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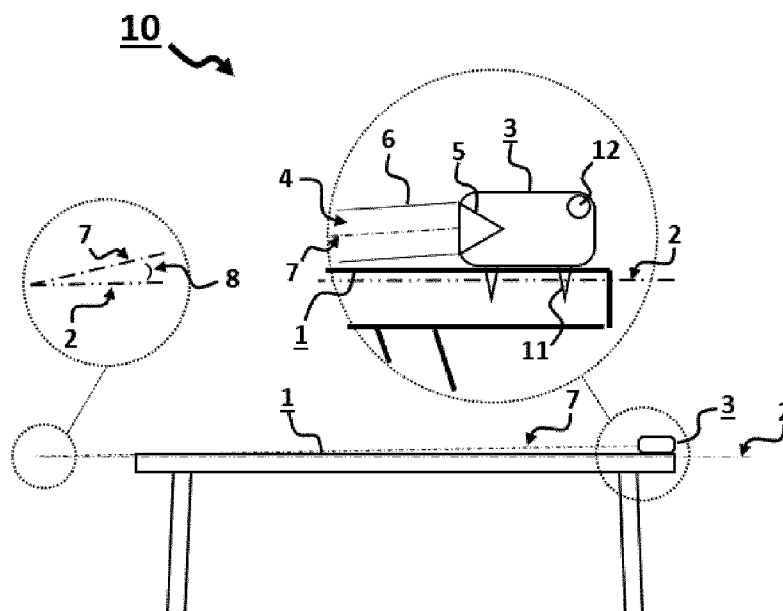


FIG. 1.

(57) Abstract: The invention provides a furniture comprising: a surface (1, 21) in a first plane; a lighting device for disinfecting the surface with a lighting characteristic; wherein the lighting device comprises a light output configured to project a beam of light (6, 26) along an optical axis (7, 27) to illuminate the surface in operation; wherein the beam of light comprises the lighting characteristic; wherein an angle between the optical axis and the first plane is at most 10 degrees.

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A furniture comprising a surface and a lighting device for disinfecting the surface

FIELD OF THE INVENTION

The invention relates to a furniture comprising a surface and a lighting device. The lighting device is arranged for disinfecting the surface with a lighting characteristic. The invention further relates to a corresponding method of disinfecting a surface of a furniture
5 with a lighting characteristic. The invention further relates to a kit of parts comprising an item of furniture and such a lighting device.

BACKGROUND OF THE INVENTION

The COVID-19 pandemic has been shaking the world in 2020. Said pandemic
10 has already shown that it may cause economic recession, and that it may disrupt the mental wellbeing of people as a consequence of social distancing measures. However, irrespective of COVID-19, the health and wellbeing of people has been contested periodically with other viruses and bacteria outbreaks already, such as for example the seasonal symptomatic influenza A/B outbreak, SARS, MERS, H1N1 and Bird Flu (Avian Influenza). Seasonal
15 symptomatic influenza A/B has for example proven to be a returning economic burden. Future outbreaks, epidemics, and pandemics are not excluded.

Consequently, to prevent economic loss and to improve health and wellbeing of people and/or animals, a clear need exists for health and wellbeing in for example the office domain, the public space and/or home. Such a need may at least partly be met by
20 disinfecting contaminated surfaces. For example, surfaces of furniture.

Namely, studies have shown that COVID-19 has a lifespan of 5 days on metal, glass and ceramics; 4 days on wood; 2 to 3 days on plastics and stainless steel. This also applies to Influenza and cold viruses. Influenza can for example survive 1-2 days on hard surfaces, while cold viruses only survive a few hours up to a day.

25 Surfaces may typically be disinfected manually with detergents. However, such manual disinfection is tedious, time-consuming, labor-intensive, undesired due to the use of chemicals, and copes with human cleaning errors. Alternatively, surfaces may be disinfected with ultraviolet (UV) illumination based disinfection devices, such as e.g. ceiling-mounted UV-C disinfection devices, UV-C robots, and/or free standing mobile UV-C lamps.

However, in order to disinfect contaminated surfaces in a space, such UV based disinfection devices need to be installed accurately and oriented properly. This is a tedious effort, because safety against UV-light exposure also has to be taken into account. Therefore, a clear need exists for more ergonomic, effective, efficient, less bulky, and less tedious means for disinfecting surfaces.

SUMMARY OF THE INVENTION

It is an object of the invention to provide an improved furniture, which at least alleviates the problems and disadvantages mentioned above. Thereto, the invention provides a furniture comprising: a surface in a first plane; a lighting device for disinfecting the surface with a lighting characteristic; wherein the lighting device comprises a light output configured to project a beam of light along an optical axis to illuminate the surface in operation; wherein the beam of light comprises the lighting characteristic; wherein an angle between the optical axis and the first plane is at most 10 degrees, wherein the furniture may comprise a cavity for housing at least part of the lighting device; wherein the light output may be configured to retractably extend from a first position within the cavity into a second position outside the cavity for projecting the beam of light along said optical axis to illuminate the surface in operation.

The furniture according to the invention comprises a surface in a first plane. This surface may require disinfection. Hence, the present invention is advantageously providing an auto-cleaning functionality to the furniture, because the furniture comprises a lighting device for disinfecting the furniture surface itself.

