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(54) AUTOMATED INHALATION TOXICOLOGY EXPOSURE SYSTEM AND METHOD

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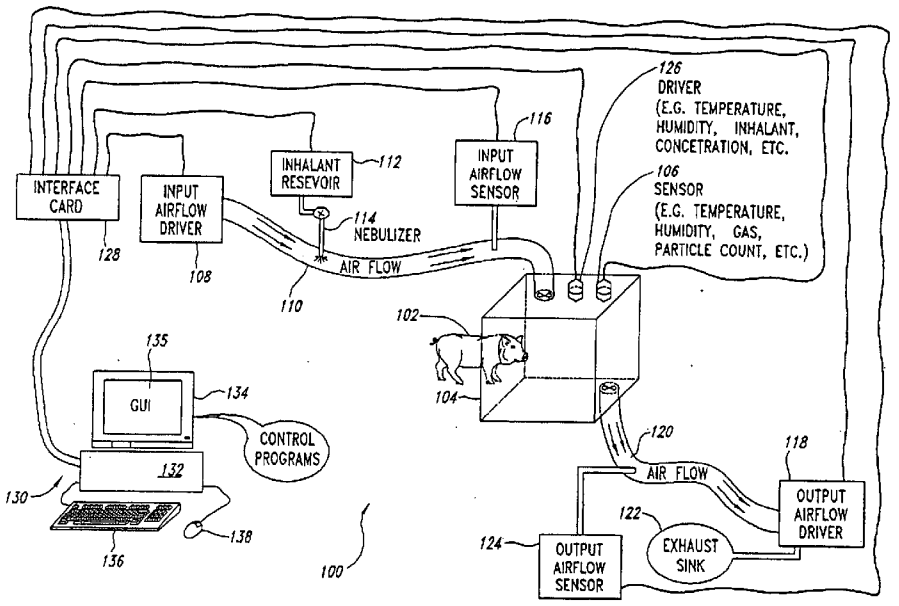
(57) **ABSTRACT**

In one embodiment, a method includes but is not limited to exposing an animal to an inhalant; acquiring near real time measurement of at least respiration during said exposing; and calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing. In one embodiment, a method includes but is not limited to automatically controlling an environment of an inhalant chamber; and automatically controlling a concentration of an inhalant in the inhalant chamber. In one embodiment, a method includes but is not limited to displaying near real time measurement data related to an animal in an inhalant chamber. In addition to the foregoing, other method embodiments are described in the claims, drawings, and text forming a part of the present application. In one or more various embodiments, related systems include but are not limited to circuitry and/or programming for effecting the foregoing-described method embodiments; the circuitry and/or programming can be virtually any combination of hardware, software, and/or firmware configured to effect the foregoing-described method embodiments depending upon the design choices of the system designer. In one embodiment, a system includes but is not limited to at least one inhalant chamber; and at least one animal respiration sensor integral with the at least one inhalant chamber.



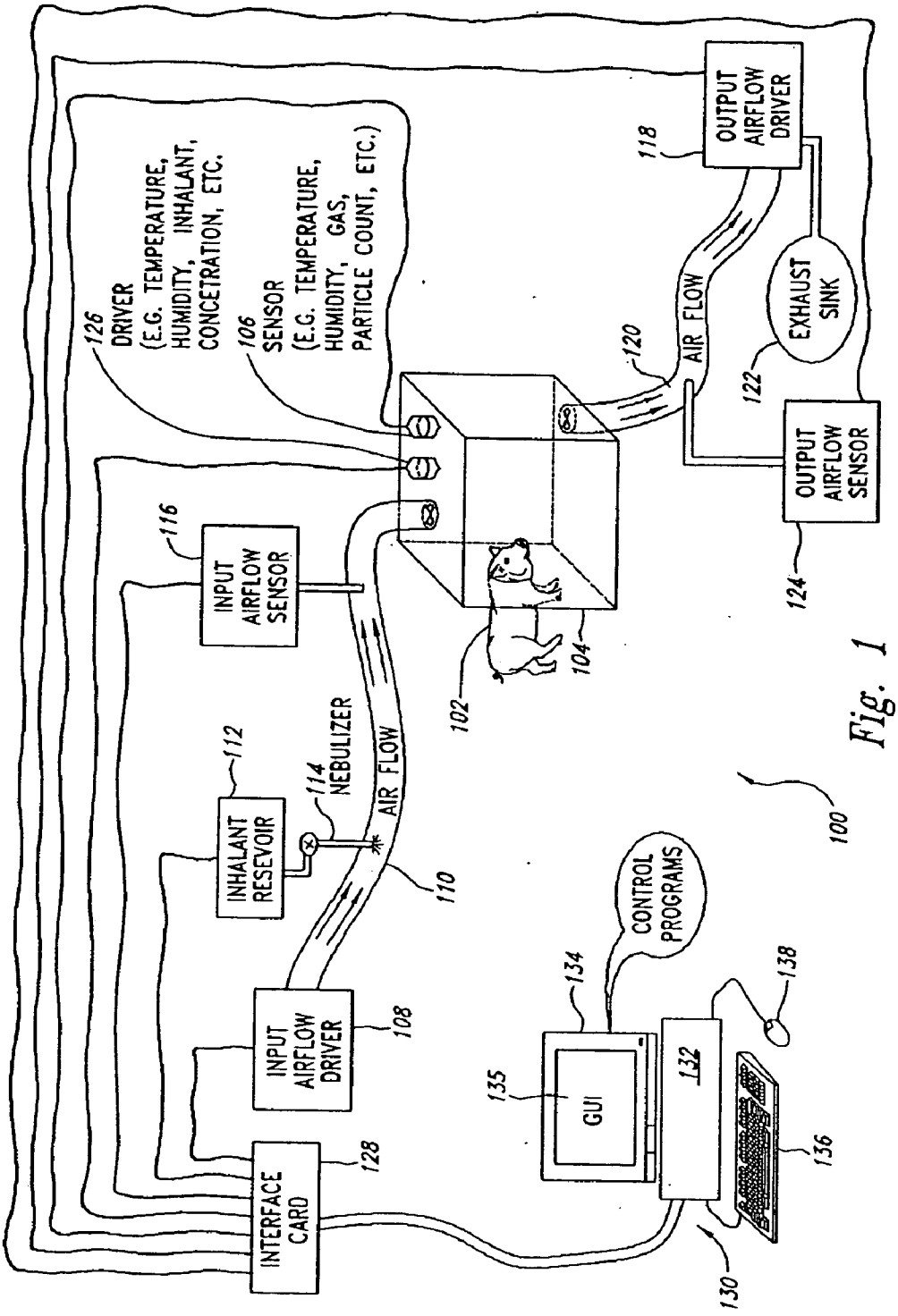

126
DRIVER
(E.G. TEMPERATURE, HUMIDITY, INHALANT, CONCETRATION, ETC.
106
SENSOR
(E.G. TEMPERATURE, HUMIDITY, GAS, PARTICLE COUNT, ETC.)
118
OUTPUT AIRFLOW DRIVER
120
AIR FLOW
EXHAUST SINK
122
OUTPUT AIRFLOW SENSOR
124
116
INPUT AIRFLOW SENSOR
102
104
112
INHALANT RESEVOIR
114
NEBULIZER
AIR FLOW
110
INPUT AIRFLOW DRIVER
108
128
INTERFACE CARD
CONTROL PROGRAMS
134
135
GUI
132
138
136
130
100

