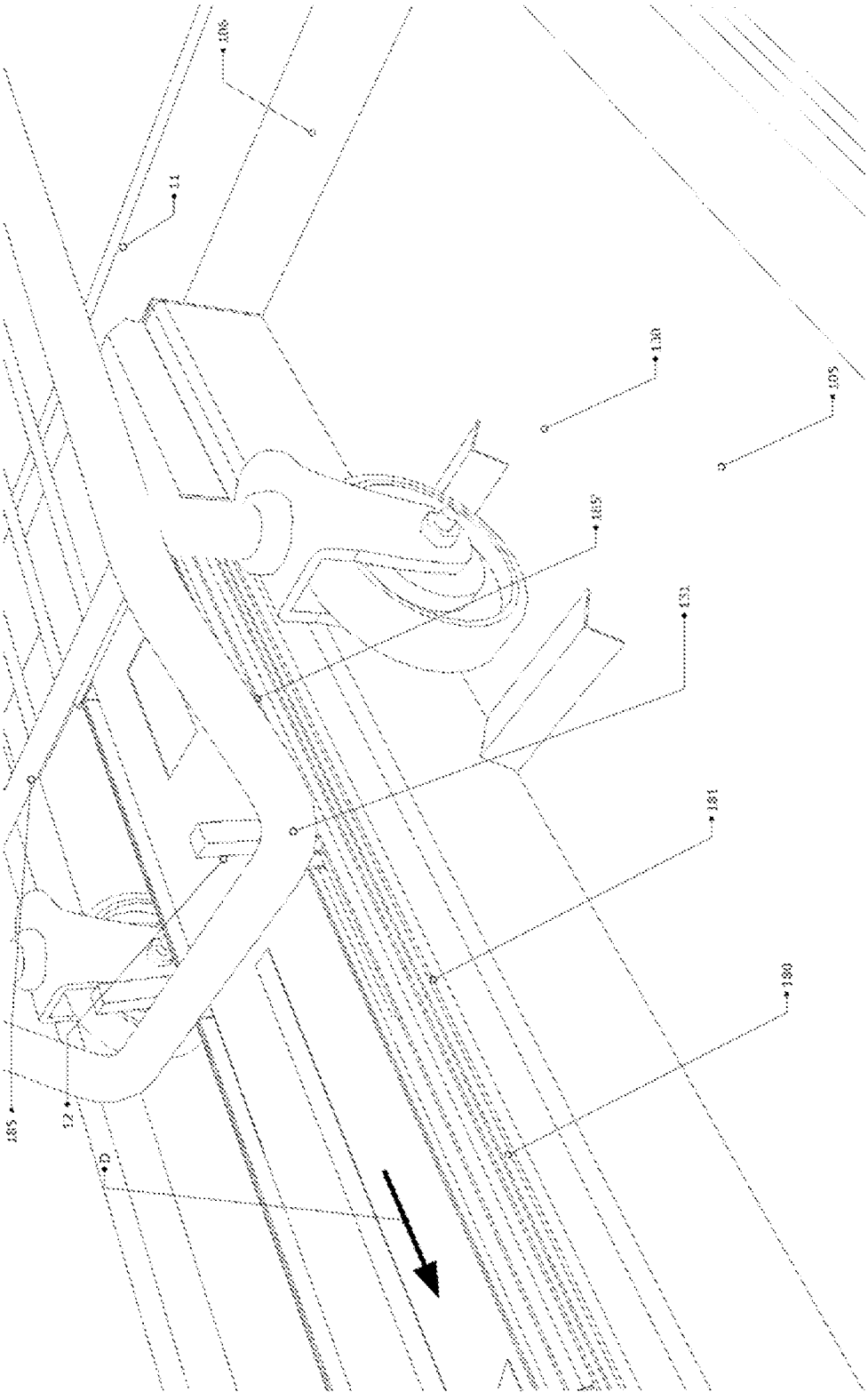


Fig 7A.