Moreover, since the light output of the lighting device projects a beam of light along an optical axis, wherein an angle between said optical axis and said first plane is at most 10 degrees, the beam of light is directed to the surface and not to the ambient. As a result of this, the surface may be disinfected effectively and efficiently, while e.g. UV-light exposure of the ambient is kept to a minimum, thereby improving safety during said auto-cleaning functionality.

Even further, due to the angle between said optical axis and said first plane being at most 10 degrees, the beam of light is automatically tailored to the furniture surface to be disinfected. Hence, in the present invention, there is no need for continuously determining a proper orientation for disinfecting said furniture surface. Even further, as the beam of light is particularly dedicated to the surface of the furniture, the surface may require less exposure time to the disinfecting lighting characteristic to disinfect the surface.

Moreover, an external line-of-sight to the projecting source of the possible undesired and/or harmful ultraviolet lighting may also be kept to a minimum.

In an embodiment, the angle between the optical axis and the first plane may be at most 5 degrees, or preferably at most 2 degrees. With decreasing angle between the optical axis and the first plane, the beam of light emitted by the light output of the lighting device may be even more tailored and confined to the surface of the furniture, thereby providing the advantages also mentioned above.

Moreover, in an embodiment, the first plane and the optical axis may be parallel (to each other). In such an embodiment, wherein the first plane and the optical axis are parallel, the optical axis may for example lay within the first plane, or may lay at a (geometrically) normal distance from the first plane. Said normal distance being at most 5 centimeters, preferably at most 2 centimeters, more preferably at most 1 centimeter, even more preferably at most 0.5 centimeter.

In an embodiment, the furniture may be one of: a table, a sofa, a bed, a chair, a door, a cabinet. Such items of furniture may require to be disinfected, because such items of furniture may be in contact with persons often. For example, according to the invention, the furniture may be a table, such as a desk in an office, which may advantageously be disinfected with said lighting characteristic. Similarly, the furniture may be a working bench in industry or agriculture, for example a working bench in a slaughterhouse (where many different shifts of people work alongside). Similarly, said furniture may be a reception counter or locker door.

In an embodiment, the surface may be an outer surface of the furniture. Such an outer surface may mean a surface in connection with, open to, and/or facing an ambient. Said ambient may e.g. be an open space, a room, the natural environment, etc. Such outer surfaces may require disinfection, because such outer surfaces may be in contact with persons and/or animals often.

In an embodiment, the lighting characteristic may be a spectral distribution comprising at least one of: Ultraviolet light; Ultra Deep UV in the range of 100 -190 nm; Deep UV light in the range of 190-220 nm; UV-C light in the range of 220-280 nm; UV-B light in the range of 280-315 nm; UV-A light in the range of 315-400 nm; UV light at 254 nm, deep blue light in the range 400-420 nm; deep blue light at 405 nm. Such UV spectra have proven to be successful in disinfecting air, objects, and/or surfaces. Alternatively, or additionally, in aspects, said lighting characteristic may be a spectral distribution comprising infrared (IR) light.

In examples, for safety, the lighting characteristic may comprise visible light for indicating the lighting device is in operation, i.e. projecting the beam of light along an optical axis to illuminate the surface.

5 As mentioned, the lighting device comprises the light output. The light output is configured to project the beam of light along an optical axis to illuminate the surface, when in operation. The light output may be phrased as light output body throughout the application.

10 In an embodiment, the light output may comprise at least one of: a LED light source, a LED strip, a TLED, a fluorescent tube, a conventional light source, a light guide, a mirror, a lens. For example, the LED light source may project the beam of light along said optical axis to illuminate the surface. In other examples, the lighting device may comprise a light source, of which light source light may be conveyed to the light output, so as to project the beam of light along said optical axis to illuminate the surface. Hence, the light output may in such examples be a light guide, a mirror, an optical arrangement, a louvre, or a lens.

15 In a further embodiment, related to ensure safety when projecting the beam of light along the optical axis to illuminate the surface, the lighting device may comprise an indicator light source for indicating the light output is in operation. In examples, the light output may comprise the indicator light source. The indicator light source may emit a visible indication light.

20 Thus, the indicator light source may be a visible light source. Hence, in an embodiment, in other words, the lighting device may comprise a visible light source for indicating an operational state of the light output. For example, the operational state may be the light output projecting the beam of light comprising the lighting characteristic. Said visible light source may emit visible light in operation of the light output of the lighting device, i.e. when projecting the beam of light along the optical axis to illuminate the surface.

25 In an embodiment, the lighting device may comprise a power socket and/or a data socket. Hence, the lighting device may advantageously host a functionality beyond lighting while being comprised by the furniture. Such a functionality may thus be being a power node and/or a data node.

30 As mentioned, the furniture according to the invention comprises a surface. The surface may require disinfection. The furniture also comprises the lighting device. It may be advantageous to conceal the lighting device when not in operation, thereby maintaining the integrity and/or functionality of the furniture to its core purpose of being an item of furniture. Hence, as mentioned, the furniture may comprise a cavity for housing at least part of the lighting device; wherein the light output may be configured to retractably extend from

a first position within the cavity into a second position outside the cavity for projecting the beam of light along said optical axis to illuminate the surface in operation. Because the light output is retractable, the lighting device and corresponding light output may be selectively used when requiring disinfection. When not in operation, the lighting device may be
5 concealed in the furniture, i.e. within the cavity.

