



(51) International Patent Classification:

A61L 9/22 (2006.01) F21S 8/00 (2006.01)
F21V 21/00 (2006.01) A61L 9/20 (2006.01)

(21) International Application Number:

PCT/EP2021/078495

(22) International Filing Date:

14 October 2021 (14.10.2021)

(25) Filing Language:

English

(26) Publication Language:

English

(30) Priority Data:

63/093,943 20 October 2020 (20.10.2020) US
20203890.7 26 October 2020 (26.10.2020) EP

(71) Applicant: **SIGNIFY HOLDING B.V.** [NL/NL]; High Tech Campus 48, 5656 AE Eindhoven (NL).

(72) Inventors: **BROERSMA, Rémy, Cyrille**; c/o High Tech Campus 7, 5656 AE Eindhoven (NL). **VAN BOMMEL, Ties**; c/o High Tech Campus 7, 5656 AE Eindhoven (NL).

DEIXLER, Peter; c/o High Tech Campus 7, 5656 AE Eindhoven (NL).

(74) Agent: **PET, Robert, Jacob** et al.; High Tech Campus 7, 5656 AE Eindhoven (NL).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IR, IS, IT, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,

(54) Title: ADAPTIVE TRACK SYSTEM COMPRISING TRACK LIGHTS AND TRACK IONIZERS FOR CUSTOMIZED LIGHTING AND DISINFECTION

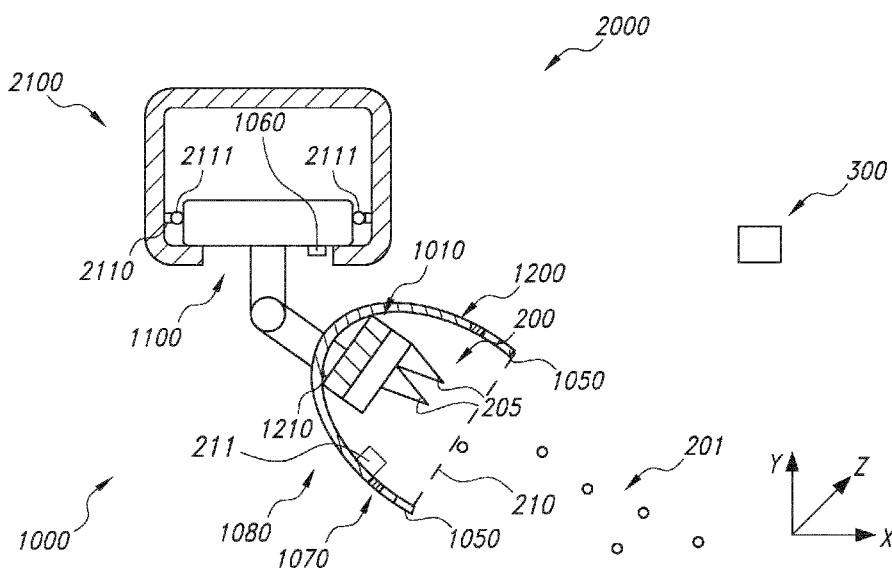


FIG. 1A

(57) Abstract: The invention provides a system comprising a first system element, which is mountable on a track of a track lighting system, wherein the first system element comprises: (a) a connector element configured for a mechanical and electrical coupling with the track, wherein in embodiments the connector element is movable along the track; and (b) an ionizer unit, comprising an ionizer device, functionally coupled to the connector element, wherein the ionizer device is configured to generate ionized air, and wherein in embodiments the ionizer device is movable relative to the connector element in one plane or in two orthogonal planes.

TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Declarations under Rule 4.17:

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*

Published:

- *with international search report (Art. 21(3))*

Adaptive track system comprising track lights and track ionizers for customized lighting and disinfection

FIELD OF THE INVENTION

The invention relates to a system comprising an ionizer which is mountable on a track lighting system, as well as to a track lighting system including such mounted ionizer. The invention further relates to a kit of parts for such system.

5

BACKGROUND OF THE INVENTION

The use of ion generating devices for disinfection is known in the art. US20020130269, for instance, describes an ion generating apparatus for generating ions by ionizing gas particles comprising: an electrode needle supplied with electric voltage for generating ions; an electrode holding part made of insulating material, for holding said electrode needle so that a distal end portion of said electrode needle is in an exposed state; a body part made of an insulating material, for supporting said electrode holding part projecting from one side face of said body part, said body part including a voltage supply section for supplying the electric voltage to said electrode needle; and a counter electrode disposed on the one side face of said body part where said electrode needle exists so that at least a portion of said counter electrode is in contact with said body part, wherein at least one of said body part and said electrode holding part has a surface discharge restraining part in a convex or concave shape for restraining surface discharge along a surface discharge path created between said electrode needle and said counter electrode through said electrode holding part.

10

15

20

SUMMARY OF THE INVENTION

It appears desirable to protect people from the spread of bacteria and viruses such as influenza or against the outbreak of novel (corona) viruses like COVID-19, SARS and MERS. A method for disinfection may be the use of air ionizers. Microorganisms may be killed by positive ions and/or negative ions in air. Therefore ionization is a technology that may bring benefits in containing and reducing the spread of viruses in air and on surfaces. Additionally, ionizers may be used for reducing particles in the air, removing pollen and/or

25

removing VOC's (volatile organic compounds). Existing ionization systems may include floor standing purifiers utilizing a fan, such systems may be an obstacle in the room and the fan may produce a discomforting noise. Such ionization systems may not easily be implemented in existing infrastructure, such as in existing buildings like offices, hospitality areas, etc. and/or may not easily be able to serve larger spaces. This may again increase the risk of contamination. Further, incorporation in HVAC systems may not lead to desirable effects and appears to be relatively complex.

Hence, it is an aspect of the invention to provide an alternative system for disinfection, for instance in office spaces or retail shops, which preferably further at least partly obviates one or more of above-described drawbacks. The present invention may have as object to overcome or ameliorate at least one of the disadvantages of the prior art, or to provide a useful alternative.

Amongst others, it is herein proposed in embodiments to apply an ionizing module, that can be connected (like track lighting spots) to e.g. an already existing track lighting infrastructure (i.e. basically in embodiments a retrofit approach). The proposed module may in embodiments be used with or without a fan (or blower). The module may in embodiments fit the design of the light modules (to be unobtrusive) or can in embodiments look differently.

Hence, in a first aspect the invention provides a system comprising a first system element, which is mountable on a track (or "rail") of a track lighting system. In embodiments, the first system element comprises a connector element which may be configured for a mechanical and electrical coupling with the track. Especially, in embodiments the connector element may be movable along the track. In embodiments, the first system element further comprises an ionizer unit, wherein the ionizer unit may comprise an ionizer device. In embodiments, the ionizer device may be functionally coupled to the connector element. Especially, the ionizer device is configured to generate ionized air. In embodiments, the ionizer device may be movable relative to the connector element in one plane or in two orthogonal planes. Further, the first system element comprises a first control element configured to control a direction of an ion flow from the ionizer device; wherein the first control element comprises an electrical deflection element configured to deflect an ion flow from the ionizer device. In specific embodiments the invention provides a system comprising a first system element, which is mountable on a track of a track lighting system, wherein the first system element comprises: (a) a connector element configured for a mechanical and electrical coupling with the track; and (b) an ionizer unit, comprising an

ionizer device, functionally coupled to the connector element, wherein the ionizer device is configured to generate ionized air. Therefore, in specific embodiments the invention provides a system comprising a first system element, which is mountable on a track of a track lighting system, wherein the first system element comprises: (a) a connector element configured for a mechanical and electrical coupling with the track, wherein in embodiments the connector element is movable along the track; and (b) an ionizer unit, comprising an ionizer device, functionally coupled to the connector element, wherein the ionizer device is configured to generate ionized air, and wherein in embodiments the ionizer device is movable relative to the connector element in one plane or in two orthogonal planes.

Such a system for disinfection may be easy to install in existing buildings as it may be implemented in existing infrastructures. Such infrastructures may often (already) comprise track lighting systems. The system may further provide a large flexibility in the positioning of ionizers as they may be plugged-in anywhere on the track of the track lighting system and they may be repositioned when desired, for instance when the setup of the office or retail store is altered. Hence, the system may allow a relatively easy integration in existing lighting systems and may e.g. also allow a grid of units. This may facilitate a relative even disinfection over rooms, in contrast to disinfection systems that are implemented in (existing) climate control systems. For an ionizer device it may be advantageous to be located at a ceiling or otherwise over a floor, such as suspended from a roof, etc. In this way, the amount of obstruction by other elements, like chairs, desks, cupboards, cubicle walls, etc., may be minimized and large areas may be treated (with one or more units). One or more of a track lighting system may often (already) be installed in large spaces, such as in retail shops or offices. Such track lighting systems may comprise one or more tracks, which may be connected to a ceiling of the space. Such track lighting systems may further comprise a plurality of lights. The lights may be configured in a light housing. The light housing may be connected to the track (via a connector element). The track lighting system may allow a large flexibility in the positioning of the lights and may also allow easy repositioning of the lights.

As indicated above, the invention provides in embodiments a system comprising a first system element, which is mountable on a track of a track lighting system. Hence, the invention is directed to the first system element as such, as well in combination with track lighting system, to which it may be mounted. Both the first system element, as well as the first system element mounted to a track are herein indicated as "system". In embodiments, the first system element may be a kind of spot module, mountable to the track lighting system, wherein the spot module, i.e. the first system element, can be used to provide

ionized air. Especially, the first system element comprises: (a) a connector element configured for a mechanical and electrical coupling with the track and (b) an ionizer unit. These features of the first system element are discussed in more detail below.