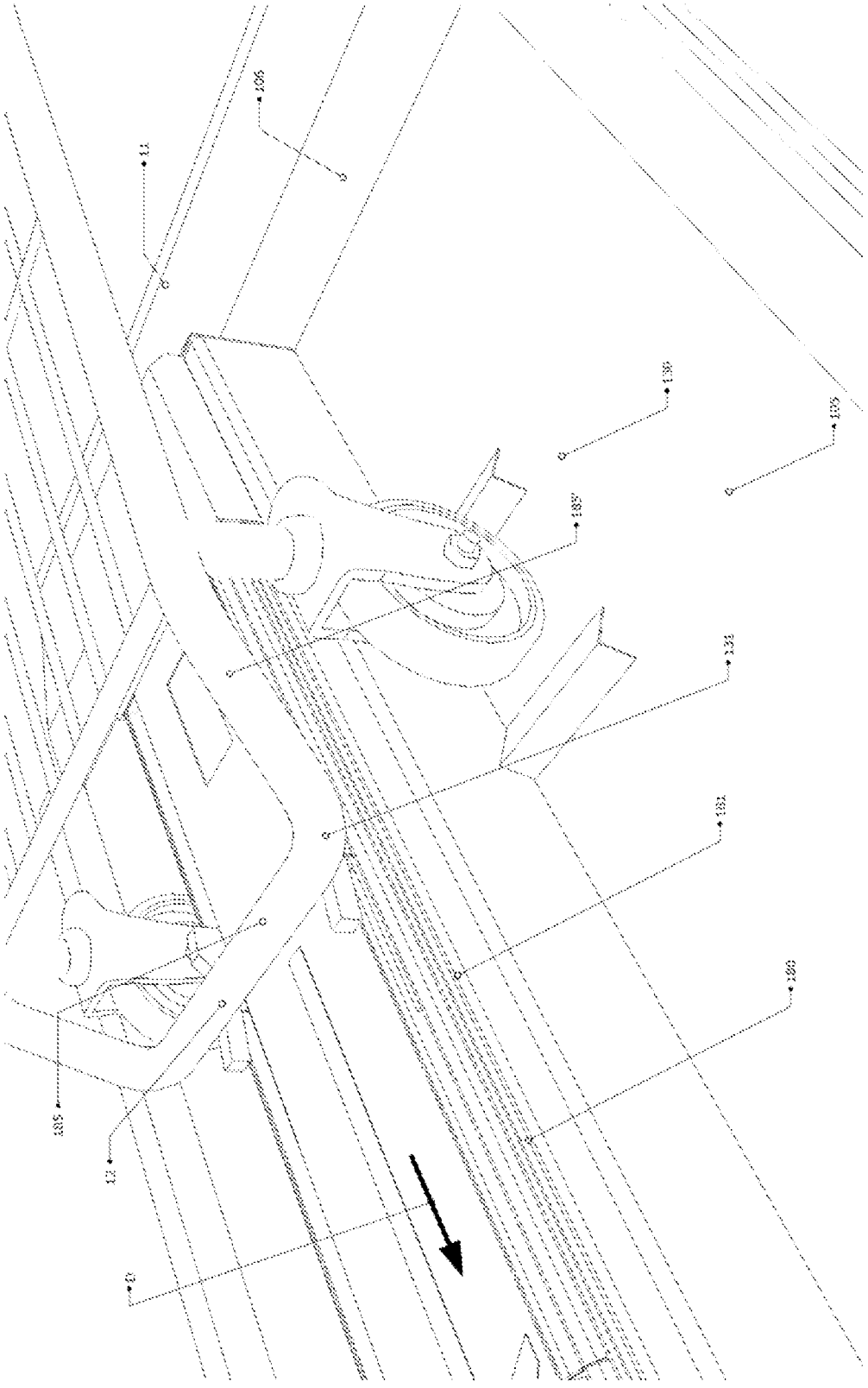


Fig 7B.