In a further embodiment, the lighting device may comprise a push latch mechanism configured to extend said light output from the first position within the cavity into the second position outside the cavity upon a push-touch operation. In a further embodiment, the push latch mechanism may be configured to retract said light output from
10 the second position outside the cavity to the first position within the cavity upon a push-touch operation. Such a push latch mechanism may provide additional ergonomics to the use of the lighting device in the furniture. Moreover, in examples, the lighting device may control the light output to project the beam of light when in the second position.

In an embodiment, said light output of the lighting device is bound to extend
15 within an offset distance perpendicular to the first plane, wherein said offset distance is at most 10 centimeter. Said phrasing 'perpendicular to the first plane' may also be phrased as (geometrically) 'normal to the first plane'. Yet in a further embodiment, said offset distance is at most 2 centimeter. Such embodiments may be advantageous, because the light output is kept unobtrusively in operation, yet effectively in disinfecting surface of the furniture.

20 In an embodiment, the beam of light comprises a beam width of at least 2 centimeter, at least 4 centimeter, at least 10 centimeter, at least 60 centimeter, at least 90 centimeter, at least 100 centimeter, or at least 120 centimeter.

In an embodiment, the light output may be configured to project at least one further beam of light along at least one further optical axis to illuminate the surface in
25 operation; wherein the at least one further beam of light comprises the lighting characteristic; wherein an angle between the at least one further optical axis and the first plane is at most 10 degrees. Hence, the light output may project a plurality of beams along optical axes to illuminate the surface in operation. For example, the beam of light and the at least one further beam of light may be projected in different directions. For example, the beam of light and the
30 at least one further beam of light may be projected in opposite directions. The lighting device may thereby for example be mounted in a center of the surface.

In an embodiment, the light output may be configured to rotatably project beam of light along the optical axis to illuminate the surface in operation. Hence, the light

output may disinfect the surface by providing a sweeping light over the surface due to the rotatable arrangement.

Hence, in examples, phrased differently, the light output may be rotatable and configured to project the beam of light along the optical axis to illuminate a first part of the surface in operation and rotate further so as to project the beam of light along the optical axis to illuminate a second part of the surface in operation.

In an embodiment, the light output may comprise a top surface; wherein the top surface of the light output is in the first plane and in alignment with the surface of the furniture, when the light output is in the first position within the cavity. Such an embodiment may be advantageous in concealing the light output of the lighting device in the furniture.

In an embodiment, the light output may be configured to control the angle between the optical axis and the first plane; wherein lighting device may be configured to select a lighting characteristic and control the light output to control the angle between the optical axis and the first plane based on the selected lighting characteristic. Such an embodiment may be advantageous, because the angle between the optical axis and the first plane may be controlled in dependence of the selected lighting characteristic for the purpose of safety. For example, when selecting a lighting characteristic comprising a spectral distribution with a more hazardous near UV-C light, the angle may be set to a lower value compared to the spectral distribution being less hazardous far UV-C light (e.g. at 222 nm).

In an embodiment, the lighting device may control the light output to project the beam of light along the optical axis to illuminate the surface, when in the second position outside the cavity after a delay time. The delay time may e.g. be one second, at least five seconds, at least ten seconds, at least one minute, at least two minutes, at most 5 minutes.

For safety purposes, in an embodiment, the lighting device may comprise a sensor for receiving an input indicative of people presence in proximity to the furniture, wherein the lighting device may be configured to stop projecting the beam of light upon receiving said input.

In an embodiment, the furniture may comprise a mounting slot, and the lighting device is detachably mounted to the mounting slot. Such an embodiment may allow items of furniture to be equipped with a lighting device according to the invention. Moreover, such an embodiment enables maintenance and serviceability of the lighting device comprised by the furniture according to the invention. Moreover, furniture may be built up of parts to facilitate logistics. Therefore, having a lighting device being detachable will similarly facilitate packaging and logistics of the furniture.

In examples, the lighting device may comprise a controller for performing control actions related to controlling the light output, related to receiving control commands and/or instructions, related to receiving sensor input, related to setting delay times, related to setting control parameters, related to receiving a user input, etc.

5 It is a further object of the invention to provide a kit of parts, which at least alleviates the problems and disadvantages mentioned above. Thereto, the invention further provides a kit of parts comprising an item of furniture comprising a surface in a first plane and a lighting device according to the invention, wherein the lighting device is connectable to said item of furniture; wherein the lighting device comprises a light output configured to
10 project a beam of light along an optical axis to illuminate the surface in operation; wherein the beam of light comprises the lighting characteristic; wherein an angle between the optical axis and the first plane is at most 10 degrees. Thereby, the advantages and/or embodiments applying to the furniture according to the invention may also apply mutatis mutandis to the kit of parts according to the invention.

15 It is a further object of the invention to provide an improved method, which at least alleviates the problems and disadvantages mentioned above. Thereto, the invention further provides a method of disinfecting a surface of a furniture with a lighting characteristic, wherein the furniture comprises the surface and a lighting device comprising a light output, wherein the surface is in a first plane, wherein the method comprises: the light
20 output of the lighting device projecting a beam of light along an optical axis to illuminate the surface; wherein the beam of light comprises the lighting characteristic; wherein an angle between the optical axis and the first plane is at most 10 degrees; wherein, the lighting device comprises a push latch mechanism, wherein the method comprises: the push latch mechanism extending said light output from the first position within the cavity into the second position
25 outside the cavity upon a push-touch operation; and/or the push latch mechanism retracting said light output from the second position outside the cavity to the first position within the cavity upon a push-touch operation. Thereby, the advantages and/or embodiments applying to the furniture according to the invention may also apply mutatis mutandis to the method according to the invention.