The connector element may form a mechanical and electrical connection between the ionizer unit and the track. Hence, the connector element may be used to mount the first system element to a track (of a track lighting system). Especially, the connector element and/or the track may allow mounting and demounting to the track. Mounting may be done in embodiments at an end part of a track, or mounting may be done somewhere between end parts of the track. In embodiments, essentially the same principles as apply for connector elements for spotlights for rail systems, may also apply for the connector element of the ionizer unit. The connector element may thus be configured to keep the ionizer unit mechanically coupled to the track. Further, the connector element may comprise one or more electrical conductor allowing an electrical coupling between the ionizer unit and the track.

Especially, in embodiments the connector element may be configured movable along the track. In this way, the first system element may be positioned on the track and, if desired, may easily be repositioned along the track. This may provide a large amount of flexibility to adapt an ionized air flow to a setup of the space. Also, when the setup is changed, the first system element may be repositioned and the air ionization may be optimized again.

As will be further elucidated below, in embodiments the connector element may be configured for an electrical coupling with one or more further electrical conductors comprised by the track which are not configured for providing electrical power to a light generating device but especially configured for providing electrical power to the ionizer device. In alternative embodiments, the connector element may be configured for an electrical coupling with the one or more electrical conductors comprised by the track which are configured for providing electrical power to a light generating device and which may also be used to provide electrical power to the ionizer device.

The ionizer unit comprises an ionizer device. In embodiments, the ionizer unit may essentially consist of the ionizer device. Especially, the ionizer unit may comprise further elements, such as e.g. a housing for the ionizer device. Hence, the ionizer unit may thus comprise the ionizer device.

In embodiments, the ionizer device may produce ionized air. As will be further elucidated below, this may be done with or without a fan or other type of air blower. Hence, the phrase “producing ionized air”, and similar phrase, may especially indicate that air in the

ionizer device is ionized, which thus leads to the production of ionized air. In this way, ions subsequently may be issued from the ionizer device into the exterior and spread in the space wherein the ionizer device is configured.

In embodiments, the ionized air may be used for disinfection of one or more of
5 (i) bacteria, (ii) viruses, and (iii) spores. Other terms for air ionization that may be used are “plasma cluster ionization” or “needle point bi-polar ionization (NPBI)”, which are considered to be equivalent to air ionization. In embodiments, the ionizer device may produce negative ions. In embodiments the ionizer device may produce positive ions. In
10 embodiments, the ionizer device may produce positive and negative ions, such as at different positions and/or guided in different directions.

In embodiments, the ionizer device may be configured movable relative to the connector element. The ionizer device may be movable in one plane, for instance by using a hinge. The ionizer device may be movable in two orthogonal planes. This may be achieved
15 by using two hinges configured orthogonal to one another or by using a ball joint. This may allow a (more) precise orientation of the ionizer device which may allow an optimal direction of the ionized air flow.

In embodiments, the ionizer device may be configured movable relative to a housing comprised by the ionizer unit. Alternatively or additionally, the entire ionizer unit may be configured movable relative to the connector element. Especially, the ionizer unit and
20 the connector element are connected via a connector element that allows such movement in one or two planes, as known for spotlights for rail systems. Hence, especially the ionizer device may be configured to be able to be directed in multiple directions spanning a space of essentially a hemisphere, or even larger. Together with the fact that in embodiments the connector element may be movable along a track, the degree of freedom (for the user) to
25 target spaces with the first system element for disinfection may be relatively large. Here, the term “user” may in embodiments refer to an installer or to an end-user.

As indicated above, the ionizer unit may comprise a housing, for housing the ionizer device. Especially, in embodiments, the ionizer unit may have the shape of a spotlight housing. Therefore, in specific embodiments the ionizer unit may materially have the shape
30 of a spotlight housing. In this way, the system may be incorporated in an existing track lighting system, wherein the ionizer unit may visually blend in with the spotlights on the track lighting system. The ionizer unit may fit the design of the spotlight housing. Furthermore, the spotlight shape may assist in controlling and aiming an ion flow, as

generated by the ionizer unit, in a desired direction. In alternative embodiments, however, the ionizer unit may have an appearance distinctive from the spotlight housing.

In embodiments, the ionizer unit may be configured detachable to the connector element. Alternatively or additionally, the ionizer unit may comprise a support element, wherein the ionizer device is configured detachable to the support element. In this way, it may be relatively easy to perform maintenance or to replace the ionizer unit and/or the ionizer device at their end of lives.

In specific embodiments the first system element it may even be possible to replace the ionizer device from the housing of the ionizer unit with a spotlight, thereby essentially providing a spotlight instead of an ionizer unit.

In embodiments, the ionizer device may comprise needles or brushes functioning as ion emitters. In embodiments, the ionizer device may comprise needles electrically coupled to the connector element. In embodiments, the ionizer device may comprise brushes electrically coupled to the connector element. In embodiments, the ionizer device may comprise needles and brushes, electrically coupled to the connector element (as electrical powering may be executed via the connector element). In embodiments, the ion emitters may comprise one or more of tungsten, titanium, steel, and carbon, such as needles or brushes comprising one or more of tungsten, titanium, steel, and carbon. In embodiments, ions may be generated on the basis of the corona effect also referred to as a single-electrode discharge. (see https://en.wikipedia.org/wiki/Corona_discharge)

In embodiments, the ionizer unit may comprise a fan. Such fan may produce an air flow in a target direction which may transport ions produced by the ionizer device in the target direction. The term “fan” may refer to any device that can generate a flow, with or without rotating blades. Further, the term “fan” may also refer to a plurality of (individually controllable) fans.

In alternative embodiments, the ionizer unit may not comprise a fan. In this case, ions produced by the ionizer device may diffuse out of the ionizer unit. Alternatively, the ions produced by the ionizer device may be transported by air flow that is already present (in a space), e.g. caused by heating, ventilation air conditioning (HVAC) systems. In such embodiments, ions that may propagate away from the ionizer may be entrained by an air flow that is already present in a space. Note that in case of embodiments of the ionizer unit with a fan, also the air flow already present may influence, such as assist, in distributing the ionized air (in the space).

The term “ionizer device” may also refer to a plurality of ionizer devices. The term ionizer device may e.g. refer to an air ionizer.

The first system element may comprise driver electronics. These driver electronics may in embodiments be comprised in the connector element. In other
5 embodiments, the driver electronics may be comprised in the ionizer unit. In the latter
embodiments, the driver electronics may be comprised by the ionizer device, or the driver
electronics may be comprised e.g. by the housing for the ionizer device.

Hence, in embodiments the first system element may comprise driver
electronics electrically coupled to the connector element. In embodiments, the ionizer device
10 may be functionally coupled to the driver electronics. In alternative embodiments, the ionizer
device may comprise the driver electronics. In this way, the operation of the ionizer device
may be controlled. In specific embodiments (see also below), the driver electronics may be
configured to orient the ionizer devices.

The first system element may comprise other electrical components. The
15 electronic component may include an active or a passive electronic component. An active
electronic component may be any type of circuit component with the ability to electrically
control electron flow (electricity controlling electricity). Examples thereof are diodes,
especially light emitting diodes (LED). LEDs are herein also indicated with the more general
term solid state lighting devices or solid state light sources. Hence, in embodiments the
20 electronic component comprises an active electronic component. Especially, the electronic
component comprises a solid state light source. Other examples of active electronic
components may include power sources, such as a battery, a piezo-electric device, an
integrated circuit (IC), and a transistor. In an embodiment, the electronic component
comprises a driver. In yet other embodiments, the electronic component may include a
25 passive electronic component. Components incapable of controlling current by means of
another electrical signal are called passive devices. Resistors, capacitors, inductors,
transformers, etc. can be considered passive devices. In an embodiment, the electronic
component may include an RFID (Radio-frequency identification) chip. A RFID chip may be
passive or active. Especially, the electronic component may include one or more of a solid
30 state light source (such as a LED), a RFID chip, and an IC. The term “electronic component”
may also refer to a plurality of alike or a plurality of different electronic components. Except
for an optional light source (see below) and for the ionizer device, which may essentially
exclusively be comprised by the ionizer unit (or comparable unit), such other electrical
components may be comprised by the connector element and/or the ionizer unit. Some

examples of other electrical components, like sensors or communication elements are discussed below.

In embodiments, the system may further comprise a sensor. In embodiments, the sensor may comprise one or more sensors selected from the group comprising: a movement sensor, a presence sensor, a distance sensor, an ion sensor, a gas sensor, a volatile organic compound sensor, a pathogen sensor, an airflow sensor, a sound sensor, and a communication receiver. The ion sensor may comprise a positive ion sensor. Additionally or alternatively, the ion sensor may comprise a negative ion sensor. The pathogen sensor may comprise a sensor for one or more of bacteria, viruses, and spores. Alternatively or additionally, the sensor may comprise a temperature sensor. Further, alternatively or additionally, the sensor may comprise a humidity sensor.

In specific embodiments, the first system element comprises the sensor.

In embodiments, the first system element may further comprise a communication transmitter. The communication transmitter may be configured to send a sensor signal of one or more sensors, such as indicated above, to e.g. another communication receiver, like comprised by another first system element or comprise by or functionally coupled to a central control system (see also below).

Especially, the first system element may in embodiments communicate with one or more other first system elements that may be in a relatively close proximity, such as less than 50 meters away. Additionally or alternatively, the first system element may communicate with a (central) control system. Such communication may be on the basis of Bluetooth, WIFI, LiFi, ZigBee, BLE or WiMAX, or another wireless technology.

The distribution of ionized air may depend on the orientation of the ionizer devices. Especially, when multiple ionizer devices may be operational in the same space, it seems desirable to align the ionizer devices in such way that they complement one another. In embodiments, the system may further comprise a signaling device configured to generate one or more of an optical signal, an acoustic signal, and a vibrational signal, in dependence of a sensor signal. In specific embodiments, the first system element may comprise the signaling device.