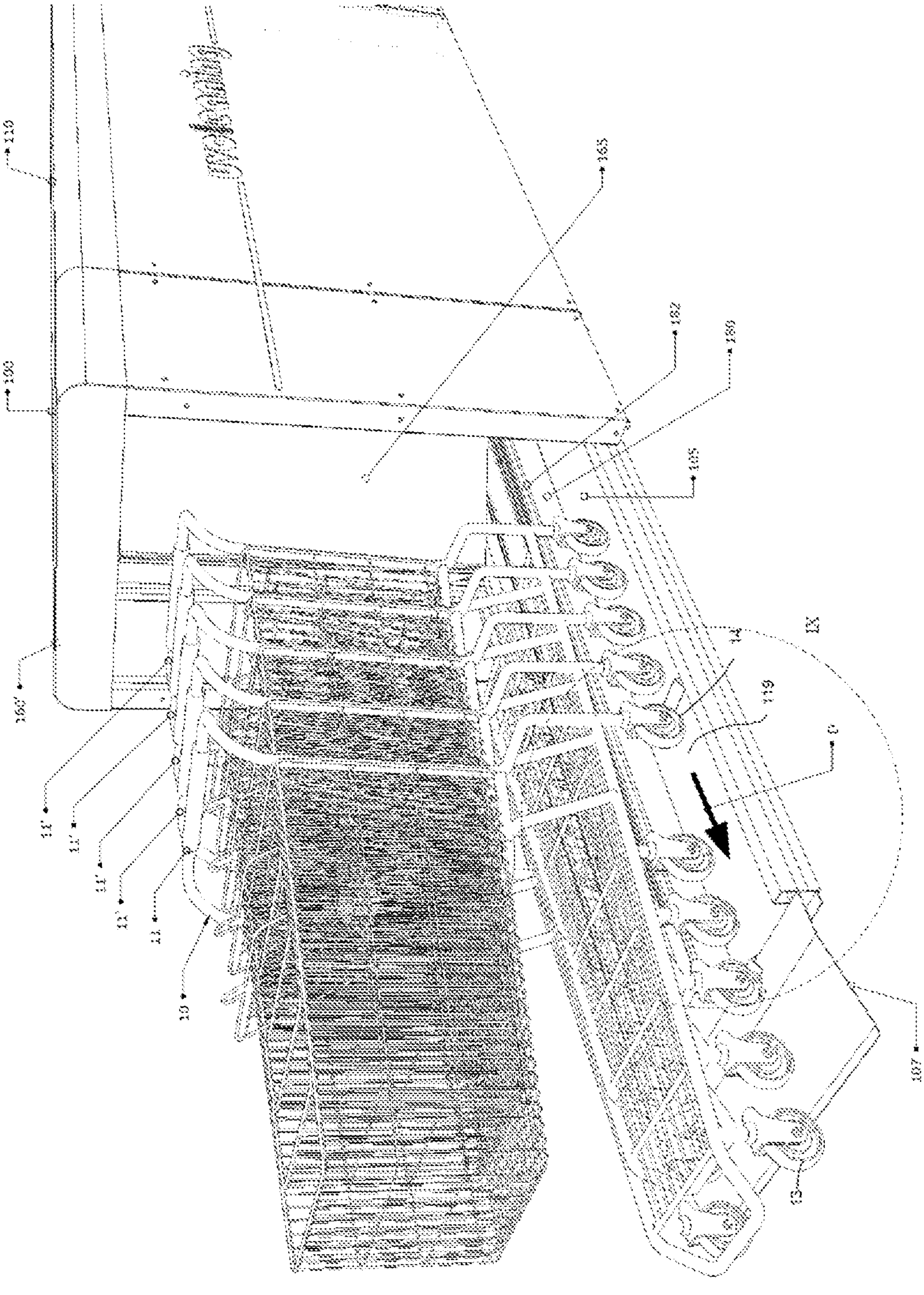


Fig 9.

