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Title of invention	Mask with flow-controlled UV light intensity sterilization
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ABSTRACT

A mask has conduit flow paths extending from a distal port to a muffler at a face mask. Germicidal UV lights irradiate the flow paths. A vented intake with a vortex generator covers each distal port. The muffler and intake block UV light emission to the user and ambient environment. A sensor detects a flow rate parameter. LED illumination is controlled by a controller implementing PWM according to sensor output, with maxximum sustained illumination during peak flow rate and no illumination when flow ceases.

Fig.1

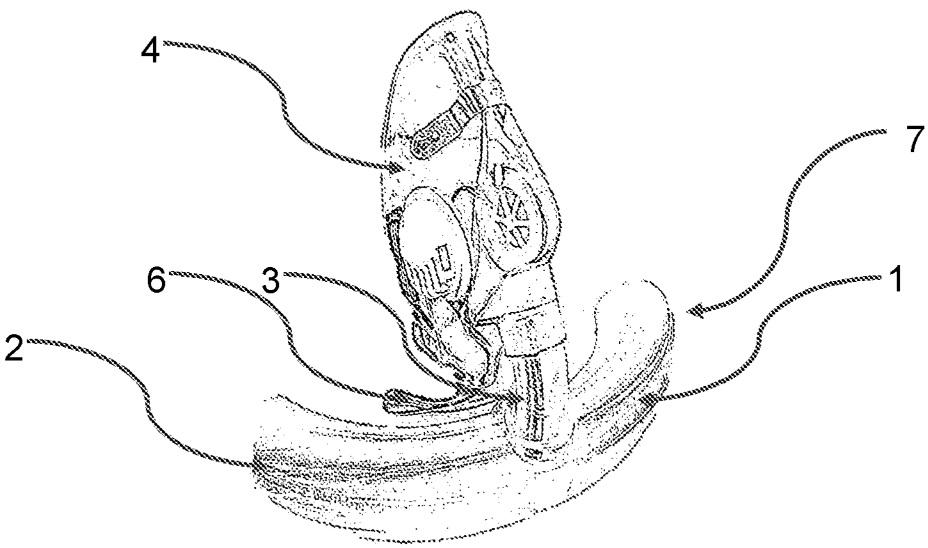


Fig. 2

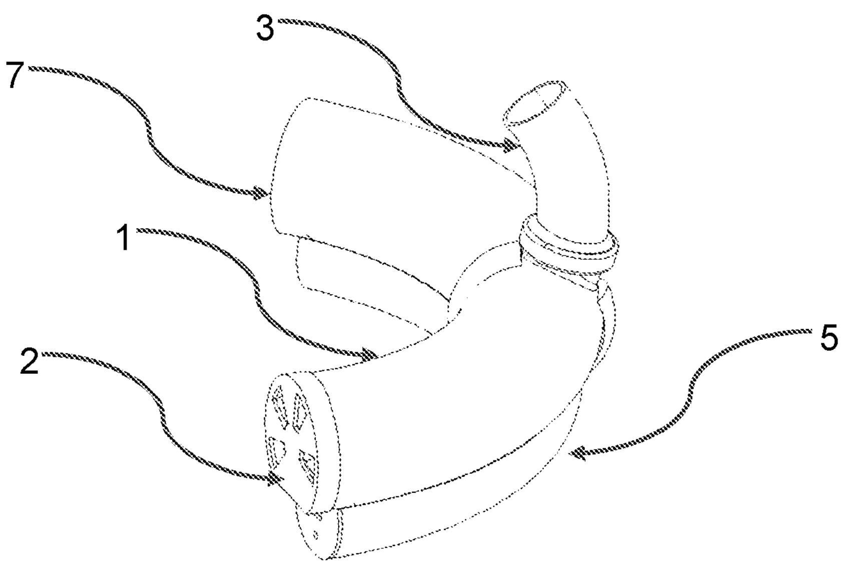


Fig.3

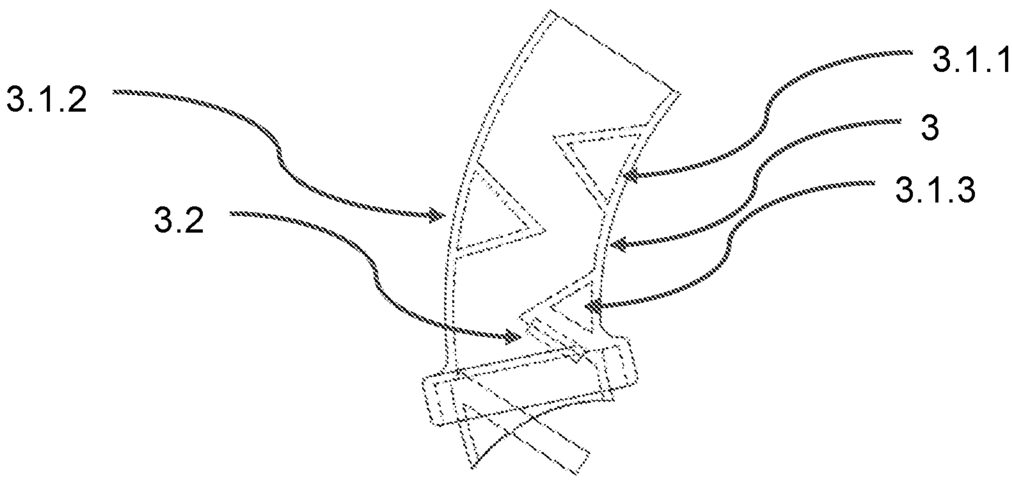


Fig.4

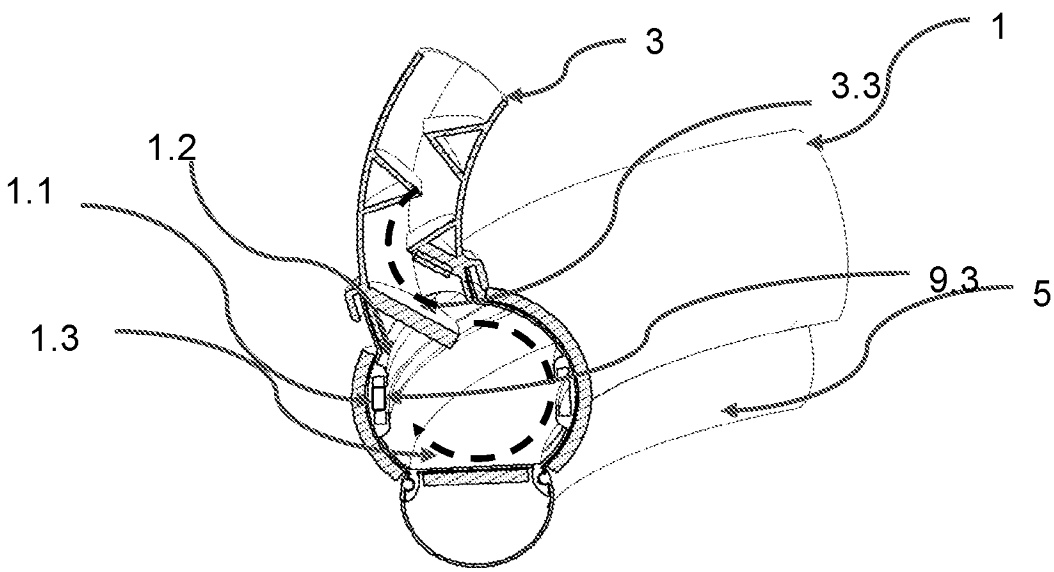


Fig.5