For instance, this may be used during an installation routine to position and/or direct the ionizer units. For instance, the signaling device may provide light and/or sound, of which the intensity may depend upon the distance to another first system element, or on the number of ions the other first system element detects, or on the number of pathogens detected by a sensor, etc. etc. Hence, the signaling device in combination with one or more sensor may

allow choosing an optimal position on a track and/or an optimal position or direction of the ionizer device. Therefore, in embodiments the system may be configured to generate a signal with the signaling device in dependence of a sensor signal of a sensor (which may include a plurality of sensor signals of a plurality of sensors).

5 The signaling device may be comprised by the system. In alternative embodiments, the signaling device may be functionally coupled to the system. For instance, with a computer program product, such as on a portable device, signals may be provided. Hence, a device which is run by the computer program product may provide the function of the signaling device. Such computer program product may be used to assist in arranging the
10 first system elements in a space. Such computer program product may generate signals on the basis of sensor signals while moving e.g. a connector element and/or an ionization device, allowing to optimize the arrangement of the first system element(s).

 In embodiments, the first system element may comprise a first control element configured to control a direction of an ion flow from the ionizer device. Especially, the first
15 control element may be configured to control a direction of an ion flow from the ionizer device in dependence of a sensor signal (such as from one or more of the above-mentioned sensors). The first control element comprises an electrical deflection element configured to deflect an ion flow from the ionizer device and thus to assist the ionizer device to issue through the exit window, during operation, an ionized air / ion flow in a desired direction. In
20 embodiments, the first control element may comprise an actuator configured to control a movement of the ionizer device relative to the connector element. Alternatively or additionally, the first control element may be configured to control a direction of the ion flow of the ionizer device in dependence of a user interface and/or a timer (see further also below).

 As indicated above, the first system element may comprise an actuator to
25 control a movement of the ionizer device relative to the connector element. Alternatively or additionally, the first system element may comprise a (second) actuator to control a movement of the first system element along the track. Hence, in embodiments a control system may e.g. control a position of the first system element along a track.

 As indicated above, the ionizer unit may (optionally) comprise a housing.
30 Especially, the housing for the ionizer device may herein be indicated as “first system element housing”. Hence, in embodiments the first system element may comprise a first system element housing, wherein the first system element housing encloses at least part of the ionizer device. Embodiments in relation to the housing are also described above.

The housing may thus be a housing for the ionization device. However, in specific embodiments the first system element may also comprise a light generating device, such as in specific embodiments a spotlight. Therefore, the first system element housing may in specific embodiment further comprise an auxiliary light generating device. The auxiliary light generating device may be configured to generate radiation which may (also) have a disinfection function and/or the auxiliary light generating device may be configured to generate radiation essentially used for visible light purposes, such as illumination of element and/or general lighting.

Hence, in embodiments, the auxiliary light generating device may be configured to generate auxiliary device radiation having one or more wavelengths selected from the range of 190-780 nm. In specific embodiments, the auxiliary device radiation may have one or more wavelengths selected from the range of 420-780 nm. Additionally or alternatively, the auxiliary device radiation may have one or more wavelengths selected from the range of 190-420 nm or 190-400 nm. As will be further elucidated below, the former may especially be used for essentially visible purposes, and the latter may especially be used for disinfection purposes. For the sake of clarity, as generally accepted, UVC with wavelengths shorter than 125 nm (i.e. > 10 eV) is ionizing radiation, while the rest of the UV spectrum from 3.1 eV (400 nm) to 10 eV (125 nm), is technically non-ionizing, yet can produce photochemical reactions that are damaging to molecules by means other than simple heat. Since these reactions are often very similar to those caused by ionizing radiation, often the entire UV spectrum is considered to be equivalent to ionization radiation in its interaction with many systems, including biological systems. (see https://en.wikipedia.org/wiki/Non-ionizing_radiation). The boundary between ionizing radiation and non-ionizing radiation in the ultraviolet area is not sharply defined, since different molecules and atoms ionize at different energies, but said boundary is in the range of 10-33 eV. (see https://en.wikipedia.org/wiki/Ionizing_radiation)

Different wavelengths of radiation may have different properties and thus may have different compatibility with human presence. In embodiments, the auxiliary device radiation may be visible light, such as general lighting, spot lighting, etc.

In embodiments, the auxiliary device radiation may be safe short-wavelength radiation, especially one or more wavelengths selected from (i) (violet) light in the range of 400-420 nm, (ii) UVA in the range of 315-400 nm, and (iii) far UV in the range of 190-230 nm. Alternatively, the auxiliary device radiation may be selected from the range of 230-315 nm. The latter may e.g. be useful for (temporarily) unoccupied spaces. Thus, in specific

embodiments, in the auxiliary device radiation may comprise one or more wavelengths selected from one or more of the following ranges: 190-230 nm, 230-280 nm, 280-315 nm, 315-400 nm, 400-420 nm, and 420-780 nm.

In embodiments, in the auxiliary device radiation may comprise one or more wavelengths selected from the range 190-230 nm. This wavelength range may be referred to as far UV and may be more safe for humans whilst being more effective in killing bacteria and viruses. Alternatively or additionally, in embodiments, the auxiliary device radiation may comprise one or more wavelengths selected from the range 230-280 nm. This wavelength range may be referred to as UV-C excluding far UV and may be effective in killing bacteria and viruses. However, this wavelength range may be less safe for humans and animals. Alternatively or additionally, in embodiments, in the auxiliary device radiation may comprise one or more wavelengths selected from the range 280-315 nm. This wavelength range may be referred to as UV-B and may kill bacteria and viruses. Alternatively or additionally, in embodiments, in the auxiliary device radiation may comprise one or more wavelengths selected from the range 315-400 nm. This wavelength range may be referred to as UV-A and may be effective in killing bacteria. Viruses may be less likely to be killed by UV-A, but this radiation may be more safe for humans than UV-B and UV-C. Alternatively or additionally, in embodiments, in auxiliary device radiation may comprise one or more wavelengths selected from the range 400-430 nm, especially from the range 400-420 nm and more especially from the range 400-410 nm. Violet light may be able to kill bacteria but may not be able to kill viruses. This wavelength range is safe. Especially, short-wavelength radiation in the range of 100-280 nm may be efficient to kill microorganisms. Short-wavelength radiation in the range of 100-190 nm may create ozone and may be less desirable.

The terms “light” and “radiation” are herein interchangeably used, unless clear from the context that the term “light” only refers to visible light.

Note that part of the visible wavelength range (see below) may thus overlap with the wavelength range of 100-420 nm.

In another aspect, the invention provides a first system element comprising a multifunctional unit, wherein the multifunctional unit may comprise (i) the auxiliary light generating device (see also e.g. above) and (ii) the ionizer device. The auxiliary light generating device may be configured to generate auxiliary device radiation, which may e.g. be selected from UV, VIS and (optionally) IR. In embodiments, the ionizer device may be configured to generate ionized air, especially with a volumetric ion flow rate Q . In embodiments, in a first operational mode of the first system element, the first system element

may be configured to generate the auxiliary device radiation which may (at least) comprise one or more wavelengths selected from the range of 100-430 nm, such as 190-430 nm, especially in the range of 100-420 nm, such as 190-420 nm. This radiation is herein also indicated as “short-wavelength radiation”. In embodiments, the auxiliary device radiation

5 may have an angular dependent intensity distribution of auxiliary device radiation intensity I , having a maximum intensity $I_{\max}$. Especially in embodiments, in a first angular part of the angular dependent intensity distribution a first intensity I_1 of the auxiliary device radiation may be at least $a_1 * I_{\max}$, wherein $0 < a_1 < 1$. Especially, in a second angular part of the angular dependent intensity distribution a second intensity I_2 of the auxiliary device radiation may be

10 smaller than $a_1 * I_{\max}$. In embodiments, in a first operational mode of the first system element, the first system element may be configured to generate the ionized air having a first volumetric ion flow rate Q_1 within at least part of the first angular part and a second volumetric ion flow rate Q_2 within at least part of the second angular part; wherein in

embodiments $Q_2 > Q_1$. Especially in embodiments, in at least part of the first angular part, the first intensity I_1 of the auxiliary device radiation may be $I_1 \geq a_1 * I_{\max}$. In specific embodiments, in the first angular part, the first intensity I_1 of the auxiliary device radiation may thus be

selected from the range of $I_1 \geq a_1 * I_{\max}$. In embodiments, in the first angular part, the first volumetric ion flow rate Q_1 may be smaller than the second volumetric ion flow rate Q_2 in the second angular part, thus $Q_2 > Q_1$. Especially, in embodiments, in at least part of the first

20 angular part, the first volumetric ion flow rate Q_1 is smaller than the second volumetric ion flow rate Q_2 in at least part of the second angular part, thus $Q_2 > Q_1$. In embodiments $Q_2 > Q_1$, especially $Q_2 \geq 1.2 * Q_1$, more especially $Q_2 \geq 1.5 * Q_1$. In specific embodiments $Q_2 \geq 2 * Q_1$, especially $Q_2 \geq 5 * Q_1$, more especially $Q_2 \geq 7 * Q_1$. In embodiments wherein Q_2 is defined in terms of Q_1 , Q_2 is mathematically dividable by Q_1 (thus there is at least some ion flow in Q_1).