30 In an embodiment, the furniture according to the invention may comprise an indicator means for indicating an operational status of the lighting device. Said operational status may be the lighting device being in operation, i.e. the lighting output projecting the beam of light along said optical axis for illuminating said surface. The indicator means may be a lighting unit. The lighting unit may provide an indicator output, such as e.g. visible light.

The visible light may further comprise colored light, modulating light, a light pattern, a blinking light, etc. Since the indicator means may be comprised by the furniture itself, the furniture may be clearly indicative of the operation of the lighting device according to the invention. For example, the indicator means may be present at a corner location of the
5 furniture. In examples, the location of the indicator means may be different to a location of the lighting device of the furniture. In other examples, the indicator means may e.g. be a transceiver, which may e.g. provide push notification messages to nearby devices when the lighting device being in operation.

10 BRIEF DESCRIPTION OF THE DRAWINGS

The invention will now be further elucidated by means of the schematic non-limiting drawings:

Fig. 1 depicts schematically an embodiment of a furniture according to the invention;

15 Fig. 2 depicts schematically an embodiment of a furniture according to the invention;

Fig. 3 depicts schematically an embodiment of a method according to the invention.

20 DETAILED DESCRIPTION OF THE EMBODIMENTS

To improve health and wellbeing of people and/or animals, a clear need exists for health and wellbeing in for example the office domain, the public space and/or home. Such a need may at least partly be met by disinfecting contaminated surfaces. For example, surfaces of furniture. Therefore, a clear need exists for more ergonomic, effective, efficient,
25 and less tedious means for disinfecting surfaces. The present invention provides an improved furniture, kit of parts, and methods for disinfecting a surface with a lighting characteristic projected by a light output of a lighting device.

Figure 1 depicts schematically, by non-limiting example, an embodiment of a furniture 10. The furniture 10 is a table. The furniture comprises a surface 1 in a first plane 2.
30 Here, the surface 1 is the tabletop of the table. This surface 1, i.e. the tabletop, may get contaminated with e.g. viral matter, bacteria, fungi, and/or contagious contaminants. Hence, the surface 1, i.e. the tabletop, may require disinfection. Alternatively, the furniture may be one of: a sofa, a bed, a chair, a door, a cabinet.

Therefore, the furniture 10 comprises a lighting device 3. The lighting device 3 is arranged for disinfecting the surface 1 with a particular lighting characteristic 4. Here, the lighting characteristic 4 comprises ultraviolet (UV) light, more specifically the lighting characteristic is a spectral distribution comprising at least UV-C light. In an example, said lighting characteristic may be UV-C light at 222 nm. Such 222 nm wavelength light may be safe to people.

Alternatively, the lighting characteristic may be a spectral distribution comprising at least one of: Ultraviolet light; Ultra Deep UV in the range of 100 -190 nm; Deep UV light in the range of 190-220 nm; UV-C light in the range of 220-280 nm; UV-B light in the range of 280-315 nm; UV-A light in the range of 315-400 nm; UV light at 254 nm, deep blue light in the range 400-420 nm; deep blue light at 405 nm. Yet alternatively, or additionally, said lighting characteristic may comprise a spectral distribution comprising infrared light. Additionally, said lighting characteristic may comprise a spectral distribution comprising visible light. The latter being a safety measure for indicating the operation of the lighting device when disinfecting the surface of the furniture.

Though optional: Figure 1 depicts that the furniture 10 comprises a mounting slot 11 for connecting the lighting device 3 to the surface 1. Thereby, said lighting device 3 may be mounted to the mounting slot 11. Here, said lighting device 3 is detachably mounted to said mounting slot, and thus to the furniture 10. Hence, the lighting device 3 may be detachably connected to the furniture 10.

Referring to figure 1, the lighting device 3 comprises a light output 5. Here, the light output 5 is a LED light source. The light output may comprise an elongated shape matching at least half the width of the table. The LED light source may optionally comprise integrated optics for rendering, controlling and/or shaping a beam. The light output 5 may be phrased as light output body 5. In operation, the light output 5 projects a beam of light 6 along an optical axis 7 to illuminate the surface 1. The beam of light 6 comprises the lighting characteristic 4, i.e. the ultraviolet light comprising UV-C. Therefore, the beam of light 6 disinfects the tabletop surface 1 of the furniture 10. The beam of light 6 may comprise a beam width corresponding to the width of the tabletop of the furniture 10.

Alternatively, in examples, the light output may comprise at least one of: a LED strip, a TLED, a fluorescent tube, a conventional light source, a light guide, a mirror, a lens. The light output may e.g. be, or comprise, a conventional discharge lamp, such as a mercury discharge lamp. The light output may e.g. be, or comprise, a fluorescent tube or incandescent lamp; for example, with a phosphor coating to generate properties of the

lighting characteristic. For example, the light output may comprise In some examples, the lighting device may comprise a light source, of which light source light may be conveyed to the light output, so as to project the beam of light along said optical axis to illuminate the surface. Hence, the light output may in such examples be a light guide, a mirror, an optical arrangement, a louvre, or a lens.