Fig. 1

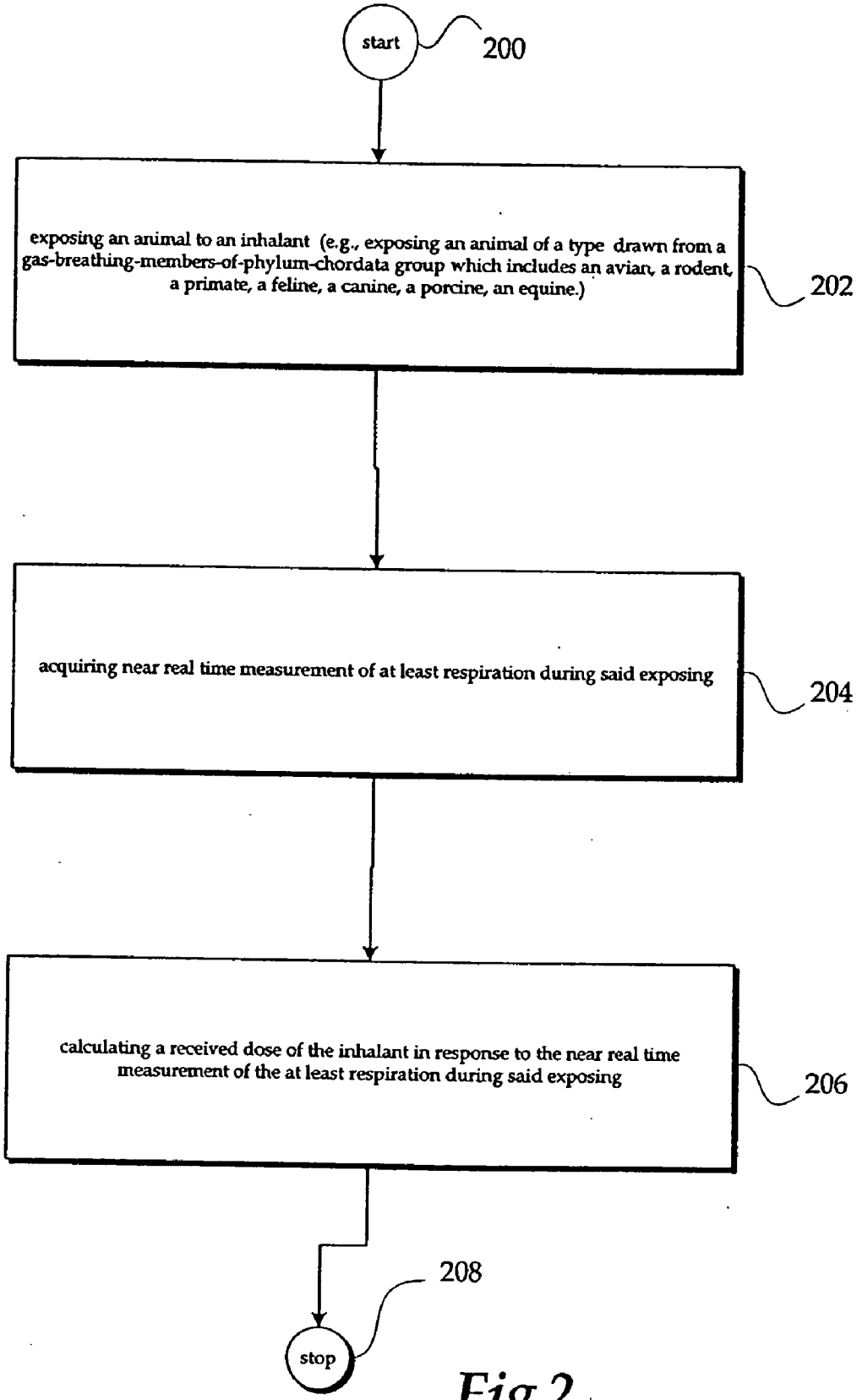

start
200
exposing an animal to an inhalant (e.g., exposing an animal of a type drawn from a gas-breathing-members-of-phylum-chordata group which includes an avian, a rodent, a primate, a feline, a canine, a porcine, an equine.)
202
acquiring near real time measurement of at least respiration during said exposing
204
calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing
206
208
stop