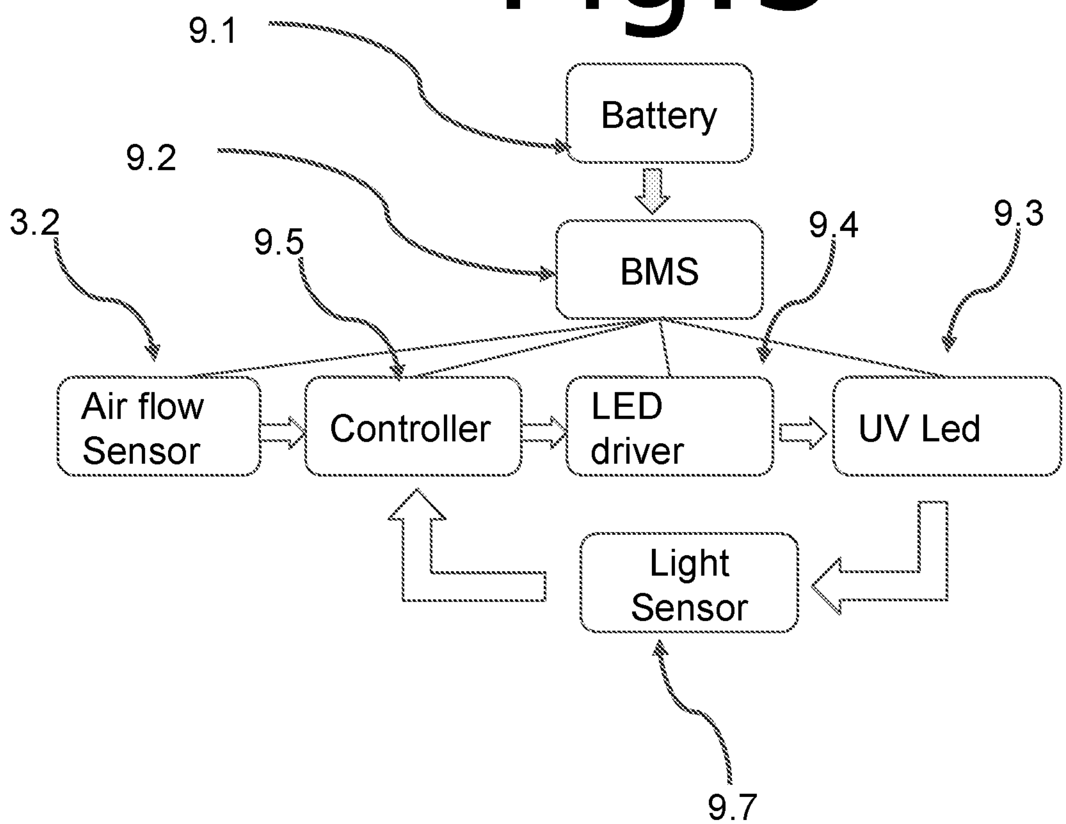

9.1
Battery
9.2
BMS
3.2
9.5
9.4
9.3
Air flow Sensor
Controller
LED driver
UV Led
Light Sensor
9.7

Fig.6

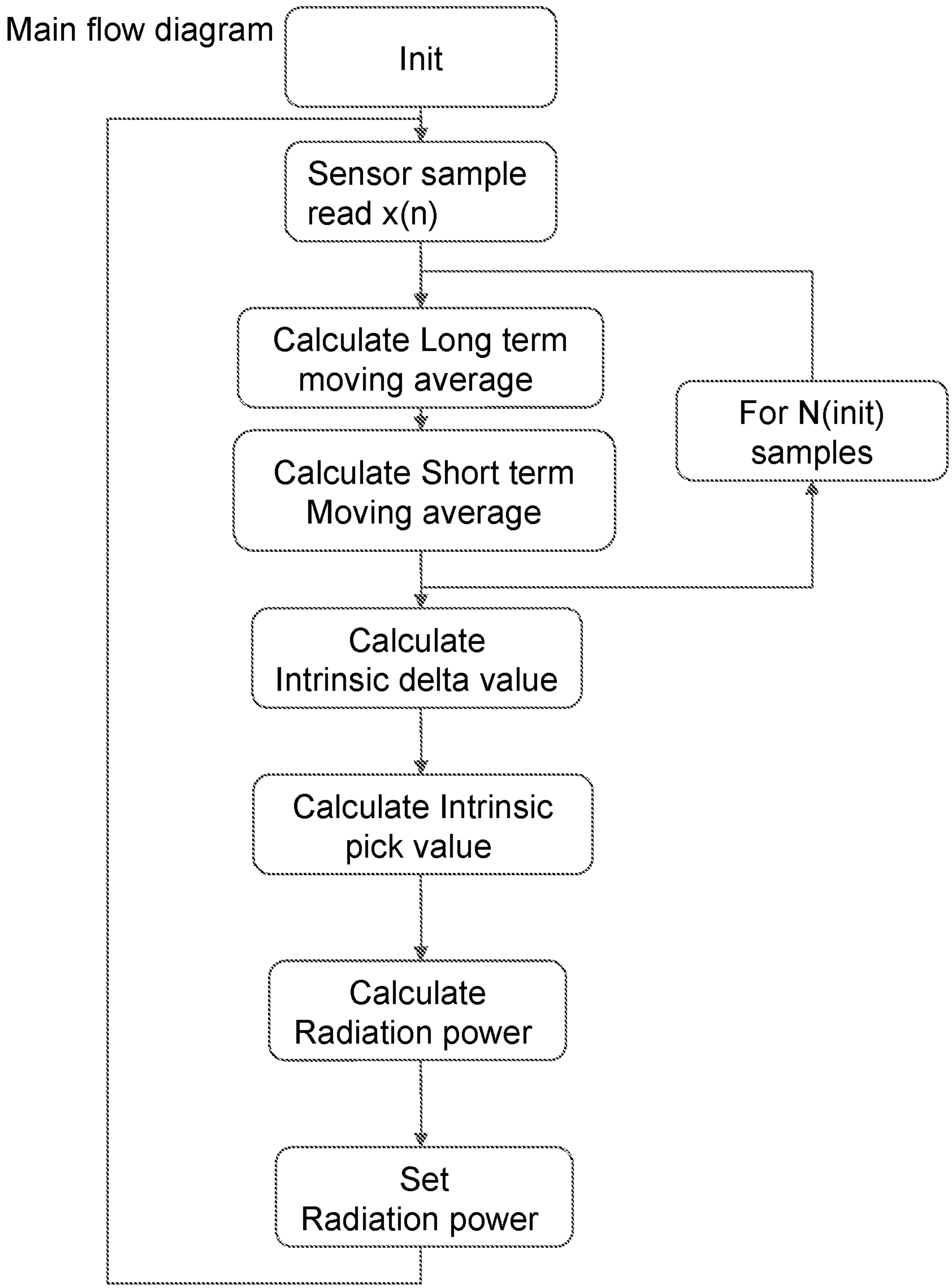
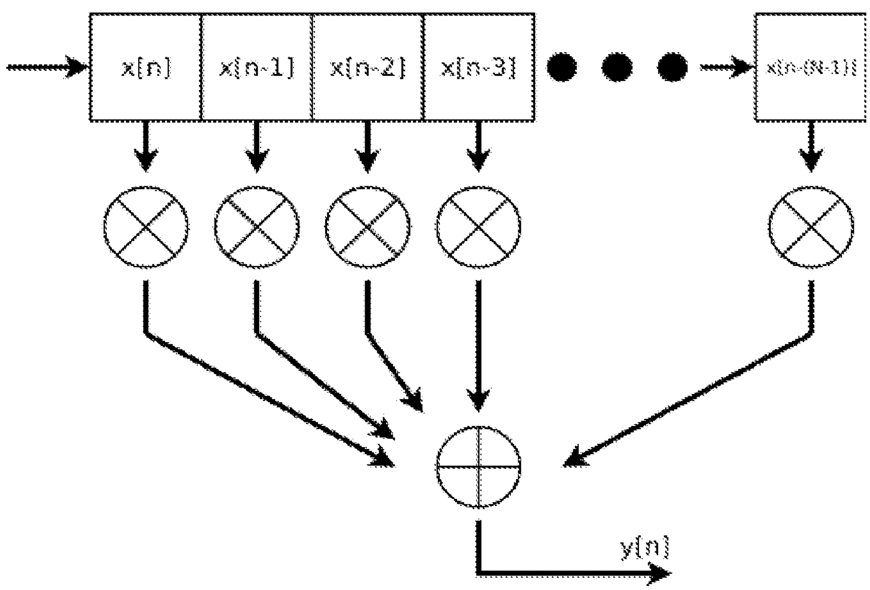

Main flow diagram
Init
Sensor sample
read x(n)
Calculate Long term
moving average
Calculate Short term
Moving average
For N(init)
samples
Calculate
Intrinsic delta value
Calculate Intrinsic
pick value
Calculate
Radiation power
Set
Radiation power