Alternatively, the light output may be configured to rotatably project beam of light along the optical axis to illuminate the surface in operation. This may reduce the size of the lighting device, but still enable respective parts of the surface to be disinfected by projecting a beam of light along an optical axis to illuminate these respective parts of the surface of the furniture.

Moreover, still referring to figure 1, the angle 8 between the optical axis 7 and the first plane 2 is at most ten degrees, such that the beam of light 6 is confined to the surface 1. In alternative embodiments, said angle between the optical axis and the first plane is at most 5 degrees, or at most 2 degrees. Yet alternatively, said optical axis and the first plane may be parallel with respect to each other. Hence, a narrow film-shaped beam is projected along and onto the surface 1.

Namely, the present invention is advantageously providing an auto-cleaning functionality to the furniture 10, because the furniture 10 comprises a lighting device 3 for disinfecting the furniture surface 1 itself. Moreover, since the light output 5 of the lighting device 3 projects the beam of light 6 along an optical axis 7, wherein the angle 8 between said optical axis 7 and said first plane 2 is at most ten degrees, the beam of light 6 is directed to the surface 1 and not to the ambient. As a result of this, the surface 1 may be disinfected effectively and efficiently, while e.g. UV-light exposure of the ambient is kept to a minimum, thereby improving safety during said auto-cleaning functionality. Even further, due to the angle 8 between said optical axis 7 and said first plane 2 being at most ten degrees, the beam of light 6 is automatically tailored to the furniture surface 1 to be disinfected. Hence, in the present invention, there is no need for continuously determining a proper orientation for disinfecting said furniture surface. Even further, as the beam of light 6 is particularly dedicated to the surface 1 of the furniture 10, the surface may require less exposure time to the disinfecting lighting characteristic 4 to disinfect the surface 1.

Though optionally, and not necessary, but still referring to figure 1, the lighting device 3 comprises a sensor 12. The sensor 12 is a presence sensor, and may alternatively be a proximity sensor and/or receiver. The sensor 12 receives an input indicative of people presence in proximity to the furniture. The sensor may for example sense such an

input itself, or receive at least part of such input from an external device. Here, the lighting device 3 stops projecting the beam of light 6 upon receiving said input.

In examples, not depicted, the lighting device may comprise a visible light source for indicating the operational state of the light output, i.e. projecting said beam of light along the optical axis to illuminate the surface of the furniture with the disinfecting lighting characteristic. The visible light source may e.g. emit visible light, such as red light, or white blinking light, so as to indicate that the lighting device is in operation. Said visible light source may be part of the light output. The light output may also project said visible light.

In an embodiment, not explicitly depicted, but similar to the embodiment as depicted in figure 1, a kit of parts is provided. The kit of parts first comprises an item of furniture comprising a surface. For example, the table of the embodiment depicted in figure 1 with the respective tabletop, but without the lighting device. The kit of parts secondly comprises the lighting device as depicted in the embodiment of figure 1. Hence, since said lighting device is detachably mountable to said table, i.e. the item of furniture, said two parts of the kit of part may be assembled to become the embodiment depicted in figure 1.

In an embodiment, not explicitly depicted, but similar to the embodiment as depicted in figure 1, the light output controls the angle between the optical axis and the first plane. The lighting device is thereby configured to select a lighting characteristic and control the light output to control the angle between the optical axis and the first plane based on the selected lighting characteristic. Such an embodiment may be advantageous, because the angle between the optical axis and the first plane may be controlled in dependence of the selected lighting characteristic for the purpose of safety. For example, when selecting a lighting characteristic comprising a spectral distribution with a more hazardous near UV-C light, the angle may be set to a lower value compared to the spectral distribution being less hazardous far UV-C light (e.g. at 222 nm).

Moreover, in examples throughout, the lighting device may comprise a user interface for setting and/or selecting the lighting characteristic. The lighting device may similarly comprise a receiver for receiving a setting and/or selection of the lighting characteristic.

Figure 2 depicts schematically, by non-limiting example, an embodiment of a furniture 20. The furniture 20 is a table, but may alternatively be any other furniture mentioned in this application comprising a surface. Only a part of the table is depicted for convenience in figure 2. The furniture 20 comprises a surface 21 in a first plane 22, namely a

tabletop. This surface 21 may get contaminated with e.g. viral matter, bacteria, and/or contagious contaminants. Hence, the surface 21, i.e. the tabletop, may require disinfection.

Therefore, the furniture 20 comprises a cavity 29 and a lighting device 23. The lighting device 23 is arranged within the cavity 29, more specifically housed by the cavity 29.

5 The lighting device 23 comprises a light output (body) 25. The light output 25 comprises a LED light source, but may alternatively comprise at least one of: a LED strip, a TLED, a fluorescent tube, a conventional light source, incandescent light source, a light guide, a mirror, a lens. The LED light source may optionally comprise integrated optics for rendering, controlling and/or shaping a beam.