Fig.2

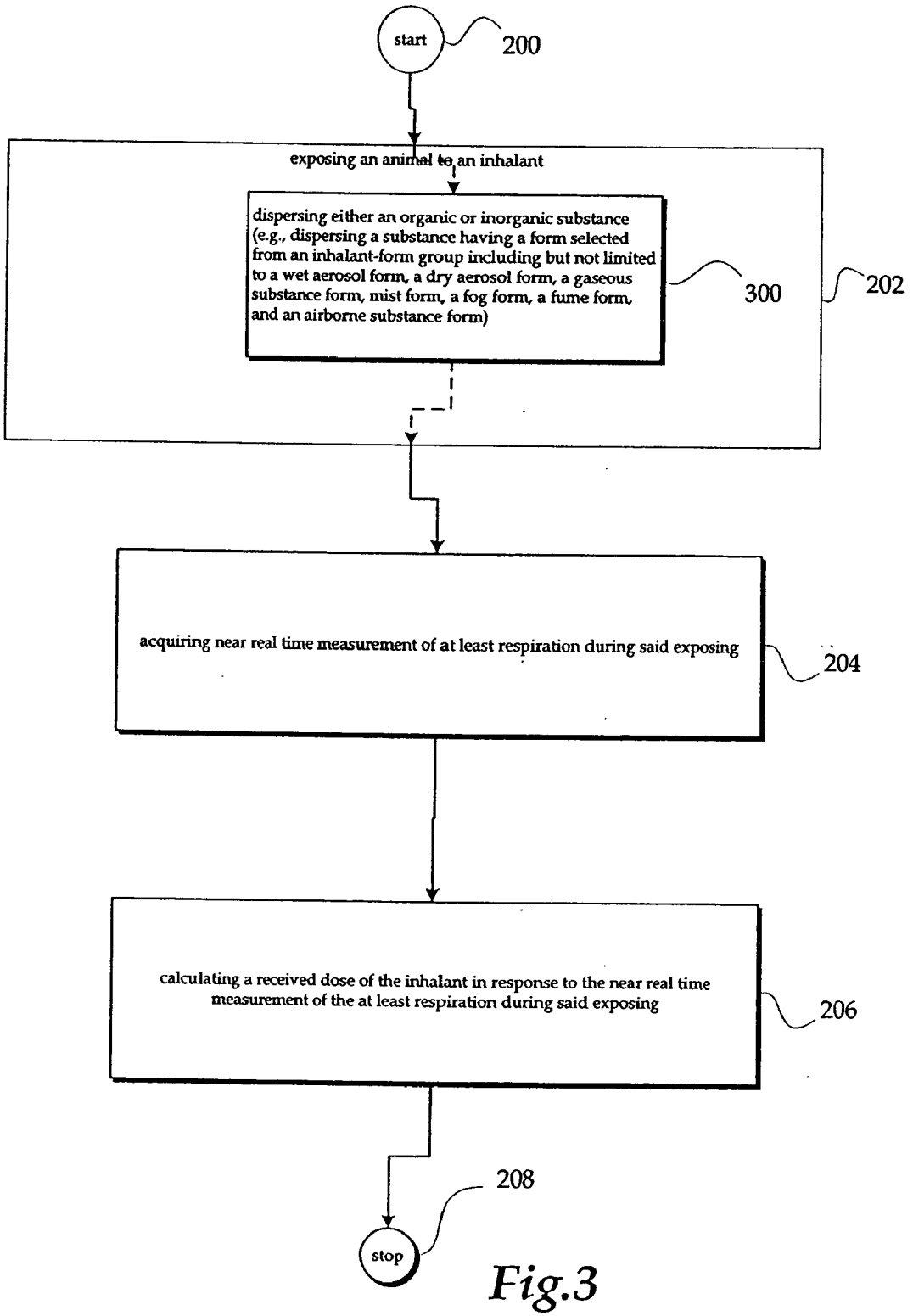

start
200
exposing an animal to an inhalant
dispersing either an organic or inorganic substance (e.g., dispersing a substance having a form selected from an inhalant-form group including but not limited to a wet aerosol form, a dry aerosol form, a gaseous substance form, mist form, a fog form, a fume form, and an airborne substance form)
300
202
acquiring near real time measurement of at least respiration during said exposing
204
calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing
206
208
stop

Fig.3

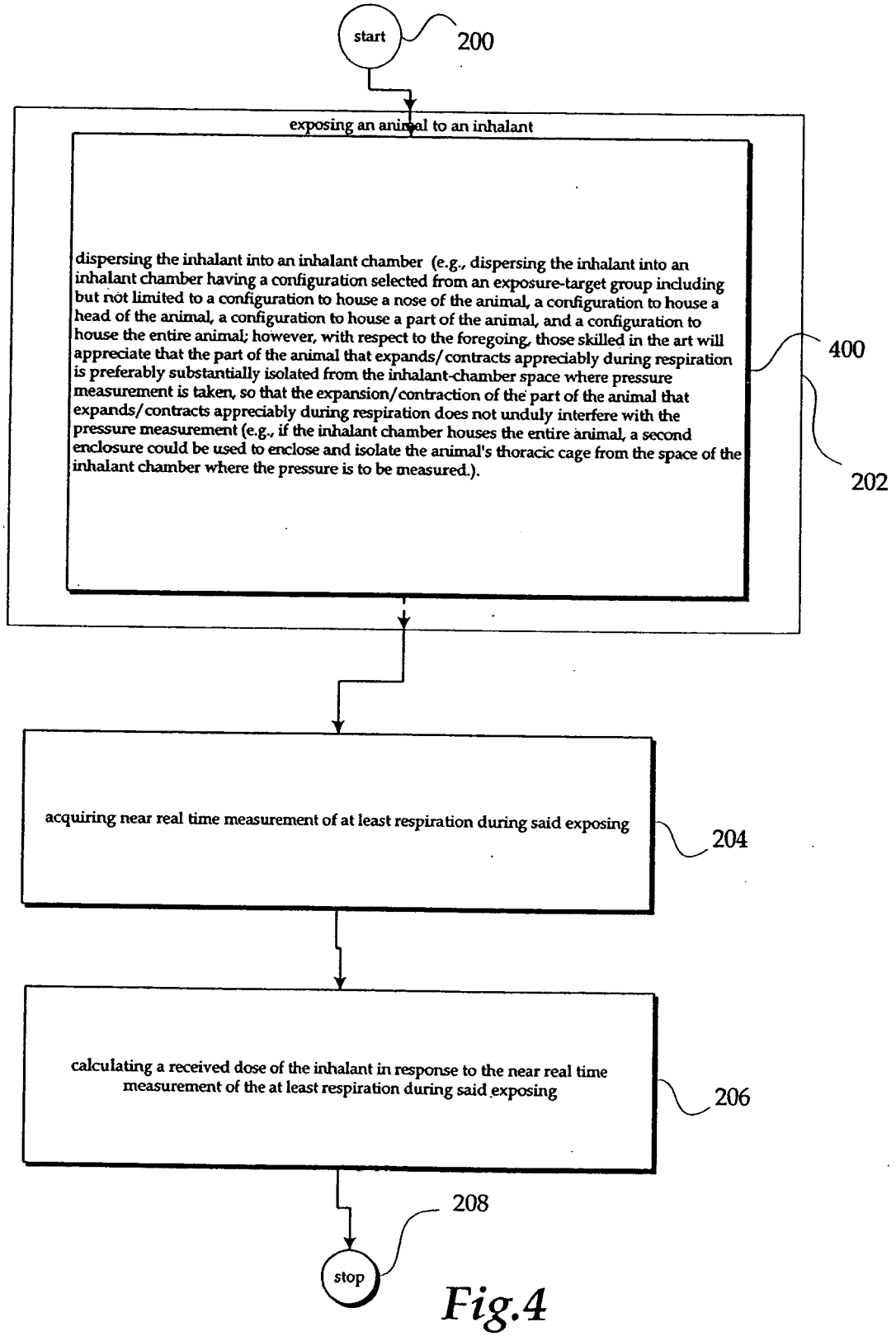

start
200
exposing an animal to an inhalant
dispersing the inhalant into an inhalant chamber (e.g., dispersing the inhalant into an inhalant chamber having a configuration selected from an exposure-target group including but not limited to a configuration to house a nose of the animal, a configuration to house a head of the animal, a configuration to house a part of the animal, and a configuration to house the entire animal; however, with respect to the foregoing, those skilled in the art will appreciate that the part of the animal that expands/contracts appreciably during respiration is preferably substantially isolated from the inhalant-chamber space where pressure measurement is taken, so that the expansion/contraction of the part of the animal that expands/contracts appreciably during respiration does not unduly interfere with the pressure measurement (e.g., if the inhalant chamber houses the entire animal, a second enclosure could be used to enclose and isolate the animal's thoracic cage from the space of the inhalant chamber where the pressure is to be measured.).
400
202
acquiring near real time measurement of at least respiration during said exposing
204
calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing
206
208
stop