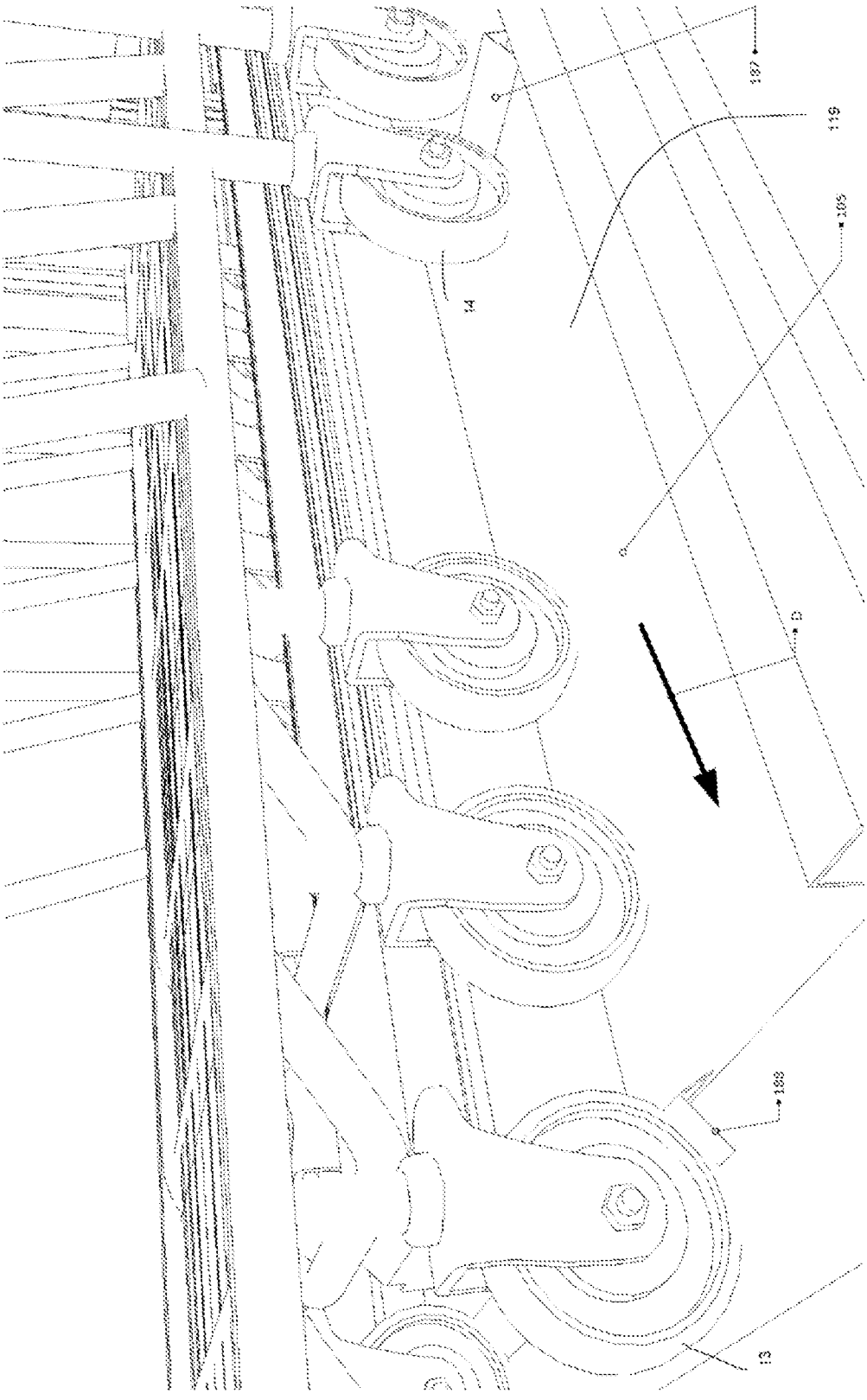


Fig. 6

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
Nederlands aanvraag nr. **2025827**	Indieningsdatum **12-06-2020**
	Ingeroepen voorrangsdatum
Aanvrager (Naam) **Rodenburg Materieel B.V.**	
Datum van het verzoek voor een onderzoek van internationaal type **08-08-2020**	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. **SN76722**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

Zie onderzoeksrapport

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC	**Zie onderzoeksrapport**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐	**GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☒	**GEBREK AAN EENHEID VAN UITVINDING**	(opmerkingen op aanvullingsblad)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2025827

A. CLASSIFICATIE VAN HET ONDERWERP
INV. A61L2/10 B62B3/00 B65G13/00
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte miminum documentatie (classificatie gevolgd door classificatiesymbolen)
A61L B62B B65G

Onderzochte andere documentatie dan de mimimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
	EENHEID VAN UITVINDING ONTBREEKT zie aanvullingsblad B -----	
X	DE 10 2019 121621 A1 (HILBERER FRANZ [DE]) 5 maart 2020 (2020-03-05)	1,3,15
Y	* alinea [0017]; figuur 1 * -----	2
X	US 2019/298866 A1 (MAJDALI DAVID [US] ET AL) 3 oktober 2019 (2019-10-03)	1,3,15
Y	* alineas [0030], [0037], [0038]; figuren 1-5 * -----	2
	-/--	

[X] Verdere documenten worden vermeld in het vervolg van vak C.