10 Referring to figure 2, the light output (body) 25 is configured to retractably extend from a first position within the cavity 29 (referred to as depicted situation I in figure 2) into a second position outside the cavity 29 (referred to as depicted situation II in figure 2). In the second position, in operation, the light output 25 of the lighting device 23 is arranged for projecting a beam of light 26 along an optical axis 27 to illuminate the surface 21. The
15 angle between the optical axis 27 and the first plane 21 is at most one degrees, hence the optical 27 and the first plane are substantially parallel in the present embodiment. Alternatively, said angle between the optical axis and the first plane may be at most ten degrees.

The beam of light 26 comprises a lighting characteristic 24. The lighting
20 characteristic is UV-C light. In an example, said lighting characteristic may be UV-C light at 222 nm. Such 222 nm wavelength light may be safe to people. Therefore, the beam of light 26 disinfects the tabletop surface 21 of the furniture 20. The beam of light 26 may comprise a beam width corresponding to a part of the width of the tabletop of the furniture 20.

Alternatively, the lighting characteristic may be a spectral distribution
25 comprising at least one of: Ultraviolet light; Ultra Deep UV in the range of 100 -190 nm; Deep UV light in the range of 190-220 nm; UV-C light in the range of 220-280 nm; UV-B light in the range of 280-315 nm; UV-A light in the range of 315-400 nm; UV light at 254 nm, deep blue light in the range 400-420 nm; deep blue light at 405 nm.

For example, in an embodiment, not depicted, the lighting device comprises a
30 light source emitting light source light comprising the lighting characteristic. The light source light is subsequently conveyed to the light output, so as to project the light source light as the beam of light along the optical axis to the surface. The light output may therefore be an optic, a mirror, a light guide, or a reflector. Since the light source generating the light source light

may remain within the cavity, the light output may be limited in size, so as to project the beam of light less obtrusively onto the surface.

Still referring to figure 2, more specifically, the lighting device 23 comprises a push latch mechanism 33 to extend said light output 25 from the first position within the cavity 29 (referred to as depicted situation I in figure 2) into the second position outside the cavity 29 (referred to as depicted situation II in figure 2) upon a push-touch operation. And/or: Said push latch mechanism 33 is arranged to retract said light output 25 from the second position outside the cavity 29 (referred to as depicted situation II in figure 2) into the first position inside the cavity 29 (referred to as depicted situation I in figure 2) upon a push-touch operation (i.e. a second, another push-touch operation relative to the push-touch operation extending the light output 25). Such a push touch operation may be ergonomic, but not particularly necessary.

Alternatively, the lighting device may comprise other means for extracting and retracting the light output (body) from the cavity. For example, the lighting device may comprise electronic means to extend and retract the light output.

Still referring to figure 2, the light output 25 of the lighting device 23, when in the second position (referred to as depicted situation II in figure 2) outside the cavity 29, is bound to extend within an offset distance 34 perpendicular to the first plane 21. Here, said offset distance is four centimeters, but may alternatively be at most ten centimeter, or at most two centimeters, or at most one centimeter. Moreover, optionally: The light output (body) 25 comprises a top surface 35. When in the first position (referred to as depicted situation I in figure 2) inside the cavity 29, the top surface 35 is in the first plane 22 and in alignment with the surface 21 of the furniture 20.

Still referring to figure 2, in an embodiment, the lighting device may control the light output to project the beam of light along the optical axis to illuminate the surface, when in the second position outside the cavity after a delay time. The delay time is here two seconds, but may alternatively be one second, at least five seconds, at least ten seconds, at least one minute, at least two minutes, at most 5 minutes.

Figure 3 depicts schematically, by non-limiting example, a method 30 according to the invention. Said method may for example be performed by the embodiment of a furniture depicted in figure 2. Said method 30 relates to disinfecting a surface of a furniture with a lighting characteristic. The furniture comprises the surface, and comprises a lighting device comprising a light output. The furniture may e.g. be a table, or alternatively any other item of furniture mentioned in the present application. The surface of the furniture

is in a first plane. The method comprises a step 31 of the light output of the lighting device projecting a beam of light along an optical axis to illuminate the surface; wherein the beam of light comprises the lighting characteristic; wherein an angle between the optical axis and the first plane is at most ten degrees.

- 5 Moreover, in a further embodiment in which the furniture comprises a cavity for housing the lighting device, the method may additionally comprise a step 32 of extending said light output from a first position within the cavity into a second position outside the cavity, for example upon a push-touch operation. The method may comprise a step 33 of
- 10 retracting said light output from the second position outside the cavity to the first position within the cavity upon a push-touch operation

CLAIMS:

1. A furniture comprising:
 - a surface in a first plane;
 - a lighting device for disinfecting the surface with a lighting characteristic;wherein the lighting device comprises a light output configured to project a
5 beam of light along an optical axis to illuminate the surface in operation;
wherein the beam of light comprises the lighting characteristic;
wherein an angle between the optical axis and the first plane is at most 10
degrees,
wherein the furniture comprises a cavity for housing at least part of the
10 lighting device;
wherein the light output is configured to retractably extend from a first
position within the cavity into a second position outside the cavity for projecting the beam of
light along said optical axis to illuminate the surface in operation.
- 15 2. The furniture according to claim 1, wherein the lighting device comprises a
push latch mechanism configured to extend said light output from the first position within the
cavity into the second position outside the cavity upon a push-touch operation.
3. The furniture according to claim 2, wherein the push latch mechanism is
20 configured to retract said light output from the second position outside the cavity to the first
position within the cavity upon a push-touch operation.
4. The furniture according to any one of the preceding claims 1-3, wherein said
light output of the lighting device is bound to extend within an offset distance perpendicular
25 to the first plane, wherein said offset distance is at most 10 centimeter.
5. The furniture according to claim 4, wherein said offset distance is at most 2
centimeter.