Fig.4

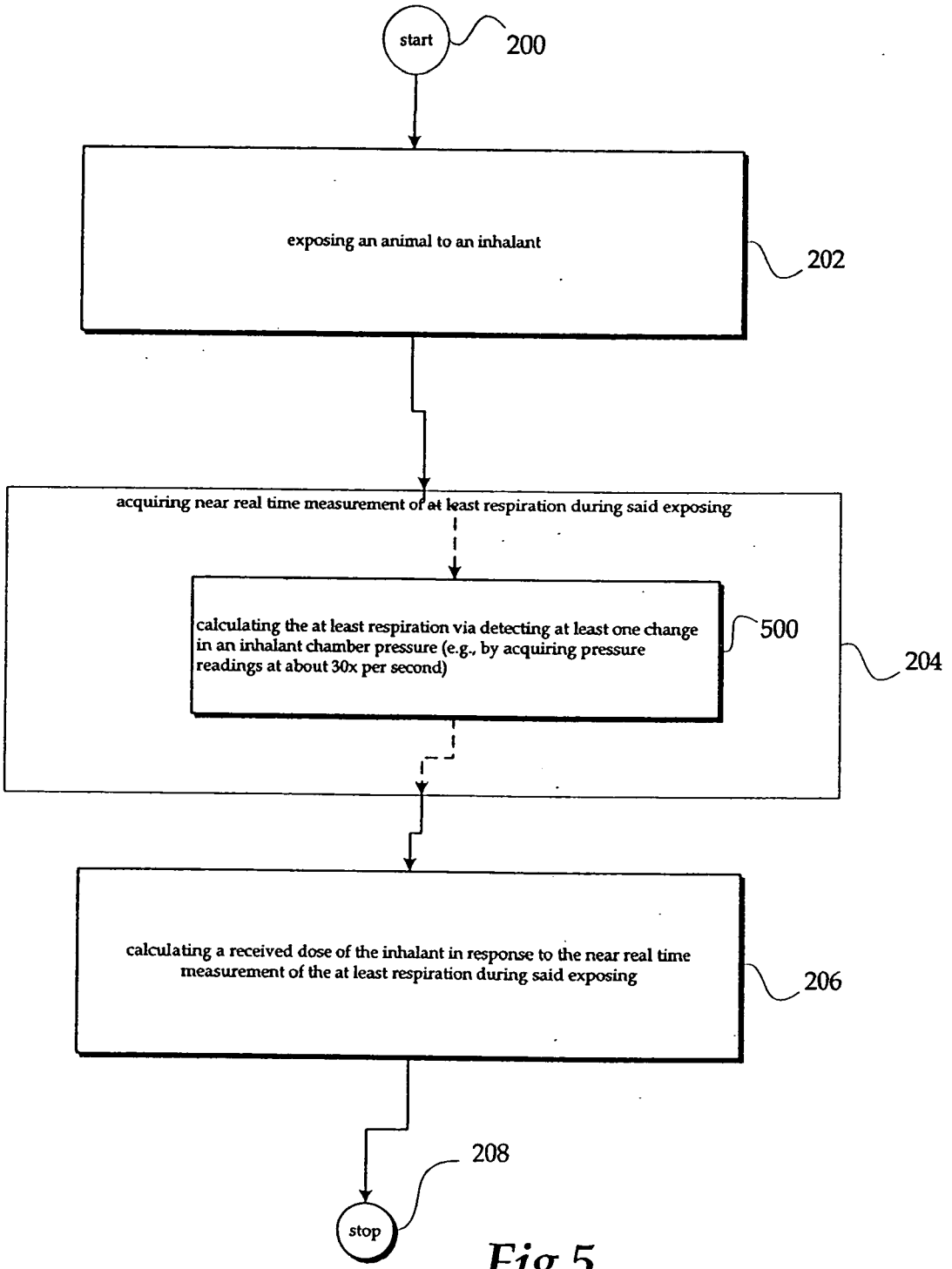

start
200
exposing an animal to an inhalant
202
acquiring near real time measurement of at least respiration during said exposing
calculating the at least respiration via detecting at least one change in an inhalant chamber pressure (e.g., by acquiring pressure readings at about 30x per second)
500
204
calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing
206
208
stop