[X] Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
8 maart 2021	

Naam en adres van de instantie	De bevoegde ambtenaar
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Fernandez Morales, N

2

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2025827

C.(Vervolg). VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
X	US 7 791 044 B1 (TAYLOR THOMAS L [US] ET AL) 7 september 2010 (2010-09-07)	1,3,15
Y	* kolom 3, regel 52 - regel 57 * * kolom 5, regel 57 - regel 63 * * kolom 6, regel 61 - regel 67 * * kolom 7, regel 11 - regel 34 * * figuren 1, 2, 3; voorbeelden 2, 3 *	2

X	US 2014/158910 A1 (FLETCHER RICHARD GLEN [US]) 12 juni 2014 (2014-06-12)	1,3,15
Y	* alineas [0034], [0035]; figuren 1-7 *	2

Y	DE 37 18 577 A1 (WENZLAFF BURKHARD [DE]) 15 december 1988 (1988-12-15) * conclusie 1; figuren 1, 2 *	2

Y	GB 2 495 161 A (GEW EC LTD [GB]) 3 april 2013 (2013-04-03) * bladzijde 1, alinea 3; figuren 1-5 *	2

GEBREK AAN EENHEID VAN UITVINDING

Octrooiaanvrage Nr.:
SN 76722
NL 2025827

AANVULLINGSBLAD B

De Instantie belast met het uitvoeren van het onderzoek naar de stand van de techniek heeft vastgesteld dat deze aanvrage meerdere uitvindingen bevat, te weten:

1. conclusies: 2, 3, 15(compleet); 1(gedeeltelijk)

   Assembly and method for disinfecting a stream of objects, comprising an UVC shielded chamber, a door opening for accessing the interior space, with a door sensor for sensing if the door is in a closed position; and a UVC radiation controller arranged for controlling exposure of the interior space to the UVC radiation based on the door sensor

   ---

2. conclusies: 4-9, 13, 14(compleet); 1(gedeeltelijk)

   Assembly and method for disinfecting a stream of objects, comprising a conveyer system

   ---

3. conclusies: 10-12(compleet); 1(gedeeltelijk)

   Assembly and method for disinfecting a stream of objects, comprising a rolling object

   ---

Het vooronderzoek werd tot het eerste onderwerp beperkt.

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2025827

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
DE 102019121621 A1	05-03-2020	DE 102019121621 A1	05-03-2020
		EP 3628338 A1	01-04-2020
US 2019298866 A1	03-10-2019	CA 3093531 A1	03-10-2019
		CN 111867695 A	30-10-2020
		EP 3773956 A1	17-02-2021
		KR 20200136953 A	08-12-2020
		SG 11202008511S A	29-10-2020
		US 2019298866 A1	03-10-2019
		WO 2019190598 A1	03-10-2019
US 7791044 B1	07-09-2010	US 7791044 B1	07-09-2010
		US 2011073774 A1	31-03-2011
		WO 2011041491 A1	07-04-2011
US 2014158910 A1	12-06-2014	GEEN	
DE 3718577 A1	15-12-1988	GEEN	
GB 2495161 A	03-04-2013	DK 2709849 T3	24-07-2017
		EP 2709849 A1	26-03-2014
		ES 2632057 T3	08-09-2017
		GB 2495161 A	03-04-2013
		PL 2709849 T3	29-09-2017
		US 2014245628 A1	04-09-2014
		WO 2013128165 A1	06-09-2013

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN76722	12.06.2020		NL2025827

International Patent Classification (IPC)
INV. A61L2/10 B62B3/00 B65G13/00

Applicant
Rodenburg Materieel B.V.

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the application
- ☐ Box No. VIII Certain observations on the application

	Examiner
	Fernandez Morales, N

Application number

WRITTEN OPINION

NL2025827

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ on paper

   ☐ in electronic form

   c. time of filing/furnishing:

   ☐ contained in the application as filed.

   ☐ filed together with the application in electronic form.