6. The furniture according to any one of the preceding claims 1-5, wherein the light output comprises a top surface;
wherein the top surface of the light output is in the first plane and in alignment with the surface of the furniture, when the light output is in the first position within the
5 cavity.
7. The furniture according to any one of the preceding claims, wherein the surface is an outer surface of the furniture.
- 10 8. The furniture according to any one of the preceding claims, wherein the furniture is one of: a table, a sofa, a bed, a chair, a door, a cabinet.
9. The furniture according to any one of the preceding claims, wherein the lighting characteristic is a spectral distribution comprising at least one of: Ultraviolet light;
15 Ultra Deep UV in the range of 100 -190 nm; Deep UV light in the range of 190-220 nm; UV-C light in the range of 220-280 nm; UV-B light in the range of 280-315 nm; UV-A light in the range of 315-400 nm; UV light at 254 nm, deep blue light in the range 400-420 nm; deep blue light at 405 nm.
- 20 10. The furniture according to any one of the preceding claims, wherein the furniture comprises a mounting slot, and the lighting device is detachably mounted to the mounting slot.
11. The furniture according to any one of the preceding claims, wherein the light
25 output comprises at least one of: a LED light source, a LED strip, a TLED, a fluorescent tube, a conventional light source, a light guide, a mirror, a lens.
12. The furniture according to any one of the preceding claims, wherein the lighting device comprises a sensor for receiving an input indicative of people presence in
30 proximity to the furniture, wherein the lighting device is configured to stop projecting the beam of light upon receiving said input.
13. A method of disinfecting a surface of a furniture with a lighting characteristic, wherein the furniture comprises the surface and a lighting device comprising a light output,

wherein the surface is in a first plane, wherein the method comprises:

- the light output of the lighting device projecting a beam of light along an optical axis to illuminate the surface;

wherein the beam of light comprises the lighting characteristic;

5 wherein an angle between the optical axis and the first plane is at most 10 degrees;

wherein the lighting device comprises a push latch mechanism, wherein the method comprises:

10 - the push latch mechanism extending said light output from the first position within a cavity into the second position outside the cavity upon a push-touch operation; and/or

- the push latch mechanism retracting said light output from the second position outside the cavity to the first position within the cavity upon a push-touch operation.

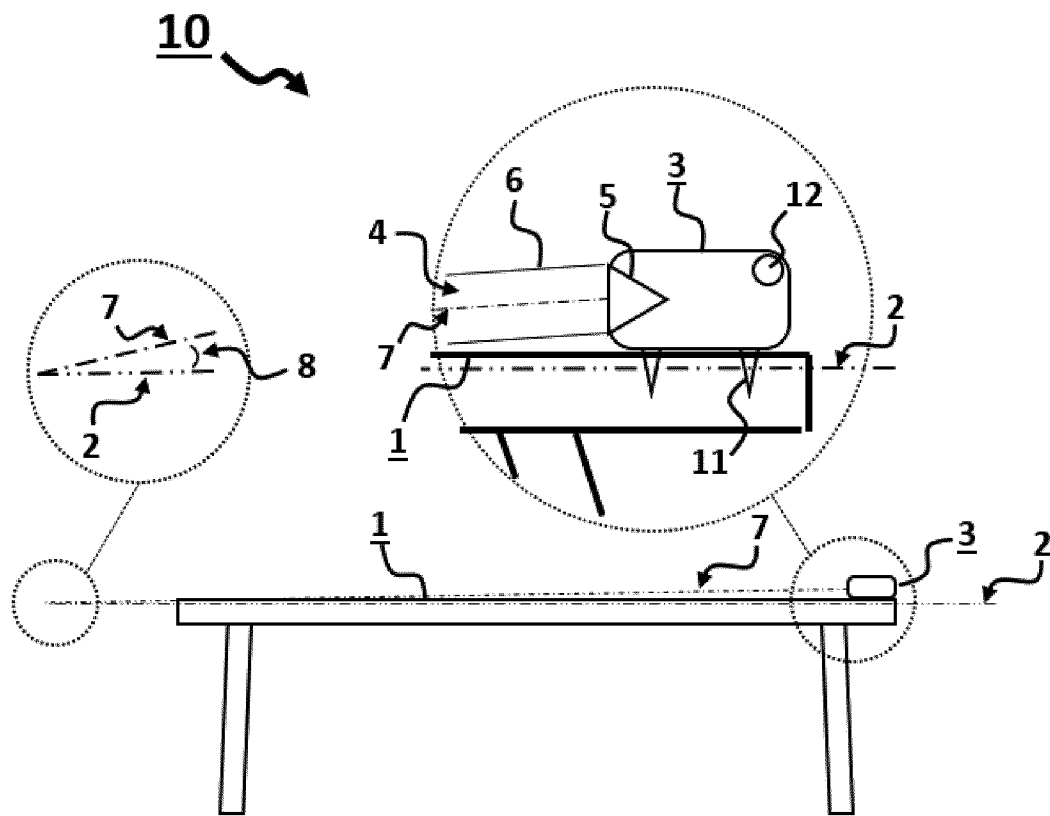


FIG.1.