Fig.7

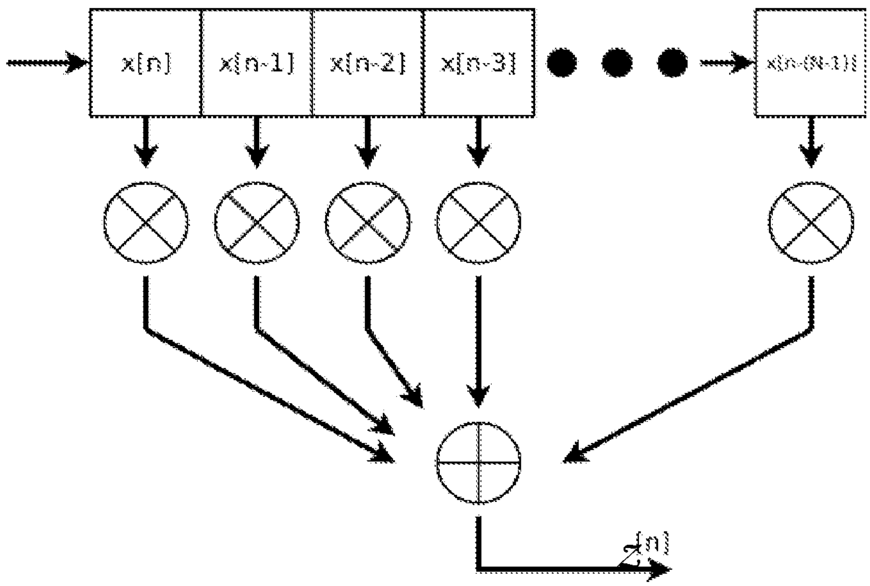
Long term moving average calculation



$$y[n] = \sum_{k=0}^{N-1} h[k]\, x[n-k]$$

Fig.8

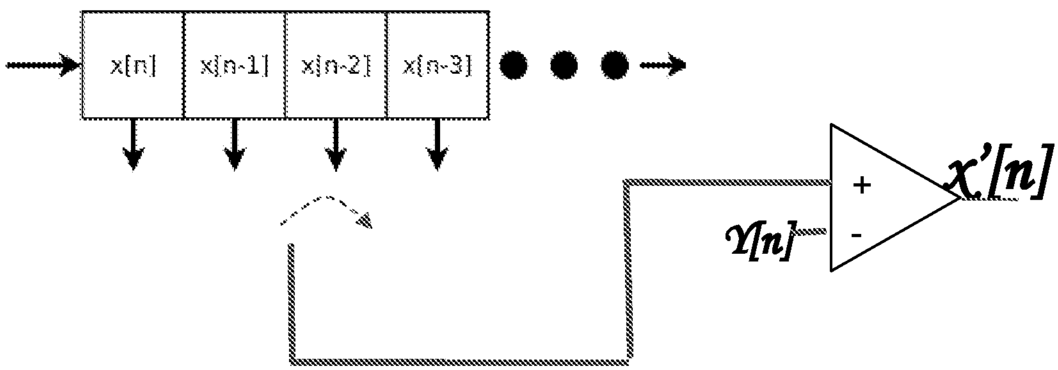
Short term moving average calculation



$$z^{[n]} = \sum_{k=0}^{N-1} h[k]\, x[n-k]$$

Fig.9

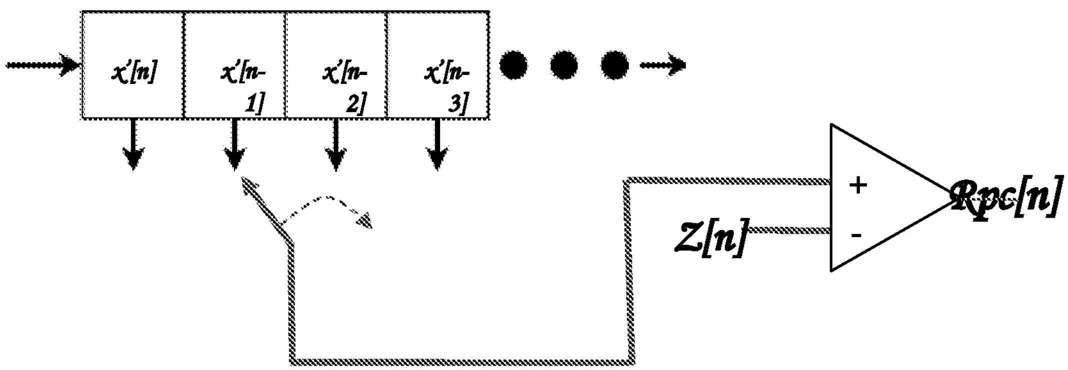
x'(n) - delta between intrinsic value and long term average y(n)