   ☐ furnished subsequently for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

WRITTEN OPINION

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step, or to be industrially applicable have not been examined in respect of

☐ the entire application

☒ claims Nos. 4-14(compleet); 1(gedeeltelijk)

because:

☐ the said application, or the said claims Nos. relate to the following subject matter which does not require a search *(specify)*:

☐ the description, claims or drawings *(indicate particular elements below)* or said claims Nos. are so unclear that no meaningful opinion could be formed *(specify)*:

☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed *(specify)*:

☒ no search report has been established for the whole application or for said claims Nos. 4-14(compleet); 1(gedeeltelijk)

☐ a meaningful opinion could not be formed as the sequence listing was either not available, or was not furnished in the international format (WIPO ST25).

☐ a meaningful opinion could not be formed without the tables related to the sequence listings; or such tables were not available in electronic form.

☐ See Supplemental Box for further details.

Box No. IV Lack of unity of invention

1. The requirement of unity of invention is not complied with for the following reasons:

   see separate sheet

2. This report has been established in respect of the following parts of the application:

   ☐ all parts.

   ☒ the parts relating to claims Nos. (see Search Report)

WRITTEN OPINION

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	2
	No:	Claims	3, 15(compleet); 1(gedeeltelijk)
Inventive step	Yes:	Claims	
	No:	Claims	2, 3, 15(compleet); 1(gedeeltelijk)
Industrial applicability	Yes:	Claims	2, 3, 15(compleet); 1(gedeeltelijk)
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item IV

Lack of unity of invention

It is considered that there are 3 inventions covered by the claims.

The reasons, for which the inventions are not so linked as to form a single general inventive concept, are as follows:

The common matter linking together the claims is the following:

"Assembly and method for disinfecting a stream of objects, comprising an UVC shielded chamber, a door opening for accessing the interior space, with a door sensor for sensing if the door is in a closed position; and a UVC radiation controller arranged for controlling exposure of the interior space to the UVC radiation based on the door sensor."

This common matter does not comprise a single general inventive concept, based on same or corresponding special technical features, because it is already known from document D1 (see below item V).

Hence, the following separate inventions or groups of inventions are not so linked as to form a single general inventive concept:

Invention 1: claims 1 (partially), 2, 3 and 15

Invention 2: claims 1 (partially), 4-9, 13 and 14

Invention 3: claims 1 (partially) and 10-12

Invention 1:

There is no technical feature, representing the difference over the non-inventive common matter, of claims of invention 1, as it is already disclosed in D1.

Invention 2:

The technical feature, representing the difference over the non-inventive common matter, of the claims of invention 2 is a conveyer system. This feature provides the technical effect of conveying the object from an outside position outside the interior space to an inside position inside the interior space and solves the objective technical problem of automatizing the access to the disinfecting chamber.

Invention 3:

The technical feature, representing the difference over the non-inventive common matter, of the claims of invention 3 is a rolling object. This feature provides the technical effect of the object to be disinfected being able to roll and solves the objective technical problem of having a suitable disinfection for rolling objects.

The technical features representing the difference over the non-inventive common matter of each invention are not the same. The objective technical problems underlying the subjects of the claimed inventions are also different, so the special technical features of the different inventions are not corresponding.

The claims are not linked by a technical relationship involving one or more same or corresponding special technical features, so the application lacks a single general inventive concept. Consequently the application does not meet the requirement for unity of invention.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1 Reference is made to the following documents:

D1 DE 10 2019 121621 A1 (HILBERER FRANZ [DE]) 5 maart 2020 (2020-03-05)

D2 US 2019/298866 A1 (MAJDALI DAVID [US] ET AL) 3 oktober 2019 (2019-10-03)

D3 US 7 791 044 B1 (TAYLOR THOMAS L [US] ET AL) 7 september 2010 (2010-09-07)

D4 US 2014/158910 A1 (FLETCHER RICHARD GLEN [US]) 12 juni 2014 (2014-06-12)

D5 DE 37 18 577 A1 (WENZLAFF BURKHARD [DE]) 15 december 1988 (1988-12-15)

D6 GB 2 495 161 A (GEW EC LTD [GB]) 3 april 2013 (2013-04-03)

2 **Novelty**

The present application does not meet the criteria of patentability, because the subject-matter of claims 1, 3 and 15 is not new.