25 In embodiments, $Q_2/Q_1 \leq 10000$, especially $Q_2/Q_1 \leq 1000$, more especially $Q_2/Q_1 \leq 100$.

Therefore, in specific embodiments the invention provides a first system element comprising a multifunctional unit, wherein the multifunctional unit comprises (i) the auxiliary light generating device and (ii) the ionizer device, wherein the auxiliary light generating device is configured to generate auxiliary device radiation, and wherein the ionizer device is

30 configured to generate ionized air; wherein in a first operational mode the system is configured to: (a) generate the auxiliary device radiation comprising one or more wavelengths selected from the range of 190-430 nm, especially in the range of 190-420 nm, wherein the auxiliary device radiation has an angular dependent intensity distribution of auxiliary device radiation intensity I having a maximum intensity $I_{\max}$; wherein in a first

angular part of the angular dependent intensity distribution a first intensity I_1 of the auxiliary device radiation is at least $a_1 \cdot I_{\max}$, wherein $0 < a_1 < 1$, and wherein in a second angular part of the angular dependent intensity distribution a second intensity I_2 of the auxiliary device radiation is smaller than $a_1 \cdot I_{\max}$; and (b) generate the ionized air having a first volumetric ion flow rate Q_1 within at least part of the first angular part and a second volumetric ion flow rate Q_2 within at least part of the second angular part; wherein $Q_2 > Q_1$.

As indicated above, the system may herein refer to essentially solely the first system element, but may also refer to a first system element functionally coupled to a track. Hence, in such embodiments the system may especially be indicated as “track light system” or “track lighting system”. Hence, in embodiments, the system comprises a track lighting system, wherein the system comprises a track and wherein the first system element is mounted to the track.

Such track lighting system may especially comprise one or more lighting devices, such as spotlights. Such one or more lighting device may herein also be indicated as “second system element”. Such second system element may especially be configured to generate light, especially visible light, and may in embodiments especially not be configured to provide ionized air (and/or disinfection light), though this is not excluded. Hence, when such disinfection light would be provided by the second system element, then this will in general be done in addition to visible light that is used for visible purposes, such as general lighting or spot lighting (and not solely for disinfection purposes). Hence, in embodiments, the system may further comprise a second system element.

Especially, the second system element may comprise a second system element connector element configured for a mechanical and electrical coupling with the track. In embodiments, the second system element connector element may be movable along the track. In embodiments, the second system element connector element may thus be configured movable along the track.

In embodiments, the second system element light generating device is movable relative to the second system element connector element in one plane or in two orthogonal planes. In embodiments, the second system element light generating device is configured movable relative to the second system element connector element in one plane or in two orthogonal planes.

Especially, the second system element may comprise a second system element light generating device configured to generate second device radiation having one or more wavelengths selected from the range of 190-780 nm. In specific embodiments, the second

device radiation may have one or more wavelengths selected from the range of 410-780 nm. Additionally, in embodiments the second device radiation may have one or more wavelengths selected from the range of 190-420 nm.

Especially, the second system element may be configured to provide second device radiation that is, in an operational mode, white light.

In embodiments, the second system element comprises a second system element housing that may have a same shape as the first system element housing. In embodiments, the second system element may not comprise an ionizer device. In specific embodiments, the second system element comprises a second system element housing that may materially have a same shape as the first system element housing. In embodiments, the second system element housing may have the same look and feel as the first system element housing. In this way, the first system element and the second system element may have the same appearance. In embodiments, the ionizer device may comprise a fitting and shape that fits in the second system element housing. In embodiments, in an operational mode the system may be configured to generate visible light (during the operational mode of the system). In specific embodiments, the second system element does not comprise an ionizer device, wherein the second system element comprises a second system element housing having a same shape as the first system element housing, wherein in an operational mode the system is configured to generate visible light.

The visible light generated by the system may be provided by the second system element and/or the first system element. Especially, the track lighting system as described herein may be configured to generate visible light, which is at least partly provided by the second system element(s) and optionally partly by the first system element(s). In an operational mode, the visible light may be white light. In other operational modes, the visible light may be colored light.

In embodiments, in an operational mode of the system, the first system element may provide ionized air (via corona discharge) and the second system element may provide device radiation. In embodiments, the device radiation may comprise UV-light. In this way, the system may have additional disinfection properties.

Above, the sensor has been described in general, and especially in relation to the first system element. However, when referring to the extended system, at least also including a track, alternatively or additionally, one or more sensors may also be configured elsewhere. Hence, in specific embodiments the system may comprise the sensor, configured external from the first system element. Thus, in embodiments, the sensor may be configured

on the track. Additionally or alternatively, the sensor may be configured on the second system element. However, the system may also be configured elsewhere, for instance at a ventilation channel inlet or in such ventilation channel, etc.

In embodiments, the system may comprise the communication transmitter, configured external from the first system element. Thus, in embodiments, the communication transmitter may be configured on the track. Additionally or alternatively, the communication transmitter may be configured on the second system element.

Further, below some specific embodiments are described.

In embodiments, in an operational mode of the system the ionizer device may be configured to generate ions having a positive or negative charge, and wherein at least part of the track may have the same charge as the ions. This may facilitate propagation of the ions in the room.

An ionizer device may be configured to generate air with primarily positive ions, or air with primarily negative ions.

For instance, in specific embodiments, in an operational mode of the system the ionizer device may be configured to generate ions having a positive charge, and wherein at least part of the track may have a positive charge. Alternatively, in an operational mode of the system the ionizer device may be configured to generate ions having a negative charge, and wherein at least part of the track may have a negative charge. In specific embodiments, in an operational mode of the system, the ionizer device may be configured to generate ions having a positive charge and ions having a negative charge. The positive ions may be mainly directed in a first direction where part of the track may have a positive charge to further guide the ions away from the track and the negative ions may be mainly directed in a second direction where part of the track may have a negative charge to further guide the ions away from the track.

The ionizer unit may comprise lamella, e.g. to direct the air flow. In specific embodiments, the position of the lamella may be controllable (e.g. rotatable and/or closable and openable). In specific embodiments, the lamella may have the same charge as the ions. In this way, the ions may be repulsed by the system and guided downwards. This may result in a larger amount of ions at the desired location.

In embodiments, the track may comprise one or more first electrical conductors configured to provide during an operational mode electrical power to one or more of (a) the auxiliary light generating device, and (b) the second system element light generating device, and one or more further electrical conductors configured to provide during

the operational mode electrical power to the ionizer device. In this way, the electric circuit of the ionizer device may be separate from the electric circuit for any of the light generating devices. This may be desirable in case the ionizer device requires a different voltage or current compared to any of the light generating devices.

5 In embodiments, the system may further comprise a surveillance system. The term “surveillance system” especially refers to a system that may register sensor signals. Hence, one or more of the herein described sensors may be comprised by the surveillance system. Hence, the term “surveillance system” may especially refer to a passively monitoring system. Would the surveillance system also be able to execute actions, e.g. in response to a
10 sensor signal, such surveillance system may be indicated as “control system”.

In specific embodiments, the surveillance system may be configured to impose an action on one or more elements in dependence of one or more of a user interface, a sensor, and a timer. Therefore, in specific embodiments the surveillance system may comprise a control system to control one or more elements in dependence of one or more of a user
15 interface, a sensor, and a timer. Alternatively, as indicated above, the surveillance system may be configured to passively monitor one or more elements.

In embodiments, the one or more elements may be selected from the group comprising: the ionizer device, the sensor, the first control element, the auxiliary light generating device, the second system element light generating device, a source of electrical
20 power. In embodiments, the one or more elements may be selected from the group comprising: the ionizer device; the sensor; the communication transmitter; the signaling device; the first control element; the auxiliary light generating device; the second system element light generating device; a source of electrical power.

In specific embodiments, the control system may recognize patterns. The control system may perform predictions based on such patterns. The control system may
25 incorporate external data such as opening hours, rush hours etc. to predict an optimal amount of ions. The control system may then control the one or more elements as described above. Additionally, the control system may utilize artificial intelligence (AI) to control the one or more elements as described above. For instance, the control system may predict an increase
30 in customers shortly after opening time of a restaurant or shop and prepare the environment by increasing the ion production e.g. 15 minutes before opening. Additionally or alternatively, motion trails within the shop or restaurant may be anticipated and the control system may control the one or more elements accordingly. For instance, once the last course

of a dinner is almost finished, the system may proactively prepare a bar or lounge area for being occupied by increasing the ion concentration in the ionized air in such spaces.

In embodiments, the system may further comprise a user interface functionally coupled to the surveillance system. In specific embodiments, the user interface may be part of the system. Alternatively, the user interface may be not part of the system, but (only) be functionally coupled to the system. Such external user interface may for example be a personal computer, a smartphone, a tablet, such as an iPad. Other external user interfaces may also be possible.

In embodiments, the surveillance system may comprise an optimization routine, wherein in dependence of a sensor signal of the sensor a signaling device is configured to provide a signal. In embodiments, the user interface may comprise the signaling device. In embodiments, the surveillance system may indicate an ion concentration at sensor locations. Based on this information, the surveillance system may suggest the optimization routine.

The optimization routine may include one or more of (i) positioning one or more of an ionizer unit, (ii) orienting one or more of an ionizer unit, and (iii) setting the ionization strength of one or more of an ionizer device. Alternatively or additionally, optimization routine may include controlling deflection of an ion flow. Alternatively or additionally, optimization routine may include controlling a position of the first system element along the track.

In embodiments, the optimization routine may be performed manually. For instance, a user interface of the signaling device may suggest or assist in choosing positions, directions, angles, number of first system elements, etc.

In specific embodiments, the optimization routine may be performed automatically, for instance based on artificial intelligence learning and the use of one or more actuators, and optionally sensors.

The ionization strength may refer to the ion concentration. Increasing the ionization strength and thus increasing the ion concentration may be achieved by increasing the production of ions, for instance by one or more of (i) increasing a voltage on the needle or brushes, (ii) increasing a pulse frequency, and (iii) increasing a pulse width. In embodiments, the ion concentration may be defined as the number of ions per cubic centimeter. The ion concentration may be quantified using an air ion counter.

In embodiments, in an operational mode, the surveillance system is configured to control the ionizer device in dependence of the sensor. In embodiments, in an operational

mode, the surveillance system is configured to control the ionizer device in dependence of a sensor signal of the sensor. For example, setting the ionization strength of the ionizer device.