Fig.5

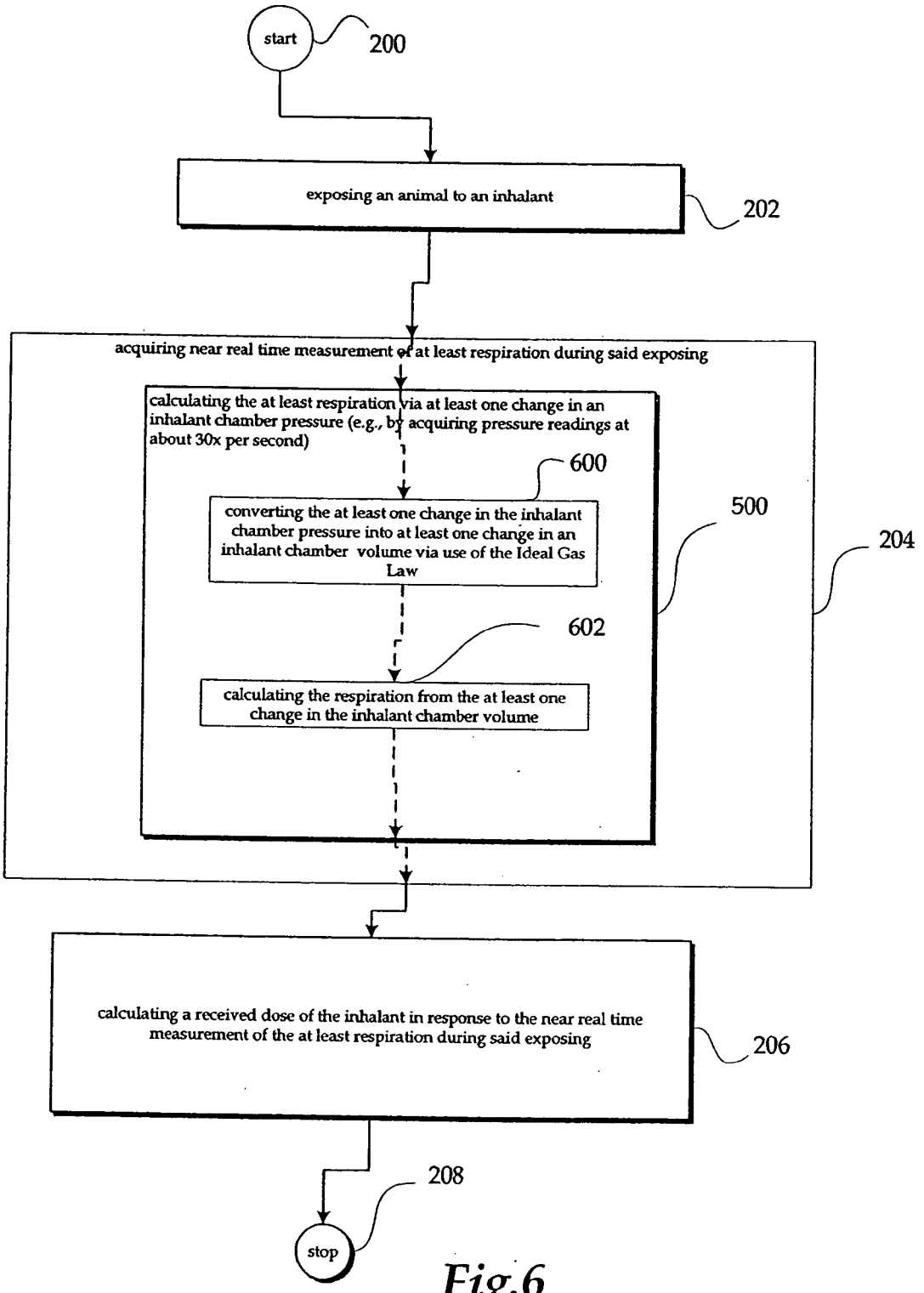

start
200
exposing an animal to an inhalant
202
acquiring near real time measurement of at least respiration during said exposing
calculating the at least respiration via at least one change in an inhalant chamber pressure (e.g., by acquiring pressure readings at about 30x per second)
600
converting the at least one change in the inhalant chamber pressure into at least one change in an inhalant chamber volume via use of the Ideal Gas Law
500
204
602
calculating the respiration from the at least one change in the inhalant chamber volume
calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing
206
208
stop

Fig.6

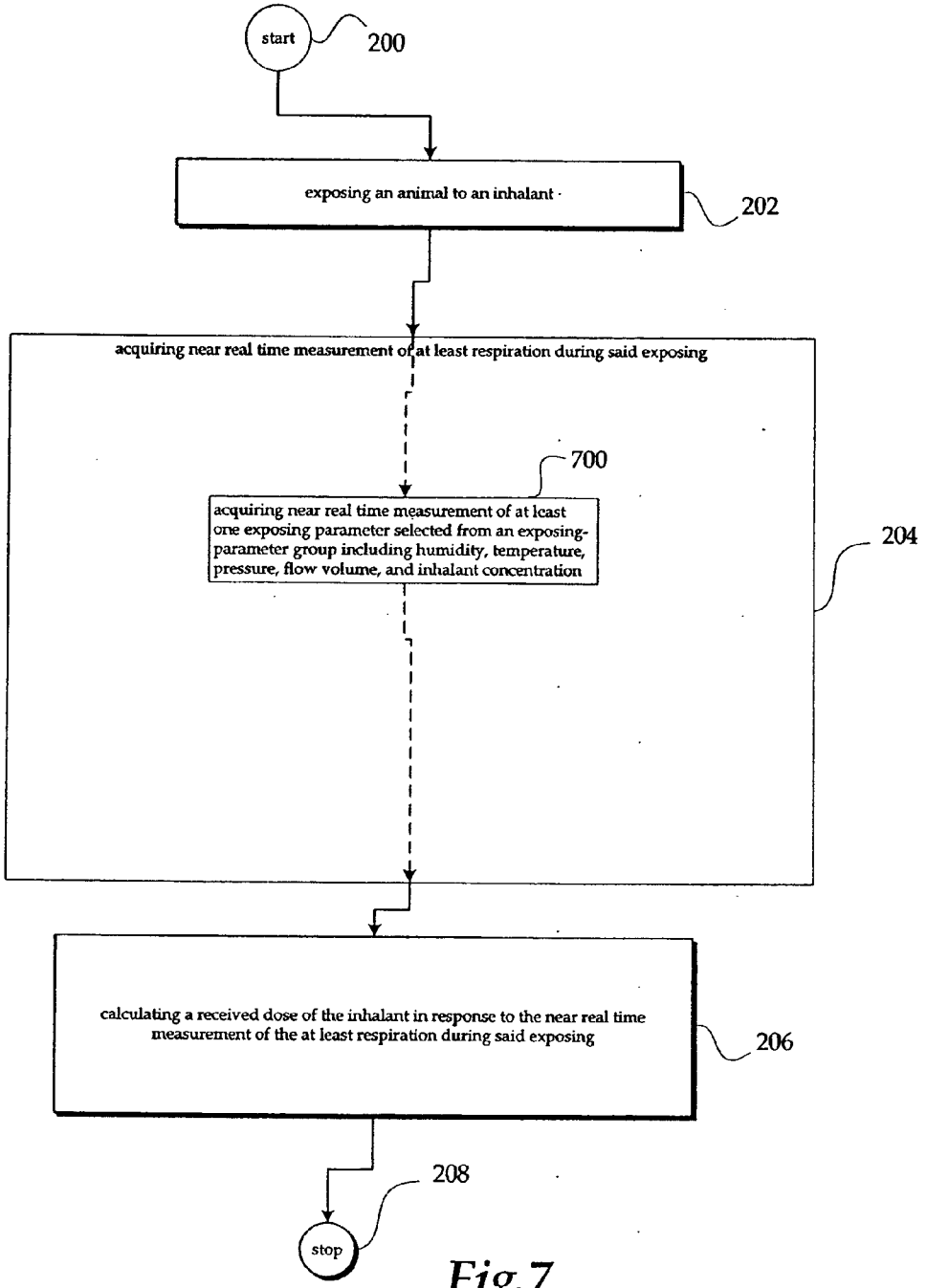

start
200
exposing an animal to an inhalant
202
acquiring near real time measurement of at least respiration during said exposing
700
acquiring near real time measurement of at least one exposing parameter selected from an exposing-parameter group including humidity, temperature, pressure, flow volume, and inhalant concentration
204
calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing
206
208
stop