$$x'[n] = |X[n] - Y[n]|$$

Fig.10

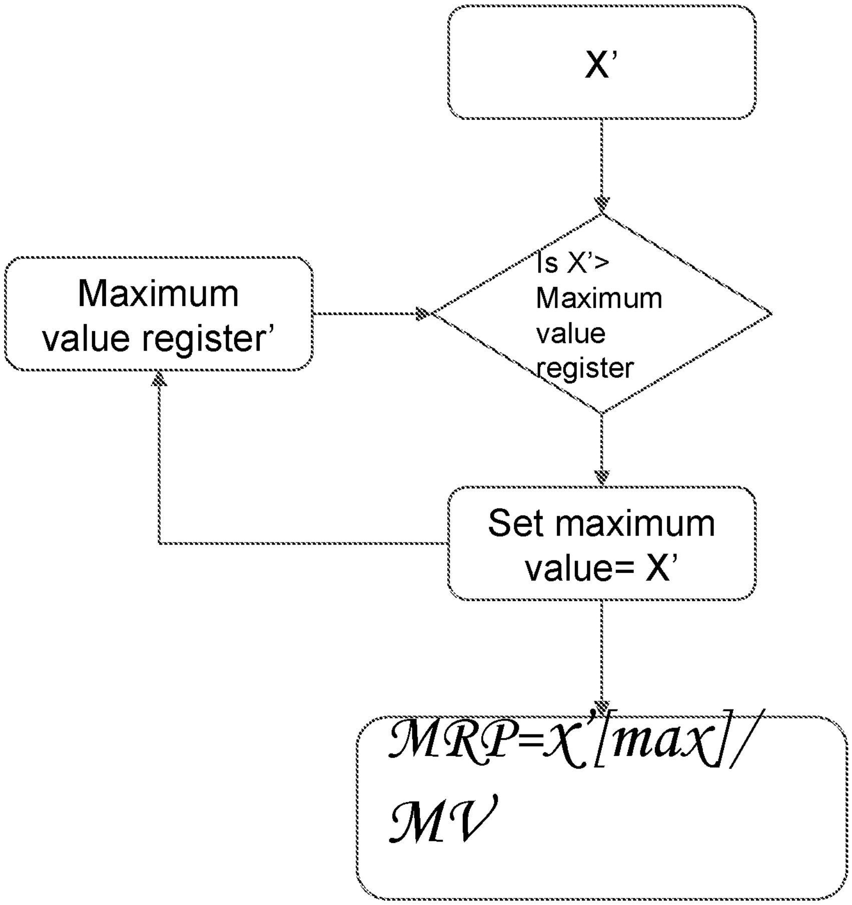
Radiation power calculation



$$Rpc[n] = |X'[n] - Z[n]|$$

Fig.11

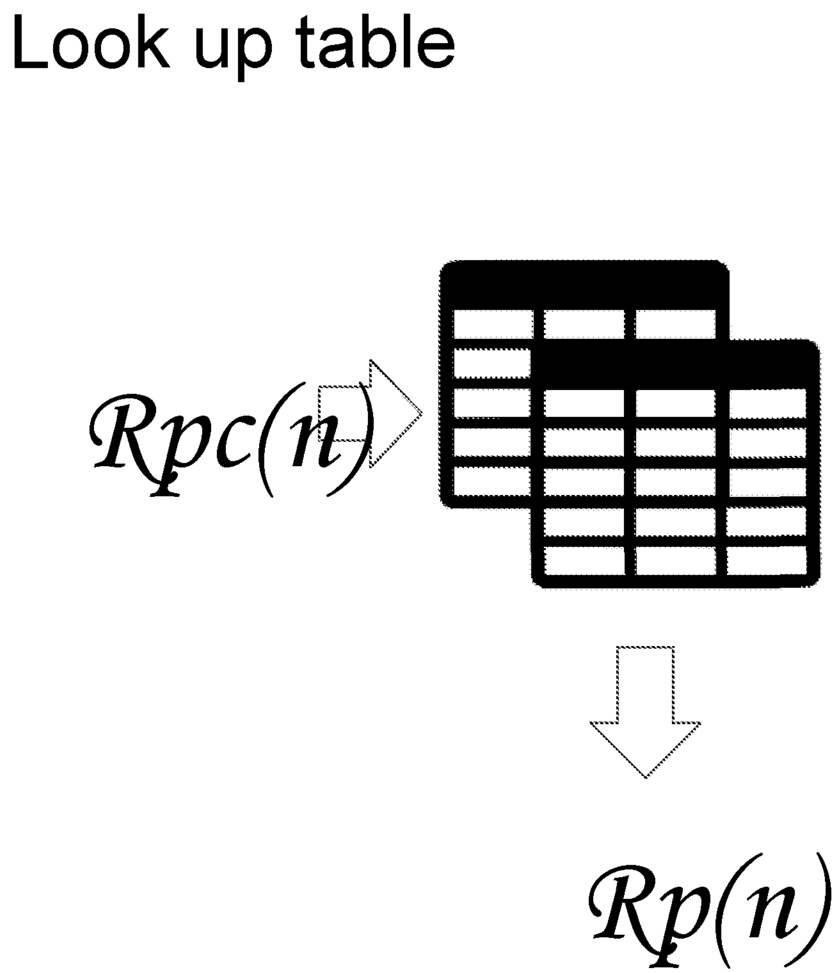
Pick Value calculation



MRP=Maximum Radiation Power

$$MRP=Rpc(n)/MV$$

Fig.12



MASK WITH FLOW-CONTROLLED UV LIGHT INTENSITY STERILIZATION

[0001] The present invention relates to a method and system of controlling germicidal UV light intensity for face masks designed to prevent the transmission of virus, germs and other pathogens in special severe acute respiratory syndrome (SARS) and Coronavirus disease 2019 (COVID 19), that occur through aerosols, smaller droplets that are able to stay suspended in the air for longer periods of time. The system and method controls intensity based upon a sensed flow parameter. In so doing, the system and method conserves battery life, while enabling sufficient intensity to sterilize flows during normal breathing, including inhalation and exhalation.

[0002] In addition, the present invention relates to face masks designed to disinfect breath-generated small droplets, in which the air going into the mask or going out from the mask. Inhalation breaths and exhalation breaths, including any droplets in such breaths, are subjected to sterilization by radiation prior to entering the human lungs and prior to entering the ambient environment. In this manner all, or the vast majority, of pathogens that the air might have contained may be neutralized.

[0003] One challenge is a safe way to employ UVC radiation, because direct UVC exposure to human skin or eyes may cause injuries. To solve this problem a light barrier air duct is implemented. The light barrier air duct eliminates exposure to skin and eyes.

[0004] The present invention uses light-emitting diodes (LEDs) that emit a very narrow wavelength band of radiation. Currently available UV LEDs have peak wavelengths at 214 nm, 265 nm, and 273 nm, among others. One advantage of LEDs over low-pressure mercury lamps is that they contain no mercury, and they are friendly to power control via pulse width modulation (PWM). However, the small surface area and higher directionality of LEDs makes them less effective for germicidal applications, with narrow typical numerical aperture (NA), and beam spread of 30 to 120 degrees. This invention overcomes this problem, and ensures equal (or about equal) UV energy distribution on all air partials.

[0005] Another problem in germicidal effectiveness is to ensure adequate exposure energy (typically is 2-8 millijoules per square centimeter, mJ/cm2), taking into account the airflow speed (when inhaling or exhaling), by providing the light source radiation power proportional to the moving airflow speed. This invention solves this problem.

[0006] The invention is directed to overcoming one or more of the problems and solving one or more of the needs as set forth above.

SUMMARY OF THE INVENTION

[0007] To solve one or more of the problems set forth above, in an exemplary implementation of the invention, a mask with separate flow paths is provided. Each exemplary flow path is a curved tubular conduit extending from a face mask port to a distal port. These conduits are referred to herein as sterilization chambers. The separate flow paths converge at a muffler at the face mask port. The muffler includes a plurality of baffles, which prevent UV radiation from reaching the user and also baffle the flow and introduce a vortex in the flow. An air intake covers each distal port. Each intake includes air openings (e.g., vents), vortex generators and a light trap. The vortex generators are angled vanes that guide inlet flow through the intake in a helical path towards the face mask. The helical flow path and muffler increase the time of exposure of the inhaled gasses to the UV radiation. The vanes also introduce eddies and turbulence, the churining of which exposes much (if not all) of the inhaled gasses to the UV radiation. The light trap blocks UV light from being emitted out of the intake.

[0008] At least one LED in each flow path emits germicidal UV radiation. A sensor (e.g., pressure sensor) detects flow rate in one or each flow path. Power is supplied to the UV LEDs according to the sensor output. A microcontroller samples sensor output, and determines a power setting based upon the sampled sensor output. An LED driver, which may be integrated with the microcontroller or separate, provides sufficient current to illuminate each LED, while limiting the current to prevent damaging the LED. The microcontroller implements pulse width modulaiton (PWM), causing the LED driver to produce oscillating output, with a pulse that is on for part of each duty cycle. By varying (or "modulating") the pulsing width (the portion of the cycle during which the power is on, illuminating the LED), light output from each LED is controlled (i.e., increased or decreased). Increasing the pulsing width, increases light output from each LED for a cylce. Decreasing the pulsing width, decreases light output from each LED for a cylce. The pulsing width is determined from the sampled sensor output. A higher flow rate through the sterilization chamber is irradiated with increased light output from each LED for each cylce. A lower flow rate through the sterilization chamber is irradiated with decreased light output from each LED for each cylce. When flow rate through the sterilization chamber ceases, the LEDs are not powered, thereby conserving battery power. In all cases, battery consumption is limited to as much as is deemed necessary to irradiate a flow.