In embodiments, the system may comprise a plurality of first system elements. Additionally, the system may comprise one second system element or a plurality of second system elements. In embodiments, the system may comprise a grid of first system elements and optionally a grid of second system elements. In embodiments in an operational mode, the system may be configured to generate visible light. In embodiments, the visible light may be general lighting. In embodiments, the general lighting may be colored lighting. In embodiments, the general lighting may be white lighting. Especially, the visible light may be accent lighting. In embodiments, the accent lighting may be colored lighting. In embodiments, the accent lighting may be white lighting. In embodiments in an operational mode, the system may be configured to generate white light (during an operational mode of the system). Hence, in specific embodiments, the system may comprise a plurality of first system elements and optionally a plurality of second system elements; wherein in an operational mode the system is configured to generate white light (during an operational mode of the system).

The term “space” may for instance relate to a (part of) hospitality area, such as a restaurant, a hotel, a clinic, or a hospital, etc.. The term “space” may also relate to (a part of) an office, a department store, a warehouse, a cinema, a church, a theatre, a library, etc. However, the term “space” also relate to (a part of) a working space in a vehicle, such as a cabin of a truck, a cabin of an air plane, a cabin of a vessel (ship), a cabin of a car, a cabin of a crane, a cabin of an engineering vehicle like a tractor, etc.. The term “space” may also relate to (a part of) a working space, such as an office, a (production) plant, a power plant (like a nuclear power plant, a gas power plant, a coal power plant, etc.), etc. For instance, the term “space” may also relate to a control room, a security room, etc.

Especially for indoor areas that are larger than the reach of a single disinfection unit, such as offices, public transport, cinema’s, restaurants, shops, etc., multiple units may be applied. Hence, in embodiments, the system may comprise a grid of a plurality of units. In embodiments, the individual units may be functionally connected to the control system. In embodiments, the individual units in the grid may comprise a sensor, especially one or more of a radiation sensor and an air flow sensor. In embodiments, a first individual unit may adjust its settings based on sensor signals. In embodiments, the individual units, especially the control systems thereof, may communicate with one another. The individual units may comprise means for communicating with other units, systems or devices, such as

on the basis of Bluetooth, WIFI, LiFi, ZigBee, BLE or WiMAX, or another wireless technology. In specific embodiments, settings of a first unit of the grid may depend on the settings of a second unit of the grid, wherein the settings comprise one or more of (i) position of one or more of an ionizer unit, (ii) orientation of one or more of an ionizer unit, and (iii) the ionization strength of one or more of an ionizer device.

The system may be part of or may be applied in e.g. office lighting systems, household application systems, shop lighting systems, home lighting systems, accent lighting systems, spot lighting systems, theater lighting systems, fiber-optics application systems, projection systems, self-lit display systems, pixelated display systems, segmented display systems, warning sign systems, medical lighting application systems, indicator sign systems, decorative lighting systems, portable systems, automotive applications, (outdoor) road lighting systems, urban lighting systems, green house lighting systems, horticulture lighting, digital projection, or LCD backlighting. The light generating system (or luminaire) may be part of or may be applied in e.g. optical communication systems or disinfection systems.

The term “white light” herein, is known to the person skilled in the art. It especially relates to light having a correlated color temperature (CCT) between about 1800 K and 20000 K, such as between 2000 and 20000 K, especially 2700-20000 K, for general lighting especially in the range of about 2700 K and 6500 K. In embodiments, for backlighting purposes the correlated color temperature (CCT) may especially be in the range of about 7000 K and 20000 K. Yet further, in embodiments the correlated color temperature (CCT) is especially within about 15 SDCM (standard deviation of color matching) from the BBL (black body locus), especially within about 10 SDCM from the BBL, even more especially within about 5 SDCM from the BBL.

In embodiments, the CRI (coloring rendering index) of white light is larger than 75, especially larger than 80, more especially larger than 85.

The terms “visible”, “visible light” or “visible emission” and similar terms refer to light having one or more wavelengths in the range of about 380-780 nm. Herein, UV may especially refer to a wavelength selected from the range of 200-380 nm.

The terms “light” and “radiation” are herein interchangeably used, unless clear from the context that the term “light” only refers to visible light. The terms “light” and “radiation” may thus refer to UV radiation, visible light, and IR radiation. In specific embodiments, especially for lighting applications, the terms “light” and “radiation” refer to (at least) visible light.

The term “controlling” and similar terms especially refer at least to determining the behavior or supervising the running of an element. Hence, herein “controlling” and similar terms may e.g. refer to imposing behavior to the element (determining the behavior or supervising the running of an element), etc., such as e.g.

5 measuring, displaying, actuating, opening, shifting, changing temperature, etc.. Beyond that, the term “controlling” and similar terms may additionally include monitoring. Hence, the term “controlling” and similar terms may include imposing behavior on an element and also imposing behavior on an element and monitoring the element. The controlling of the element can be done with a control system, which may also be indicated as “controller”. The control
10 system and the element may thus at least temporarily, or permanently, functionally be coupled. The element may comprise the control system. In embodiments, the control system and element may not be physically coupled. Control can be done via wired and/or wireless control. The term “control system” may also refer to a plurality of different control systems, which especially are functionally coupled, and of which e.g. one control system may be a
15 master control system and one or more others may be slave control systems. A control system may comprise or may be functionally coupled to a user interface.

The control system may also be configured to receive and execute instructions form a remote control. In embodiments, the control system may be controlled via an App on a device, such as a portable device, like a Smartphone or I-phone, a tablet, etc.. The device is
20 thus not necessarily coupled to the lighting system, but may be (temporarily) functionally coupled to the lighting system.

Hence, in embodiments the control system may (also) be configured to be controlled by an App on a remote device. In such embodiments the control system of the lighting system may be a slave control system or control in a slave mode. For instance, the
25 lighting system may be identifiable with a code, especially a unique code for the respective lighting system. The control system of the lighting system may be configured to be controlled by an external control system which has access to the lighting system on the basis of knowledge (input by a user interface of with an optical sensor (e.g. QR code reader) of the (unique) code. The lighting system may also comprise means for communicating with other
30 systems or devices, such as on the basis of Bluetooth, WIFI, LiFi, ZigBee, BLE or WiMAX, or another wireless technology.

The system, or apparatus, or device may execute an action in a “mode” or “operation mode” or “mode of operation”. Likewise, in a method an action or stage, or step may be executed in a “mode” or “operation mode” or “mode of operation” or “operational

mode”. The term “mode” may also be indicated as “controlling mode”. This does not exclude that the system, or apparatus, or device may also be adapted for providing another controlling mode, or a plurality of other controlling modes. Likewise, this may not exclude that before executing the mode and/or after executing the mode one or more other modes may be executed.

However, in embodiments a control system may be available, that is adapted to provide at least the controlling mode. Would other modes be available, the choice of such modes may especially be executed via a user interface, though other options, like executing a mode in dependence of a sensor signal or a (time) scheme, may also be possible. The operation mode may in embodiments also refer to a system, or apparatus, or device, that can only operate in a single operation mode (i.e. “on”, without further tunability).

Hence, in embodiments, the control system may control in dependence of one or more of an input signal of a user interface, a sensor signal (of a sensor), and a timer. The term “timer” may refer to a clock and/or a predetermined time scheme.

In yet a further aspect, the invention also provides a kit of parts comprising the system as defined herein. Especially, in embodiments a kit of parts may comprise a first system element and a track, to which the first system element is mountable.

The embodiments described above in relation to the system of the present invention, may also apply for the kit of parts of the invention.

The system of the present invention may in embodiments comprise a track rail, a track light, and a track ionizer.

The track ionizer may comprise a track portion and one or more of an ionizer mounted on the track portion. The track portion may comprise a track guiding portion and track electrodes disposed on the track guiding portion. The ionizer may be provided with connecting terminals electrically connected to the track electrodes. The track guiding portion may be provided with an electrode isolation portion disposed between the track electrodes. In a specific embodiment, the track ionizer may be designed such that the unit is not visually distinguishable from track lights, except for the amount of light that might be produced by the unit.

The track light may comprise a track portion and one or more of a light module mounted on the track portion. The track portion may comprise a track guiding portion and track electrodes disposed on the track guiding portion. The light module may be provided with connecting terminals electrically connected to the track electrodes. The track

guiding portion may be provided with an electrode isolation portion disposed between the track electrodes.

The track rail may comprise a track guiding and track electrodes disposed on the track guiding. The track guiding may be provided with an electrode isolation portion
5 disposed between the track electrodes.

The (track) sensor unit may feature a dedicated sensor unit such as a Pointgrab sensor capable of activity detection close-by the track lighting installation.

The track guiding portions of the track ionizer and the track light may be mechanically connected to the track guiding and the track electrodes of the track ionizer and
10 the track light may be electrically connected to the track electrodes of the track guiding.

Mounting the ionizers on the existing lighting grid may be easy (as well as executing maintenance and/or replacement) for non-professionals. The system may not obstruct people, may prevent loud noise, and may be inexpensive compared to HVAC installation by a professional installer.

Another advantage may be that the modules may be placed in such a way that it suits the store setup. With changing setups the ionizers may be re-arranged as well and the ionization benefits may be optimized again. It may also be easy to extend the ionizer series to increase ionization levels. This may be an advantage compared to an ionizer installed in an HVAC unit, as the position of the air inlets/vents may be fixed and may be difficult to be
15 modified. Hence, in an HVAC centric ionizer architecture, the ionization may less likely be optimized and locally increasing the ionization levels may require another HVAC re-installation. This may be expensive and hardly possible, especially if the shop owner is not the building owner.