Fig.7

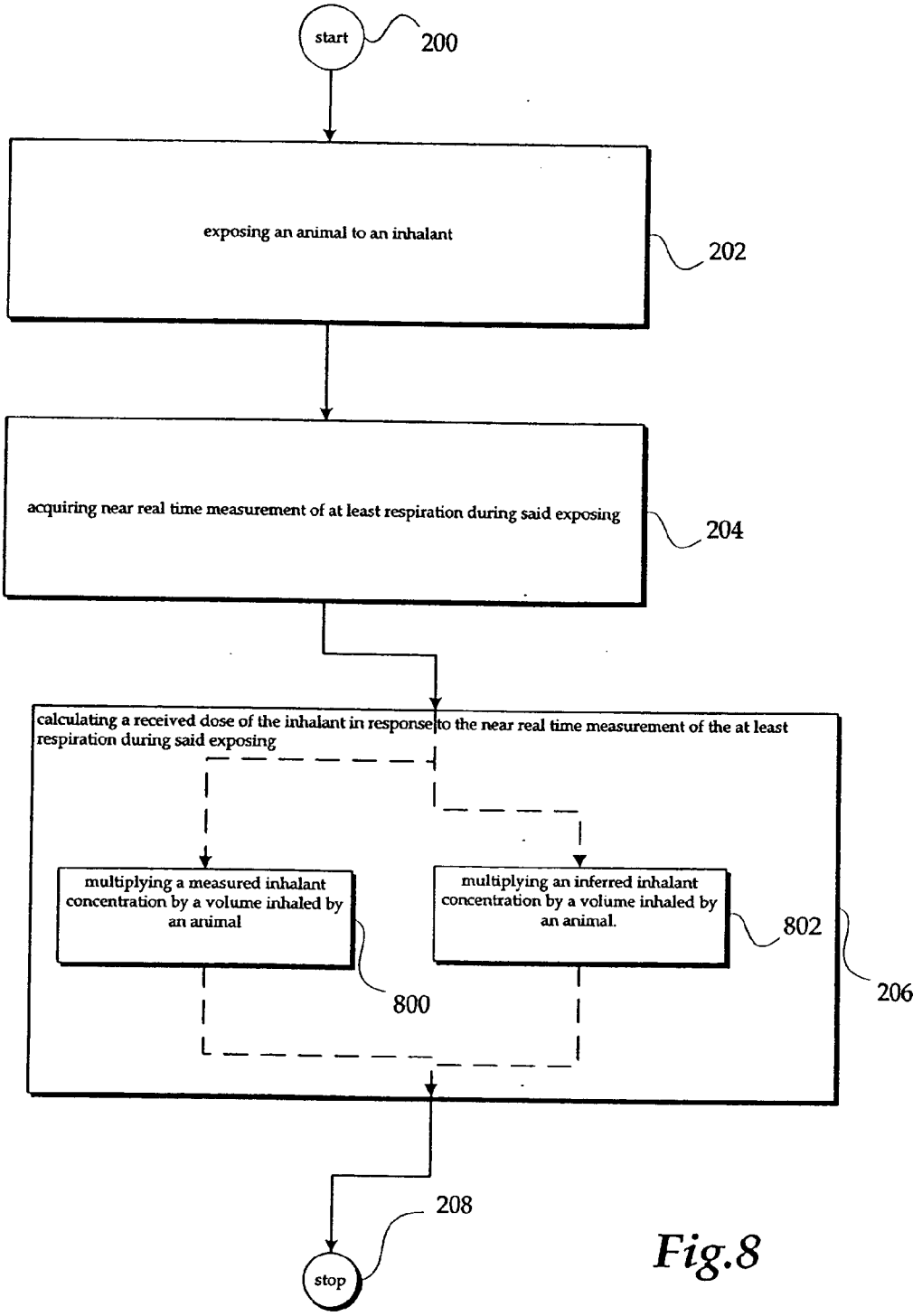

start
200
exposing an animal to an inhalant
202
acquiring near real time measurement of at least respiration during said exposing
204
calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing
multiplying a measured inhalant concentration by a volume inhaled by an animal
800
multiplying an inferred inhalant concentration by a volume inhaled by an animal.
802
206
208
stop

Fig.8

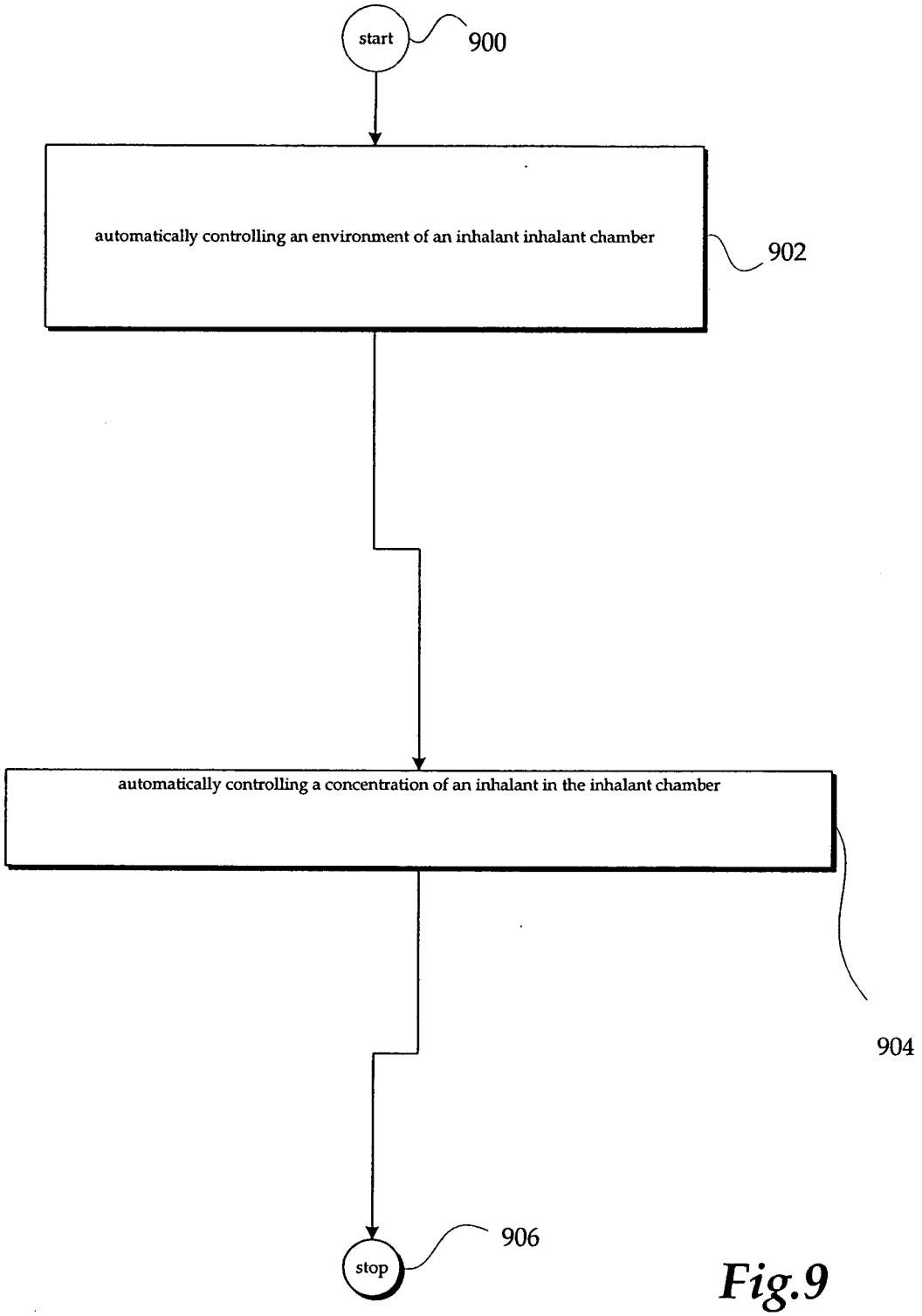

start
900
automatically controlling an environment of an inhalant inhalant chamber
902
automatically controlling a concentration of an inhalant in the inhalant chamber
904
stop
906