[0009] The present invention uses barometric pressure units (BMUs), which are high precision digital pressure sensors. Such sensors are widely available as a consumer low cost electronics devices. A system and method according to pronciples of the invention processes sensor output to determine and effectuate an effective light intensity.

[0010] In one exemplary embodiment, the BMU is a piezo-resistive sensor operably coupled to or integrated with an analog to digital converter and a control unit. By way of example and not limitation, the control unit may include an E2PROM and a serial I2C interface. The BMU delivers the uncompensated value of pressure and temperature, having individual calibration data. This is used to compensate offset, temperature dependence and other parameters of the sensor. In sum, the invention uses an electric pressure sensor to determine the air flow. The method and apparatus of the invention compensate for (e.g., account for) air density, such as density at altitude in airplane, whether or not pressurized, low pressure areas, and density at elevations in a highrise building or in a mountainous area.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] The foregoing and other aspects, objects, features and advantages of the invention will become better understood with reference to the following description, appended claims, and accompanying drawings, where:

[0012] Fig 1. conceptually illustrates an exemplary mask (4) including a non-porous face mask, connected via a muffler (3) to a sterilization chamber (1).

[0013] Fig 2. conceptually illustrates the exemplary sterilization chamber (1) coupled to muffler (3). The control electronics are located in compartment (5).

[0014] Fig 3. provides a section view of the exemplary muffler (3), which provides a light trap resulting from light barrier (3.1.1), (3.1.2) and (3.1.3) and vortex generator (3.3).

[0015] Fig 4. conceptually illustrates an exemplary air flow (1.3) moving through the sterilization chamber (1) into the muffler (3) and past the vortex generator (3.3). UV LED rails (1.1), which provide a UV light source, are located in LED rail holder (1.2). Sterilization chamber (1) is coated with a UV reflective coating such as aluminum foil, or other well-known coating such as metal particle mix polymers.

[0016] Fig 5. provides a high level block diagram that conceptually illustrates exemplary components of the mask. Rechargeable battery (9.1) is connected to battery management system BMS (9.2). The purpose of the BMS is to manage the battery charging life cycle and protection. All circuits are powered by the BMS (9.2). An air flow sensor (9.6) and processing controller (9.5) set the led driver power (9.4) feeding the LED rails (9.3). BMS (9.2) regulates power voltage supplied to the processor and LED driver, and manages battery charging. BMS (9.2) may include an interface (e.g., USB port) for battery charging.

[0017] Fig. 6 provides a high level flow chart of an exemplary method of controlling LED intensity based on the reading from the air flow sensor (e.g., pressure sensor). The flow chart shows the loop where periodic airflow measurements (sensor outputs) are performed (sampled) by a controller. In the exemplary method, sensor outputs correlate to power settings for LED rails. The controller determines the power setting from a value in the look-up table corresponding to the sampled sensor output. Other methods of adjusting power settings according to sample sensor output, include applying a function (e.g., an empirical distrubution function) to calculate a power setting based upon sampled sensor output. Such other methods may be used in accordance with the invention. Indeed, the invention is not limited to any particular method of determining a power setting based upon sampled sensor output.

[0018] An advantage of this configuration is that the UV light is turned off when the user does not breath or doesn't use the mask. This allows for a long life cycle with a relatively small battery.

[0019] Fig 7. conceptually illustrates an exemplary long term moving average methodology by which a moving average (rolling average or running average), using a series of averages of different subsets of the full data set, is calculated to analyze data points.

[0020] Fig 8. conceptually illustrates an exemplary short term moving average z(n) from a stream of intrinsic pressure values x(n), to distinguish a momentary change of pressure for an air flow speed calculation.

[0021] Fig 9. conceptually illustrates an exemplary x'(n) - delta between intrinsic pressure value and long term average y(n) and conversion to an absolute value, to determine momentary changes of the pressure, to eliminate temperature and long term air density variations, caused by elevation, weather or other similar factors.

[0022] Fig 10. conceptually illustrates an exemplary radiation power calculation.

[0023] Fig 11 conceptually illustrates an exemplary Pick Value calculation, by which calculated absolute air flow speed values are transformed to appropriate light intensity parameters for the light driver.

[0024] Fig 12 conceptually illustrates an exemplary look up table to convert a radiation value, representing the airflow speed to a radiation power value, that controls the light source power. The lookup table relations are design specific and depend on the lightsource radiation function. The main purpose of the lookup table is to provide the universal relations between calculated airflow speed x'(n) to the radiation power rp(n), so the radiation power required for sterilization will be constant per air volume (2-8 mJ/cm^2).

DETAILED DESCRIPTION OF THE INVENTION

[0025] The invention consists of Human non-porous face mask (referring to fig1, number 4) , sterilization chamber(referring to fig1, number 1) , electronics and control bay (referring to fig2, number 5), which contains a microprocessor unit, which runs the algorithm described in this invention.

[0026] In this invention the following terms are:

[0027] x(n) - pressure samples reading

[0028] y(n) - long term average calculation (usually calculated from 1000 sample)

[0029] x'(n) - delta between intrinsic value and long term average y(n)

[0030] z(n) - short term average calculation (usually calculated from 10 samples)

[0031] Rpc(n) - Radiation power calculation, represents the final value of radiation power control derived from pressure samples readings (n), according to the air flow speed. This is the final result of the algorithm for the controlling light intensity according to the air flow moving through the mask

[0032] MRP=Maximum Radiation Power - normalized x' value to max light control parameter. Represents the maximum power normalized to the value of led maximum intensity to be radiated.

[0033] Rp(n) - Radiation power - is the final result of the algorithm controlling the radiation power of the light source as per air pressure measured by a pressure sensor.

[0034] Fig 1. shows the general view of the mask (4) consists of non-porous face mask, connected via a muffler (3) to a sterilization chamber (1)

[0035] As shown in Fig. 1, an elastic band 6 is used to hold the non-porous face mask 3 that is coupled to the sterilization chamber 1 over the nose and mouth of the human user with an airtight manner.

[0036] The electronics bay and battery pack 5 is used to provide the means for control and power the uvc led strip necessary to operate the mask.