D1 discloses:

Assembly (figure 1) and method for disinfecting a stream of objects (2), comprising: an UVC shielded chamber (1) having an interior space shaped and arranged for receiving an object of the stream of objects; an UVC source (7, 23) arranged for exposing the

interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space; a door (8, 9) opening for accessing the interior space; a door having a closed position, wherein the door in the closed position seals the door opening for preventing UVC radiation radiating from the interior space; a door sensor for sensing if the door is in a closed position; and a UVC radiation controller arranged for controlling exposure of the interior space to the UVC radiation based on the door sensor ([0017]). The UVC radiation controller comprises a switch arranged for controlling the UVC radiation radiated from the UVC source ([0017]).

Claims 1, 3 and 15 are therefore not new.

3 Inventive Step

3.1 The present application does not meet the criteria of patentability, because the subject-matter of claim 2 does not involve an inventive step.

The subject-matter of claim 2 differs from the known assembly of **D1** in that the UVC radiation controller comprises a UVC shutter having a blocking state with respect to the UVC source for preventing the UVC radiation reaching the interior space. The problem to be solved by the present invention may therefore be regarded as to provide a safety option when the door is not in the closed position. The solution proposed in claim 2 of the present application cannot be considered as involving an inventive step. This feature is described in document **D5** (shutter 8, covering lamp 7) or **D6** (page 1, last paragraph and figures) as providing the same advantages as in the present application. The skilled person would therefore regard it as a normal design option to include this feature in the assembly described in **D1** in order to solve the problem posed.

3.2 Additionally, the disclosure of documents **D2**, **D3** and **D4** also render the matter of claims 1, 3 and 15 non inventive.

3.2.1 **D2** discloses an assembly (10) and method for disinfecting a stream of objects (figure 5), comprising: an UV shielded chamber (52) having an interior space shaped and arranged for receiving an object of the stream of objects; an UV source (101) arranged for exposing the interior space to UV radiation for disinfecting the object when the object is positioned inside the interior space; a door (50) opening for accessing the interior space; a door having a closed position, wherein the door in the closed position seals the door opening for preventing UV radiation radiating from the interior space; a door sensor for sensing if the door is in a closed position; and a UV radiation controller arranged for controlling exposure of the interior space to the UV radiation based on the door sensor ([0038]). D2 lacks to disclose that the UV radiation is of the UVC type. This, however, does not bring about any inventive step, as the use of

UVC type of light is well known for the disinfection of objects, in particular rolling objects, like the ones of D2. The presence of a switch for controlling the radiation is also a well known feature, as already seen above from D1.

3.2.2 Both **D3** and **D4** disclose an assembly (D3, figure 1, D4 figures 1-3) and method for disinfecting a stream of objects (D3, 110, D4, figure 2a), comprising: an UVC shielded chamber (D3 examples 2 and 3, D4 [0035]) having an interior space shaped and arranged for receiving an object of the stream of objects; an UVC source arranged for exposing the interior space to UVC radiation for disinfecting the object when the object is positioned inside the interior space; a door opening for accessing the interior space; a door having a closed position, wherein the door in the closed position seals the door opening for preventing UVC radiation radiating from the interior space; and a UVC radiation controller arranged for controlling exposure of the interior space to the UVC radiation. The UVC radiation controller comprises a switch (D3, 120, D4, 1) arranged for controlling the UVC radiation radiated from the UVC source. D3 and D4 lack to disclose a door sensor for sensing if the door is in a closed position and the controller being based on the door sensor. The effect of this difference is to increase safety of the system and the solution is not inventive, as it is already hinted in D3 (column 6 last paragraph) that the assembly comprises several sensors in relation with the door and the functioning of the system. Being these type of safety arrangements also well known (as seen in D1 or D2 above), claims 1, 3 and 15 lacks inventive step over D3 or D4 and the common general knowledge of the skilled man.

3.3 Any one of **D2, D3 or D4** would also render claim 2 non inventive in the view of their disclosures in combination with the disclosure of **D5 or D6**, as already explained in item 3.1, for the same reasons applying mutatis mutandis and also for the reason that the problem solved by claim 2 is not co-effective with the one solved by the missing features as described in 3.2.1 or 3.2.2.