Fig.9

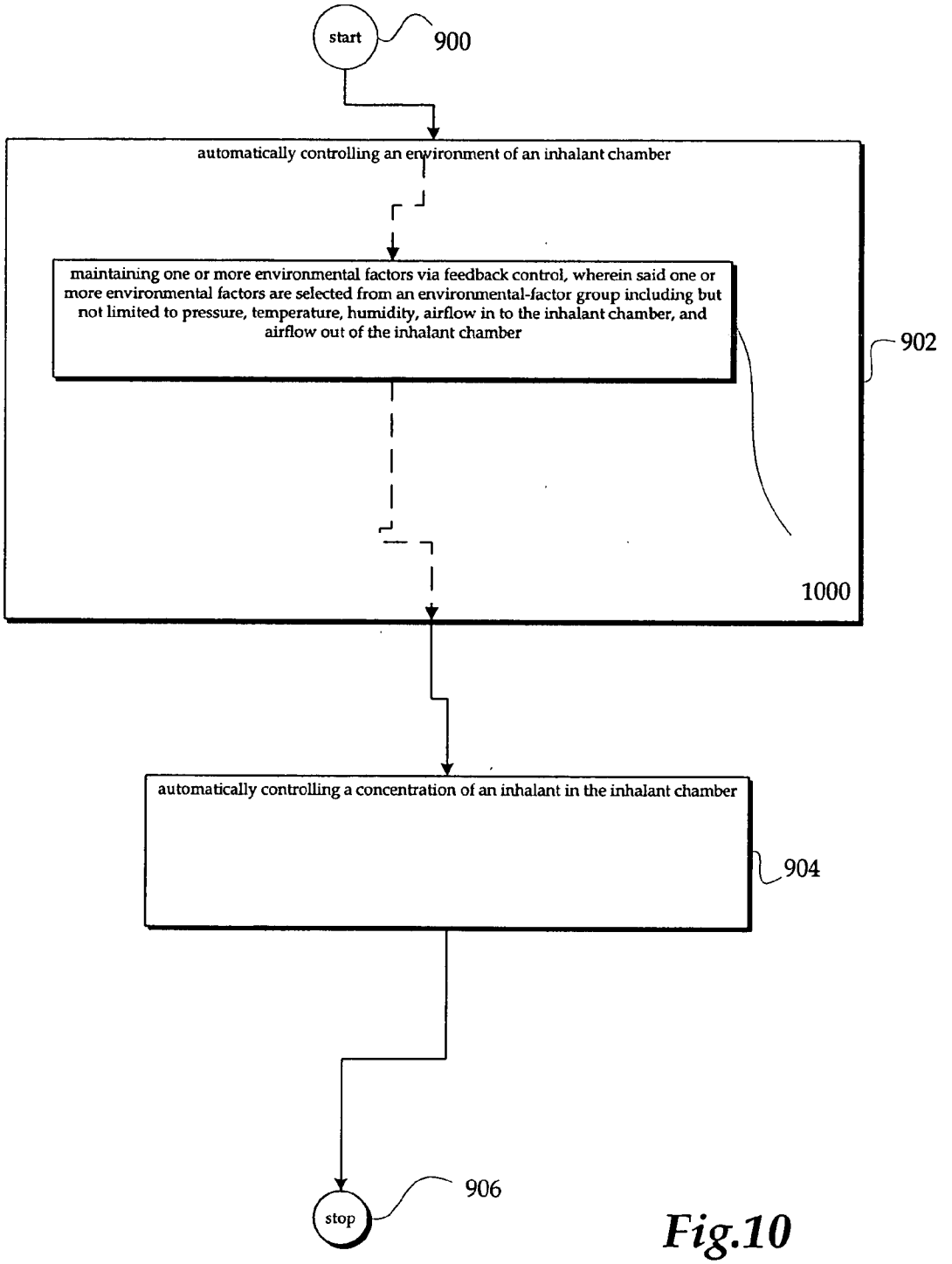

start
900
automatically controlling an environment of an inhalant chamber
maintaining one or more environmental factors via feedback control, wherein said one or more environmental factors are selected from an environmental-factor group including but not limited to pressure, temperature, humidity, airflow in to the inhalant chamber, and airflow out of the inhalant chamber
902
1000
automatically controlling a concentration of an inhalant in the inhalant chamber
904
stop
906