[0037] Fig 2. shows the sterilization chamber (1) coupled to muffler (3). The control electronics is located in compartment (5)

[0038] The air enters the sterilization chamber via two air intakes (2) and (7). The premiere function of the air intakes (2) and (7) is to create an air vortex (like a mini tornado). This vortex is induced by natural air flow passing through the air intakes towards the sterilization chamber in a spiral manner. Two vortex flows are generated by the two air intakes. Both rotate in the same manner. Main function of the dual vortex is to ensure equal distribution of UV light exposure of each air molecule moving through the chamber. The vortex spins in one direction when inhaling the air through the mask and opposite direction when exhaling the air out.

[0039] Fig 3. shows the muffler (3) cross section, which consists of a light trap resulting from light barrier (3.1.1), (3.1.2) and (3.1.3) and vortex generator (3.3). The air flow sensor (3.2) measures the air pressure.

[0040] According to the Bernoulli's principle, and Bernoulli's equation in fluid and gas, air pressure with a decrease in static pressure or a decrease in the gas's potential energy:

[0041] $$\frac{v^2}{2} + gz + \frac{p}{\rho} = \text{constant}$$

[0042] Based on the principle above, the simplified form of Bernoulli's equation can be summarized in the following memorable word equation:

[0043] static pressure + dynamic pressure = total pressure

[0044] In other words by measuring the total pressure over time and processing it allows to accurately identify the dynamic pressure separated from a static pressure. The present invention here disclosed method allows to measure the air volume being passed through the mask per time (air speed). Thus allows to control the sterilization radiation according to the fast sampling of the total pressure values and processing it by processing unit, to optimize the radiation power but ensure its minimum required value for air sterilization.

[0045] The air moves towards the mask through a muffler (3). When exhaling two vortex is generated by muffler (3) and going through the sterilization chamber (1) towards intakes (2) and (7) and then out of the mask. In this direction the air passes through UV light similarly the inhaling operation. The muffler occupies a section of the flow path near the mask (4). The muffler consists of several baffles 3.1.1 and 3.1.2 and 3.1.3 The illustrated baffles are rectangular in cross section, but the invention is not limited to any number or shape baffle structures for reducing flow velocity. The purpose of the muffler is to block UV radiation from going out, while allowing free air movement. One of the key features of this invention is that the air radiated by UV light energy is being proportional to the air flow velocity. It allows the maximum battery operation time to deliver the minimum required UV light energy per air volume to ensure sterilization of the air with most efficient volume to sterilization energy coefficient. The air flow sensor (3.2) is located within the muffler (3) to constantly measure accurate air pressure, those calculate the air flow speed in both directions when inhaling and exhaling in order to create required light intensity according to the measured pressure.

[0046] Fig 4. shows air flow (1.3) moving through the sterilization chamber (1) via the muffler (3), which spins the air by vortex generator (3.3). The UV leds rails (1.1) , which provide a UV light source are located in Led rail holder (1.2) . Sterilization chamber (1) is coated with a UV reflective coating such as aluminum foil, or other well-known coating such as metal particle mix polymers.

[0047] Fig. 5 Shows the basic electronic components of the mask. Rechargeable battery (9.1) connected to battery management system - BMS (9.2). The purpose of the BMS is to manage the battery charging life cycle and protection. All circuits powered by the BMS (9.1). The air flow sensor (3.2) and processing controller (9.5) set the led driver power (9.4) feeding the LED rails (9.3)

[0048] Fig 6. shows the algorithm flow, that provides an accurate amount of sterilization energy based on single pressure sensor input, which is based on sequence of states and calculations performed in each state. In the “init” state the processing unit and the pressure sensor units are initialized (based on specific initialisation procedures). After init the processing unit starts reading values from sensor x(n) - “sensor sample read”. The main processing loop begins with calculation of long term average in order to identify constant pressure value within the mask. For that purpose first N samples (typical values are 1000-3000 samples) are taken. This is done to eliminate any fluctuations and changes due to breath of the user. This allows us to identify slow changes of the pressure due to change in altitude (in case of moving in an elevator or plane). The short term moving average is applied based on x(n) strim in order to identify further differential values of the x(n), which will identify the airflow speed. The Intrinsic delta value provides the representation of the air flow speed, which is calculated by intrinsic value x(n) subtracted short term moving average value. Intrinsic pick value is calculated in order to find the maximum range of the airflow speed over time of operation. Next, radiation power will be set based on a specific method - look-up table or calculation. The last operation in the cycle will be set of radiation power value to the LED driver by a controller, according to the result of the algorithm processing and then the cycle begins again.

[0049] Fig 7. Shows the algorithm of Long term moving average calculation. A moving average (rolling average or running average) is a calculation to analyze data points by creating a series of averages of different subsets of the full data set. It is also called a moving mean or rolling mean and is a type of finite impulse response filter.

[0050] A series of numbers X(n), the first element of the moving average is obtained by taking the average of the initial fixed subset of the pressure number series.

[0051] Then the subset is modified by "shifting forward"; that is, excluding the first number of the series and including the next value in the subset. Mathematically, a moving average is a type of convolution and so it can be viewed as an example of a low-pass filter used in signal processing. When used with non-time series data, a moving average filters higher frequency components without any specific connection to time, although typically some kind of ordering is implied. Viewed simplistically it can be regarded as smoothing the data. For that purpose the samples, which are in the buffer, are summed and divided by its quantity.

[0052] Fig 8. shows Short term moving average z(n) implementation from stream of intrinsic pressure value x(n). The purpose of short term moving average is to distinguish the momentary change of the pressure for further air flow speed calculation. Short term moving average z(n)

Viewed simplistically it can be regarded as smoothing the data for short term. For that purpose the samples, which are in the buffer, are summed and divided by its quantity.

[0053] Fig 9. shows x'(n) - delta between intrinsic pressure value and long term average y(n) and converting it to absolute value. The purpose of this calculation is to determine the momentary changes of the pressure. In other words this is a simple calculation of the differential value of the air pressure measured by the sensor. This is done to eliminate temperature and long term air density variations, caused by height or weather.

[0054] Fig 10. Shows radiation power calculation. In this stage the final clean momentary air flow speed can be derived from x'(n) value subtracted by short term moving average z(n) and converting it to absolute value, since light radiation applied to both air flow directions with the mask. In other words the sterilization process is initiated for both inhaling and exhaling air movements.