As with the lighting modules, the proposed ionizer unit may be tilted and/or
25 rotated via a tilting/rotation means which mechanically (and electrically) connect the track portion and the ionizer. In this way, the ionizer may be directed to a certain location of the space in order to optimize the ionized air distribution in the space. The modules, like spot modules, may be changed in angle as well as in rotational degree. This may allow to direct the ions towards a particular area in the space depending on the need of the shop layout. The
30 orientation of the ionizer may take into account the local airflow pattern. For instance, if the spot-lighting track is mounted is close-by the wall, it may be advantageous to orient the ionizer such that the ion-emitting tip points towards the air flow circulation to re-distribute the ions throughout the whole space or to direct towards areas which have limited flow (still standing air pockets) to improve ion concentration in a specific area.

Optionally, the proposed ionizer module may feature an airflow sensor which guides the installer to orient the track mounted ionizer unit such that the tip of the ionizer generation unit experiences maximized airflow. The ionizer unit may also feature a distance determining unit (e.g. a 5.8 GHz radar sensor or ToF (time of flight) sensor) which measures the distance of the ionizer to the wall and may provide feedback to the installer to ensure a minimum distance between the ionizer unit and any obstacles hampering the ion distribution.

The track ionizer unit may also feature a distance measuring means to determine the spacing between a first track ionizer and a second track ionizer. For instance, a UWB radio may be employed for the distance measurement as well as mapping out of the ionizer grid within the store. This may enable multiple tracks within the store to act in concert to optimally distribute the ions not only between ionizer track units of the same track but also between different tracks in the store (e.g. for different isles).

The distance determining units may for instance determine that a first ionizer has a neighboring second and third ionizers at 2 m and 2.2 m distance whereas the third ionizer has only a single neighbor as it is mounted 1.5 m away from the wall. Consequently, the ionizing system may decide to activate the third ionizer stronger to fill the air volume between the third ionizer and the wall with the same density of ions as the air volumes served by two ionizers.

The track ionizer unit may also feature a tilt sensor to determine the orientation of the ionizer unit.

Again, this flexibility may not be achieved with an ionizer in HVAC or fixed integrated ionizers in the ceiling, for instance a luminaire.

The track light and/or track ionizer may comprise a driver for converting the electrical current of the track rail into suitable electrical current of the light module and/or ionizer.

The track light and/or track ionizer may comprise a controller for individually controlling the electrical current supplied to the light module and/or ionizer.

The track ionizer may comprise a controller for individually reorienting the ionizer (similar to a motorized track light).

The track ionizer may comprise a controller for individually reorienting the ion flow (e.g. by charging a portion of the ionizer housing the same charge as the ions) to regulate how much the ions generated by the ionizer may be repelled away from this portion of the ionizer housing. Optionally, also the entire track rail may be charged the same charge as the ions to push the ions away from the track lights into the room.

The track system may further comprise a user interface for controlling the track system or individually controlling the controllers.

The lighting system may comprise a further track rail (arranged under an angle with respect to the track rail) which may be electrically and/or mechanically connected to the track rail.

The track system may be controlled by a computer program which may calculate the desired ionized air generation based on the number (and location) of the track ionizers.

The track lighting system may comprise sensors (motion, presence, noise, temperature,...) detecting human beings, activity (e.g. singing or loud talking, which is known to create lots of aerosols; sneezing) and control the ionizers accordingly to a program depending on the event.

The track lighting system may contain sensors detecting the ion concentration in the air and a control system to act accordingly to increase, stabilize or reduce the ion concentration accordingly to a program. At the same time, the measurements may indicate disbalance between positive and negative ions which can be individually adjusted to re-balance the ion ratio or on purpose bring disbalance in the ratio depending on the objective.

Ionization may be optimized in areas with the track lighting system, which may not be possible with normal fixed HVAC.

Track lighting may also be often used in food retail shops. It has been shown that ionized air can reduce mold growth on food and reduce food decay, providing benefits for retail owners to reduce waist next to providing healthy environments.

BRIEF DESCRIPTION OF THE DRAWINGS

Embodiments of the invention will now be described, by way of example only, with reference to the accompanying schematic drawings in which corresponding reference symbols indicate corresponding parts, and in which:

Figs. 1a-1d schematically depict embodiments and variants thereon.

Figs. 2a-2b depict a further aspect of the invention.

The schematic drawings are not necessarily to scale.

DETAILED DESCRIPTION OF THE EMBODIMENTS

Fig. 1a schematically depicts the system 2000 comprising a track lighting system, wherein the system 2000 comprises a track 2100. The first system element 1000 is

mounted to the track 2100 via a connector element 1100. The system 2000 in the depicted embodiment comprises a first system element 1000, which is mountable on a track 2100 of a track lighting system. The first system element 1000 comprises a connector element 1100 configured for a mechanical and electrical coupling with the track 2100. The connector
5 element 1100 is movable along the track 2100. The first system element further comprises an ionizer unit 1200, comprising an ionizer device 200. The ionizer unit 1200 is functionally coupled to the connector element 1100. The ionizer device 200 comprises an exit window 210 and electrodes 205 and is configured to generate ionized air 201, which is to be issued through the exit window 210 during operation. The electrodes may be needles or brushes.

10 The ionizer device 200 may be movable relative to the connector element 1100 in one plane or in two orthogonal planes. The one plane may e.g. be the xy plane, or the xz plane, or the yz plane. However, alternative planes may also be possible. The two orthogonal planes may be e.g. the xy and xz planes, or the xy and yz planes, or the xz and yz planes. However, alternative orthogonal planes may also be possible. In embodiments, the ionizer unit 1200 is

15 configured detachable to the connector element 1100. In embodiments, the ionizer unit 1200 comprises a support element 1210, wherein the ionizer device 200 is configured detachable to the support element 1210. The system may further comprise a sensor 1050. The sensor 1050 may comprise one or more sensors selected from the group comprising: a movement sensor, a presence sensor, a distance sensor, an ion sensor, a gas sensor, a volatile organic compound

20 sensor, a pathogen sensor, an airflow sensor, a sound sensor, and a communication receiver 1057. The first system element 1000 may comprise the sensor 1050. The first system element 1000 may further comprise a communication transmitter 1056. The system 2000 may further comprise a signaling device 1060 configured to generate one or more of an optical signal, an acoustic signal, and a vibrational signal, in dependence of a sensor signal. In embodiments,

25 the first system element 1000 may comprise the signaling device 1060. The first system element 1000 may comprise a first control element 1070 configured to control a direction of an ion flow from the ionizer device 200. the first control element 1070 may comprise one or more of (i) an actuator configured to control a movement of the ionizer device 200 relative to the connector element 1100, and (ii) an electrical deflection element 211 configured to

30 deflect an ion flow from the ionizer device 200. The electrical deflection element 211 can be statically charged with electricity to either repel or attract the ion flow and thus assisting the ionizer device to issue through the exit window 210, during operation, an ionized air / ion flow in a desired direction to control the ion flow direction. In the depicted embodiment, the ionizer unit 1200 has the shape of a spotlight housing. The system may further comprise the

surveillance system 300, that may be configured to one or more of impose an action on one or more elements in dependence of one or more of a user interface, a sensor, and a timer. Additionally or alternatively, the surveillance system may be configured to monitor one or more elements. The one or more elements may be selected from the group comprising: the ionizer device 200; the sensor 1050; the communication transmitter 1056; the signaling device 1060; the first control element 1070; the auxiliary light generating device 120; the second system element light generating device 4110; and a source of electrical power. Especially, the surveillance system 300 may comprise an optimization routine, wherein in dependence of a sensor signal of the sensor 1050, a signaling device 1060 is configured to provide a signal. Especially, in an operational mode the surveillance system 300 is configured to control the ionizer device 200 in dependence of the sensor 1050. In embodiments, the user interface may be functionally coupled to the surveillance system 300. In embodiments, the user interface may comprise the signaling device 1060.

Fig 1b schematically depicts the connector element of the first system element configured in a track. In the depicted embodiment, the track 2100 comprises one or more first electrical conductors 2110 configured to provide during an operational mode electrical power to one or more of (a) the auxiliary light generating device 120, and (b) the second system element light generating device 4110, and one or more further electrical conductors 2120 configured to provide during the operational mode electrical power to the ionizer device 200. The connector element 1100 is configured for an electrical coupling with one or more further electrical conductors 2120 comprised by the track 2100 which are not configured for providing electrical power to a light generating device 100. The electrical conductors 2110, 2120 of the track 2100 may be electrically coupled to electrical conductors 2111, 2121 of the connector element 1100.

In the depicted embodiments, the first system element 1000 comprises driver electronics 1010 electrically coupled to the connector element 1100, wherein the ionizer device 200 is functionally coupled to the driver electronics 1010 (Fig 1b) or comprises the driver electronics 1010 (Fig 1a)

Fig 1c schematically depicts a specific embodiment of the first system element 1000 comprising the first system element housing 1080. The first system element housing 1080 may enclose at least part of the ionizer device 200. The first system element housing 1080 comprises the electrodes 205 and may further comprise an auxiliary light generating device 120, wherein the auxiliary light generating device 120 is configured to generate auxiliary device radiation 121 having one or more wavelengths selected from the range of

190-780 nm. In embodiments, the auxiliary device radiation 121 has one or more wavelengths selected from the range of 410-780 nm. Additionally or alternatively, the auxiliary device radiation 121 has one or more wavelengths selected from the range of 190-420 nm.