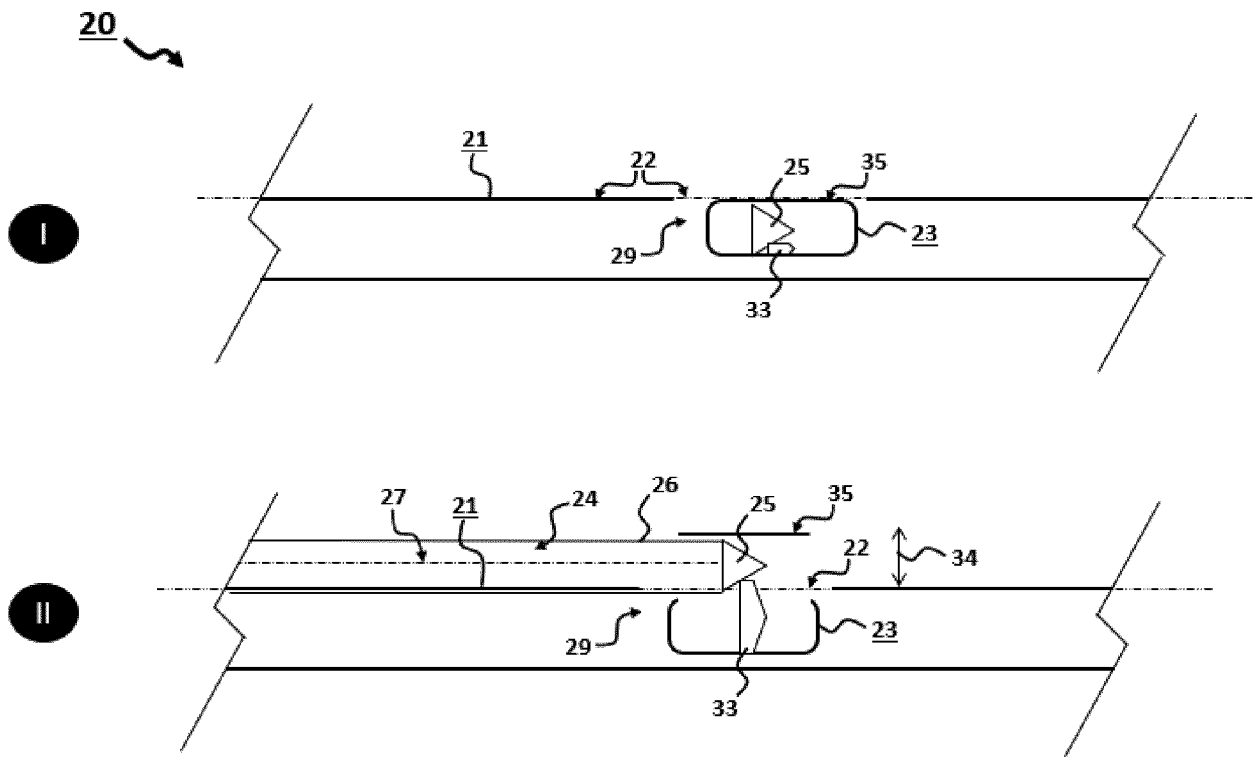


FIG.2.

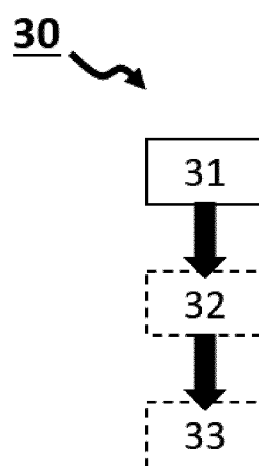


FIG.3.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2021/081006

A. CLASSIFICATION OF SUBJECT MATTER INV. A47B97/00 F24F3/16 A47C1/00 ADD. A47B13/16		
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) A47B F24F A47D A47C		
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, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	CN 211 483 737 U (FOSHAN XINJINFENG TECH CO LTD) 15 September 2020 (2020-09-15) figures 1-2 claims 1-6 paragraphs [0020] - [0021] -----	1, 4, 5, 7-12 2, 3, 6, 13
A	CN 203 399 869 U (UNIV CHUZHOU) 22 January 2014 (2014-01-22) figures 1-2 paragraph [0024] -----	1-13
A	US 2017/071332 A1 (HERRING JASON BRIAN ET AL) 16 March 2017 (2017-03-16) paragraphs [0054] - [0060] figures 4, 7, 9 ----- -/-	1-13
☒ 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 2 February 2022		Date of mailing of the international search report 10/02/2022
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 de Cornulier, P

INTERNATIONAL SEARCH REPORT

International application No

PCT/EP2021/081006

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 9 124 056 B1 (DOUG MOCKETT & COMPANY INC) 1 September 2015 (2015-09-01) figure 2 column 2, lines 38-40 -----	1-13

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2021/081006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
CN 211483737	U	15-09-2020	NONE	

CN 203399869	U	22-01-2014	NONE	

US 2017071332	A1	16-03-2017	NONE	

US 9124056	B1	01-09-2015	NONE	