[0055] Fig 11 Shows Pick Value calculation. Once the absolute air flow speed values is calculated, they should be transformed to the appropriate light intensity parameters, in order then to feed them to the light driver. For that reason the pick value should be found in order to figure out the range of the supplied MRP values and scale it to required light intensity values.

[0056] Fig 12 Shows the final look up table to convert the radiation value, representing the airflow speed to a radiation power value, that controls the light source power. The lookup table relations are design specific and depend on the lightsource radiation function. The main purpose of the lookup table is to provide the universal relations between calculated airflow speed x'(n) to the radiation power rp(n), so the radiation power required for sterilization will be constant per air volume (2-8 mJ/cm^2). This allows radiation of the air for extra time after short high pulses of flow.

CLAIMS

1. A germicidal mask, comprising: a non-porous face mask attachable to face of a user so to provide an airtight fit thereover; a built-in sterilization chamber for killing undesirable pathogens or microorganism contained therein when user is inhaling and exhaling, disinfection by UV LED radiating UV light, said UV light controlled by airflow processing system, to ensure minimum required energy for passing air, blocking UV light from user and ambient, closed loop constantly measuring air flow by at least one barometric pressure measuring unit, and mean for calculating air flow through said mask, LED emitted light intensity to ensure required amount of radiated energy for full sterilization of the air , said sterilization chamber is coated with reflective coating.

2. Germicidal mask, comprising: a non-porous face mask attachable to face of a user so to provide an airtight fit thereover; a built-in sterilization chamber for killing undesirable pathogens or microorganism contained therein when user is inhaling and exhaling, disinfection by UV LED radiating UV light, said UV light controlled by airflow processing system, to ensure minimum required energy for passing air, blocking UV light from user and ambient, closed loop constantly measuring air flow by at least one barometric pressure measuring unit, and mean for calculating air flow through said mask, LED emitted light intensity to ensure required amount of radiated energy for full sterilization of the air , said sterilization chamber is coated with reflective coating, dual vortex generators coated with black or non UV reflective material.

3. Germicidal mask according to claim 1, wherein said sterilization chamber further comprises at least two vortex spinning, each vortex is independent from each other.

4. Germicidal mask according to claim 2, wherein said sterilization chamber further comprises at least two vortex spinning, each vortex is independent from each other.

5. The germicidal mask according to claim 2, wherein said sterilization chamber further comprises at least two vortex spinning, each vortex is independent from each other.

6. Germicidal mask according to claim 1, wherein said air flow control the UV light intensity for saving battery energy and providing minimum required UV light power for air flow sterilization.

7. Germicidal mask according to claim 2, wherein said air flow control the UV light intensity for saving battery energy and providing minimum required UV light power for air flow sterilization.

8. Germicidal mask according to claim 1, wherein UV light is turned off when user do not breath or not use the mask, there is no airflow measured.

9. Germicidal mask according to claim 1, wherein UV light is proportional to the amount of air breath being passed through the mask.

10. Germicidal mask according to claim 1, wherein UV light is measured in real time and required power is verified, so the breathing air gets required energy for disinfection.

11. Germicidal mask according to claim 1, wherein the main chamber is curved allowing comfortably wearing under the chin around the neck.

12. Germicidal mask according to claim 1, wherein curved chamber air intake from the shoulder area.

13. Germicidal mask according to claim 1, wherein a method of light source power control derived from air pressure sensor by calculating air pressure short term moving average to identify the air flow speed for controlling control the light source accordingly.

14. Germicidal mask according to claim 1, wherein a method of light source power control derived from air pressure sensor by calculating air pressure long term moving average, to eliminate static height and temperature variations, calculating air pressure short term moving average to identify the air flow speed for controlling control the light source accordingly.

15. Germicidal mask according to claim 1, wherein a method of light source power control derived from air pressure sensor by calculating air pressure long term moving average, to eliminate static height and temperature variations, calculating air pressure short term moving average to identify the air flow speed for controlling control the light source accordingly, and lookup table or linear calculation to control the light source accordingly.

16. Germicidal mask according to claim 1, wherein a method of light source power control derived from air pressure sensor by calculating air pressure long term moving average, to eliminate static height and temperature variations, calculating air pressure short term moving average to identify the air flow speed for controlling control the light source accordingly, and

lookup table or linear calculation to control the light source accordingly, compensating all calculation by temperature sensor reading.

CERTIFICATION AND REQUEST FOR COVID-19 PROVISIONAL PATENT APPLICATION PROGRAM

(Page 1 of 1)

First Named Inventor:	Doron Koren
Title of Invention:	MASK WITH FLOW-CONTROLLED UV LIGHT INTENSITY STERILIZATION
Contact information to include in database (optional)	Mark Young, 1638 Camden Ave., Jacksonville, FL 32207, 904-996-8099, myoungpa@gmail.com

APPLICANT HEREBY MAKES THE FOLLOWING CERTIFICATIONS AND REQUESTS THAT THE USPTO INCLUDE THE DESCRIPTION OF THE ACCOMPANYING PROVISIONAL PATENT APPLICATION IN A PUBLIC DATABASE.

1. The description of the accompanying provisional patent application concerns a product or process relating to COVID-19 and such product or process is subject to an applicable FDA approval for COVID-19 use.
2. The accompanying application is in the English language.
3. The accompanying application is being filed in DOCX format via the USPTO's Patent Center filing system, together with this form.
4. The applicant understands that while the required filing fee for the accompanying provisional application may be deferred by acceptance into this program, the appropriate filing fee must be paid in order for a subsequent U.S. nonprovisional application to claim the benefit of the filing date of the accompanying provisional application. Applicant recognizes that the filing fee due in the future may be more than the current fee due and that by deferring payment of the filing fee, there may be an increase in the total fee due.
5. Applicant authorizes and requests that the description, including the specification and any drawings, claims and/or abstract of the accompanying provisional patent application, as well as this form, be included in a searchable online public database.
6. Applicant understands that inclusion in the public database is a publication of the description and this form.

Signature /Mark J. Young/	Date 10/01/2020
Name (Print/Typed) Mark J. Young	Practitioner Registration Number 39436

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

■ *Total of 1 forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.