5 Fig 1d schematically depicts the system 2000 comprising a track lighting system. The system in the depicted embodiment comprises a plurality of first system elements 1000 and a plurality of second system elements 4000. The first system element 1000 is configured to generate ionized air 201 and optionally auxiliary device radiation 121 and has been described in more detail above. The second system element 4000 comprises a
10 second system element connector element 4100 configured for a mechanical and electrical coupling with the track 2100. Especially, the second system element connector element 4100 is movable along the track 2100. The second system element 4000 further comprises a second system element light generating device 4110 configured to generate second device radiation 4111 having one or more wavelengths selected from the range of 190-780 nm. In
15 embodiments, the second device radiation 4111 has one or more wavelengths selected from the range of 410-780 nm. Additionally or alternatively, the second device radiation 4111 has one or more wavelengths selected from the range of 190-420 nm. Especially, the second system element light generating device 4110 is movable relative to the second system element connector element 4100 in one plane or in two orthogonal planes (planes as
20 described above). In an operational mode the system 2000 may be configured to generate white light. In the depicted embodiment, the second system element 4000 comprises a second system element housing 4080 having a same shape as the first system element housing 1080. In the depicted embodiment, the system 2000 comprises the sensor 1050 configured external from the first system element 1000. In an operational mode of the system 2000 the ionizer
25 device 200 is configured to generate ions having a positive or negative charge. In embodiments, at least part of the track 2100 may have the same charge as the ions in the generated ionized air 201.

Fig 2 depicts an embodiment of a kit of parts comprising the track 2100 (Fig 2a) and the first system element 1000 (Fig 2b). The first system element 1000 is mountable to
30 the track 2100. In alternative embodiments, the first system element may not be pre-assembled as depicted in Fig 2b but may be included in parts.

The term “plurality” refers to two or more.

The terms “substantially” or “essentially” herein, and similar terms, will be understood by the person skilled in the art. The terms “substantially” or “essentially” may

also include embodiments with “entirely”, “completely”, “all”, etc. Hence, in embodiments the adjective substantially or essentially may also be removed. Where applicable, the term “substantially” or the term “essentially” 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%.

5 The term “comprise” also includes embodiments wherein the term “comprises” means “consists of”.

 The term “and/or” especially relates to one or more of the items mentioned before and after “and/or”. For instance, a phrase “item 1 and/or item 2” and similar phrases may relate to one or more of item 1 and item 2. The term “comprising” may in an
10 embodiment refer to “consisting of” but may in another embodiment also refer to “containing at least the defined species and optionally one or more other species”.

 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
15 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, apparatus, or systems may herein amongst others be described during operation. As will be clear to the person skilled in the art, the invention is not limited
20 to methods of operation, or devices, apparatus, or systems 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
25 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. Unless the context clearly requires otherwise, throughout the description and the claims, the words “comprise”, “comprising”, and the like are to be construed in an inclusive sense as opposed to an
30 exclusive or exhaustive sense; that is to say, in the sense of “including, but not limited to”.

 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 a device claim, or an

apparatus claim, or a system claim, 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.

- 5 The invention also provides a control system that may control the device, apparatus, or system, or that may execute the herein described method or process. Yet further, the invention also provides a computer program product, when running on a computer which is functionally coupled to or comprised by the device, apparatus, or system, controls one or more controllable elements of such device, apparatus, or system.
- 10 The invention further applies to a device, apparatus, or system comprising one or more of the characterizing 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 characterizing features described in the description and/or shown in the attached drawings.
- 15 The various aspects discussed in this patent can be combined in order to provide additional advantages. Further, the person skilled in the art will understand that embodiments can be combined, and that also more than two embodiments can be combined. Furthermore, some of the features can form the basis for one or more divisional applications.

CLAIMS:

1. A system (2000) comprising a first system element (1000), which is mountable on a track (2100) of a track lighting system, wherein the first system element (1000) comprises:

- a connector element (1100) configured for a mechanical and electrical coupling with the track (2100), wherein the connector element (1100) is movable along the track (2100);

- an ionizer unit (1200), comprising an ionizer device (200), functionally coupled to the connector element (1100), wherein the ionizer device (200) is configured to generate ionized air (201), and wherein the ionizer device (200) is movable relative to the connector element (1100) in one plane or in two orthogonal planes,

wherein the first system element (1000) comprises a first control element (1070) configured to control a direction of an ion flow from the ionizer device (200); wherein the first control element (1070) comprises an electrical deflection element (211) configured to deflect an ion flow from the ionizer device (200).

2. The system (2000) according to claim 1, wherein the ionizer comprises a needle or a brush as an ion emitter.

3. The system (2000) according to claim 1 or 2, wherein the ionizer unit (1200) has the shape of a spotlight housing.

4. The system (2000) according to any one of the preceding claims, further comprising a sensor (1050); wherein the sensor (1050) comprises one or more sensors selected from the group comprising: a movement sensor, a presence sensor, a distance sensor, an ion sensor, a gas sensor, a volatile organic compound sensor, a pathogen sensor, an airflow sensor, a sound sensor, and a communication receiver (1057).

5. The system (2000) according to any one of the preceding claims, wherein the first control element (1070) further comprises an actuator configured to further control a movement of the ionizer device (200) relative to the connector element (1100).

6. The system (2000) according to any one of the preceding claims, wherein the first system element (1000) comprises a first system element housing (1080), wherein the first system element housing (1080) encloses at least part of the ionizer device (200), wherein the first system element housing (1080) further comprises an auxiliary light generating device (120), wherein the auxiliary light generating device (120) is configured to generate auxiliary device radiation (121) having one or more wavelengths selected from the range of 190-780 nm.

7. The system (2000) according to claim 6, wherein the auxiliary device is configured to generate auxiliary device radiation having one or more wavelengths selected from the range of 190-400 nm.

8. The system (2000) according to any one of the preceding claims, wherein the system (2000) comprises a track lighting system, wherein the system (2000) comprises the track (2100), and wherein the first system element (1000) is mounted to the track (2100).

9. The system (2000) according to claim 8, further comprising a second system element (4000), wherein the second system element (4000) comprises:

- a second system element connector element (4100) configured for a mechanical and electrical coupling with the track (2100);

- a second system element light generating device (4110) configured to generate second device radiation (4111) having one or more wavelengths selected from the range of 190-780 nm.

10. The system (2000) according to claim 9, wherein the second system element (4000) does not comprise an ionizer device (200), wherein the second system element (4000) comprises a second system element housing (4080) having a same shape as the first system element housing (1080), wherein in an operational mode the system (2000) is configured to generate visible light.

11. The system (2000) according to any one of the preceding claims, further comprising a surveillance system (300), wherein:

- the surveillance system (300) is configured to one or more of: (i) impose an action on one or more elements in dependence of one or more of a user interface, a sensor, and a timer, and (ii) monitor one or more elements;
- the one or more elements are selected from the group comprising: the ionizer device (200); the sensor (1050) as defined in claim 4; the first control element (1070) according to claim 1 or 5; the auxiliary light generating device (120) according to claim 6-7; the second system element light generating device (4110) according to any one of claims 9-10; a source of electrical power.

12. The system (2000) according to claim 11, wherein the surveillance system (300) comprises an optimization routine, wherein in dependence of a sensor signal of the sensor (1050), as defined in claim 4, a signaling device (1060) is configured to provide a signal.

13. The system (2000) according to any one of the preceding claims 11 or 12, wherein in an operational mode the surveillance system (300) is configured to control the ionizer device (200) in dependence of the sensor (1050) as defined in claim 4.

14. The system (2000) according to any one of the preceding claims, comprising a plurality of first system elements (1000) and optionally a plurality of second system elements (4000); wherein in an operational mode the system (2000) is configured to generate white light during an operational mode of the system (2000).

15. A kit of parts comprising first system element (1000) according to any one of the preceding claims and a track (2100), as defined in any one of the preceding claims, to which the first system element (1000) is mountable.

1/3

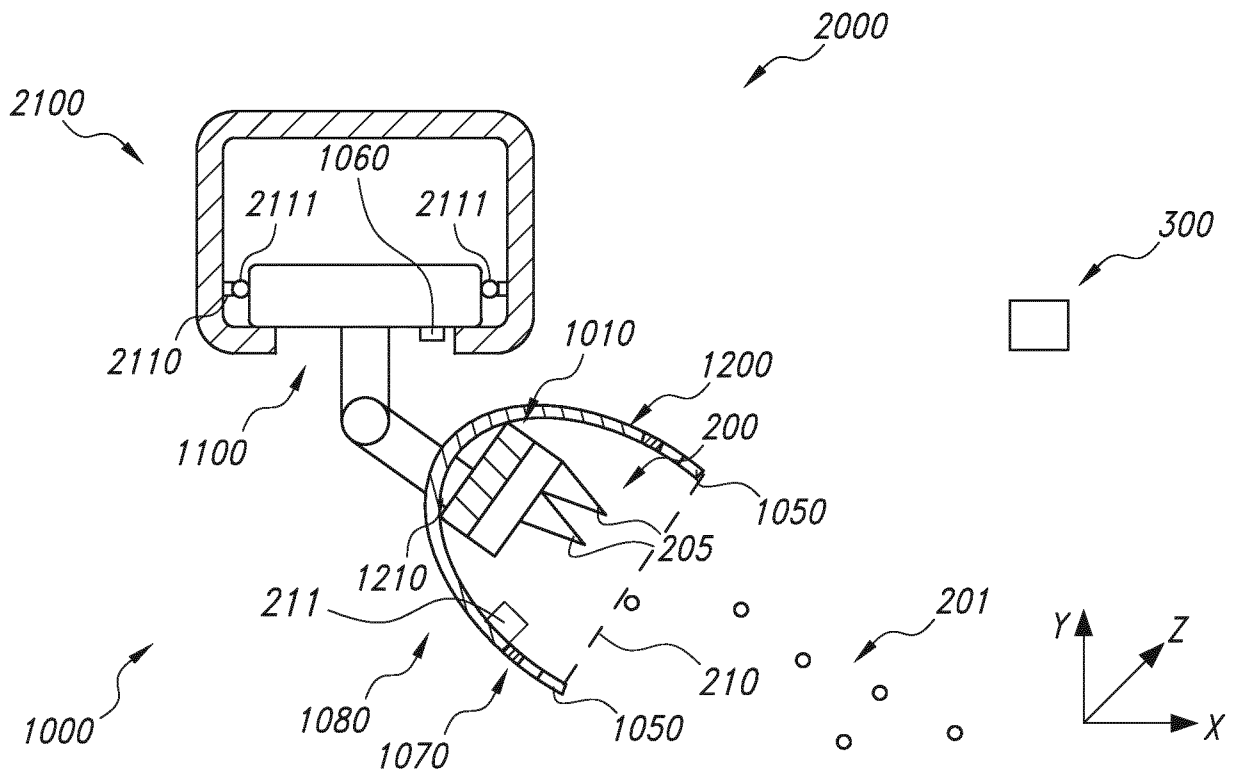


FIG. 1A

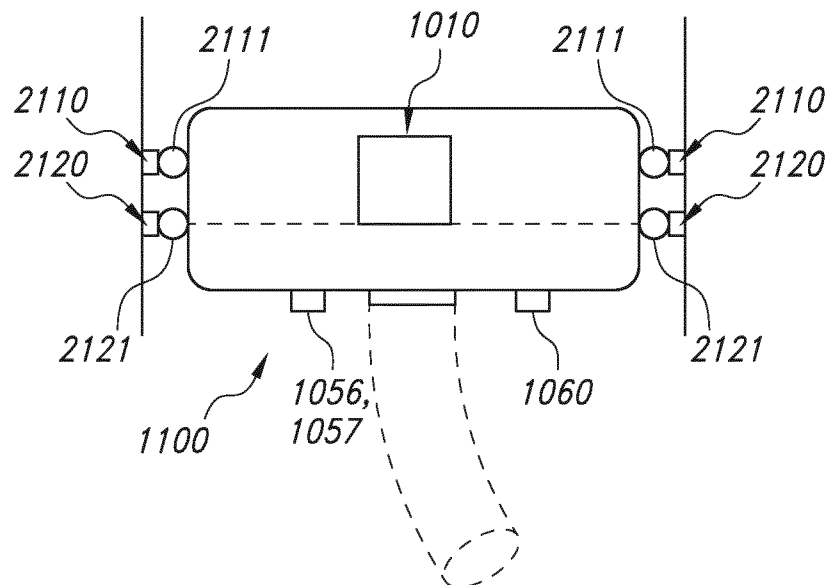


FIG. 1B

2/3

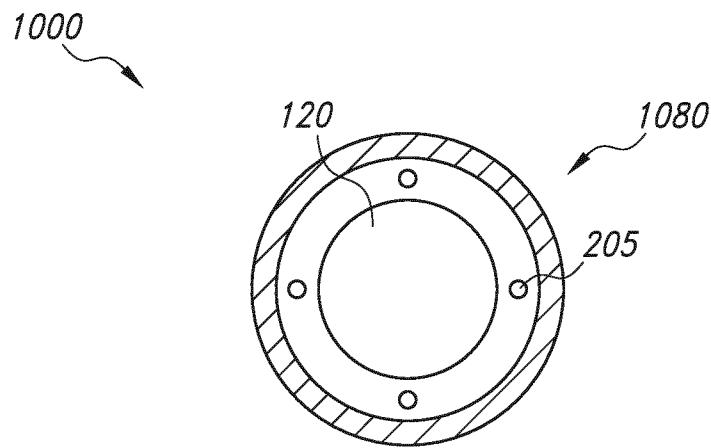


FIG. 1C

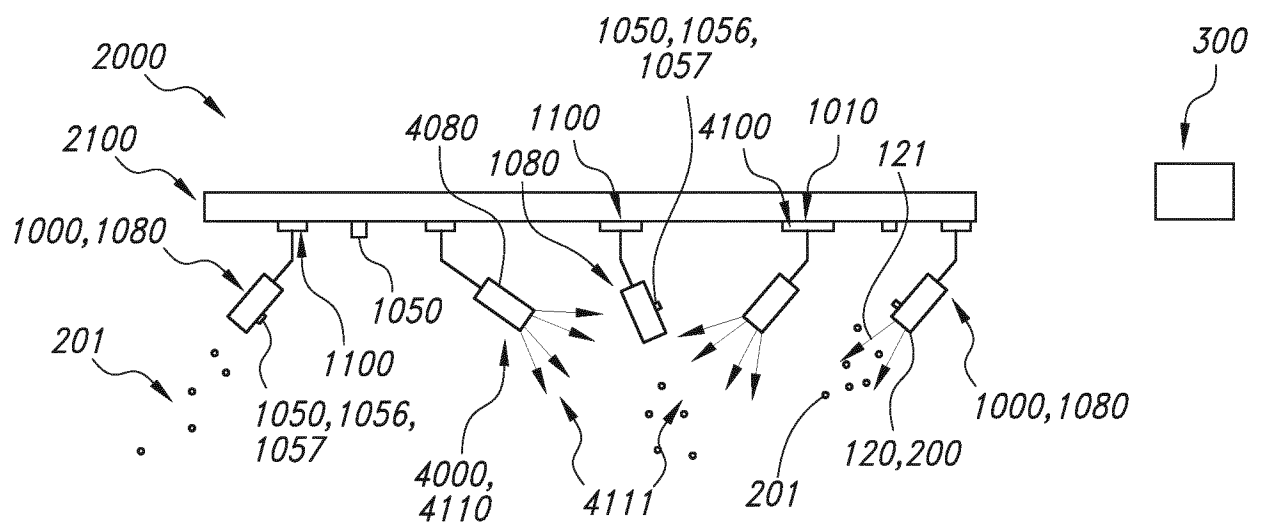


FIG. 1D

3/3

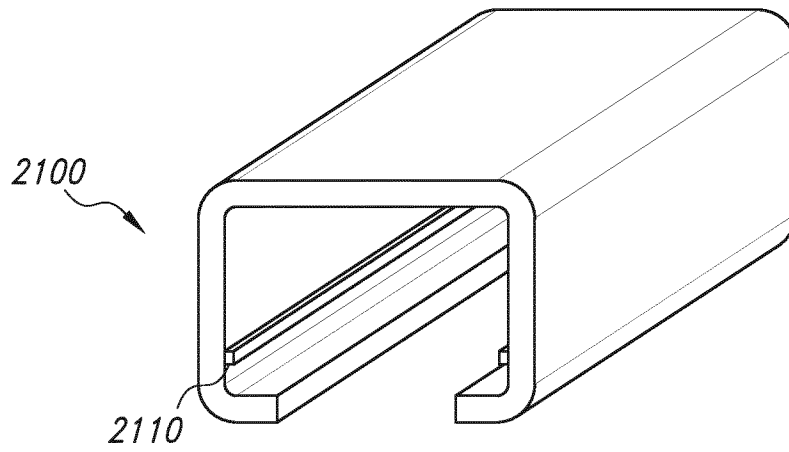


FIG. 2A

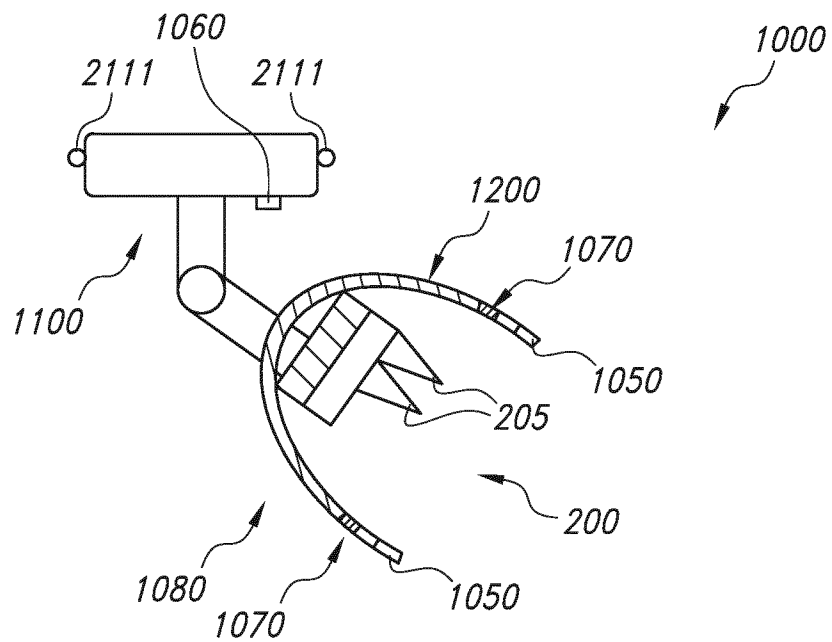


FIG. 2B

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/078495

A. CLASSIFICATION OF SUBJECT MATTER INV. A61L9/22 F21V21/00 F21S8/00 A61L9/20 ADD. 		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A61L F21V F21S		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2010/044589 A1 (GARCIA GUSTAVO [US] ET AL) 25 February 2010 (2010-02-25)	1, 3, 5, 8,
A	paragraphs [0036] - [0037], [0042], [0051], [0057]; figures -----	9, 14, 15 2
X	US 2016/195856 A1 (SPERO YECHEZKAL EVAN [IL]) 7 July 2016 (2016-07-07)	1-13, 15
X	EP 1 040 398 A2 (COLOR KINETICS INC [US]) 4 October 2000 (2000-10-04)	1, 3, 4, 8, 9, 11, 13, 15
A	paragraphs [0107] - [0110], [0184] - [0185], [0246] - [0256]; figures -----	2
☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 6 January 2022		Date of mailing of the international search report 17/01/2022
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Varga, Viktoria

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2021/078495

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2010044589 A1	25-02-2010	NONE	

US 2016195856 A1	07-07-2016	NONE	

EP 1040398 A2	04-10-2000	AU 1924199 A	05-07-1999
		EP 1040398 A2	04-10-2000
		ES 2666995 T3	09-05-2018
		WO 9931560 A2	24-06-1999