Fig.10

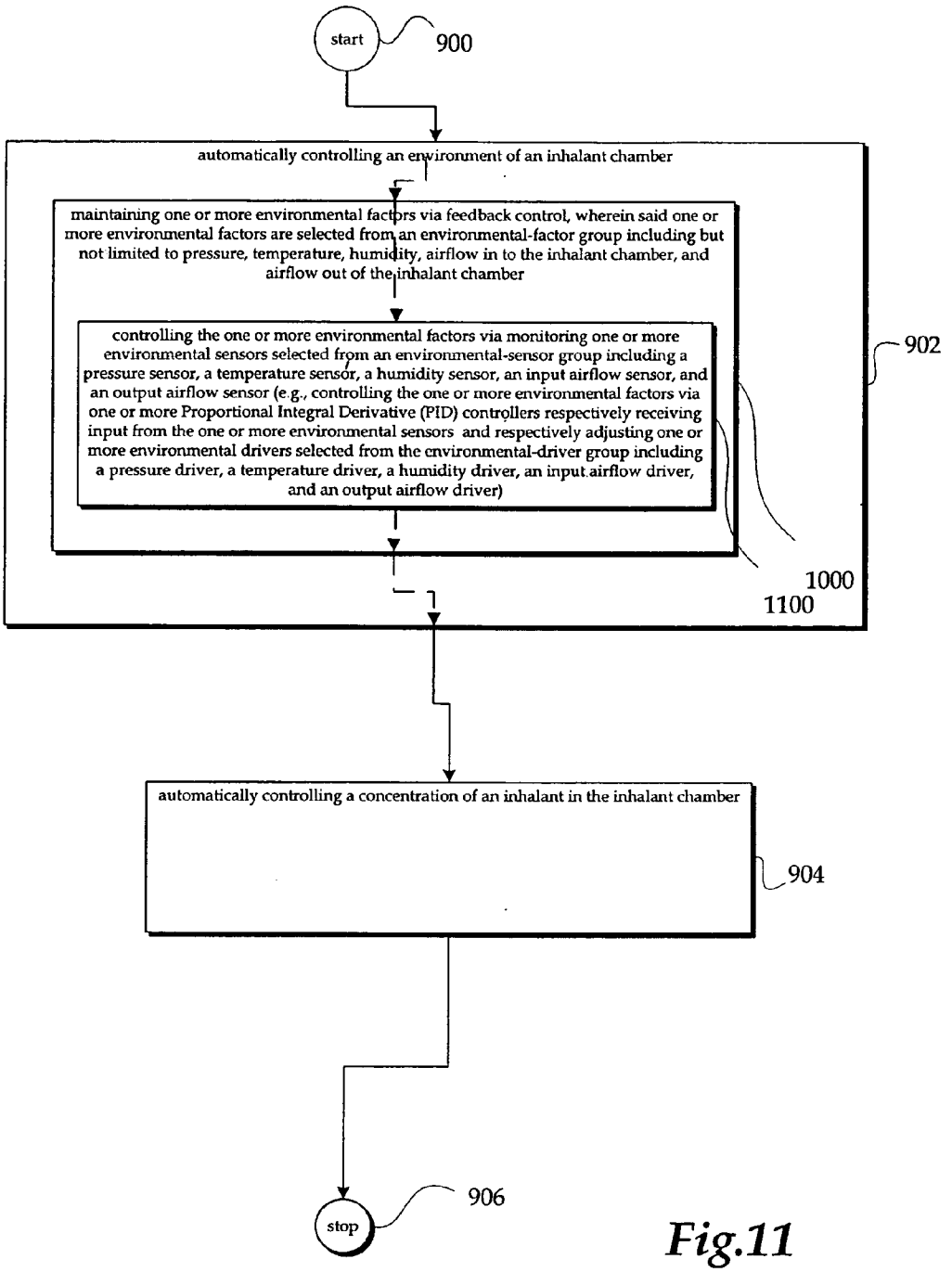

start
900
automatically controlling an environment of an inhalant chamber
maintaining one or more environmental factors via feedback control, wherein said one or more environmental factors are selected from an environmental-factor group including but not limited to pressure, temperature, humidity, airflow in to the inhalant chamber, and airflow out of the inhalant chamber
controlling the one or more environmental factors via monitoring one or more environmental sensors selected from an environmental-sensor group including a pressure sensor, a temperature sensor, a humidity sensor, an input airflow sensor, and an output airflow sensor (e.g., controlling the one or more environmental factors via one or more Proportional Integral Derivative (PID) controllers respectively receiving input from the one or more environmental sensors and respectively adjusting one or more environmental drivers selected from the environmental-driver group including a pressure driver, a temperature driver, a humidity driver, an input airflow driver, and an output airflow driver)
902
1000
1100
automatically controlling a concentration of an inhalant in the inhalant chamber
904
stop
906

Fig.11

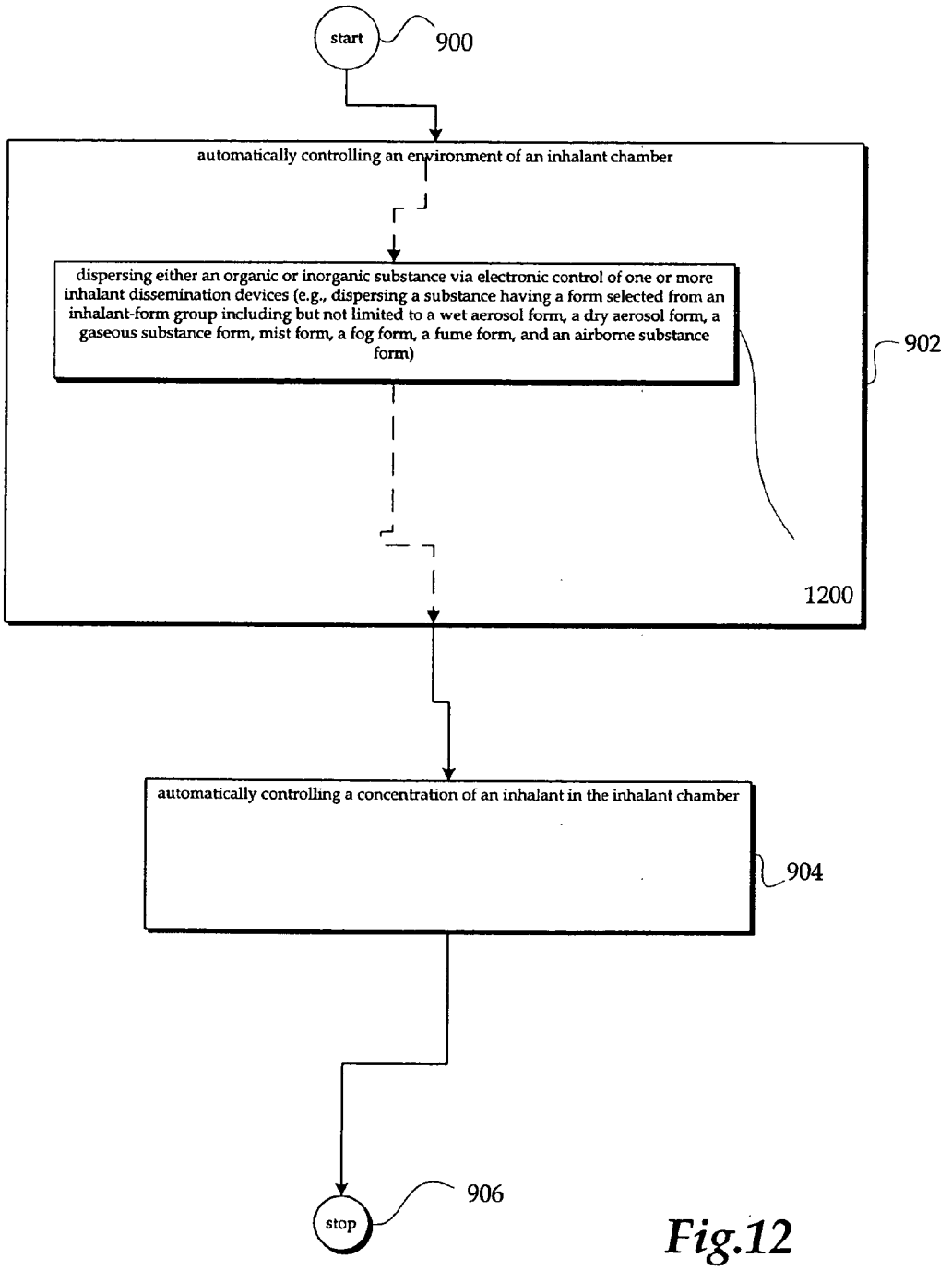

start
900
automatically controlling an environment of an inhalant chamber
dispersing either an organic or inorganic substance via electronic control of one or more inhalant dissemination devices (e.g., dispersing a substance having a form selected from an inhalant-form group including but not limited to a wet aerosol form, a dry aerosol form, a gaseous substance form, mist form, a fog form, a fume form, and an airborne substance form)
902
1200
automatically controlling a concentration of an inhalant in the inhalant chamber
904
stop
906

Fig.12

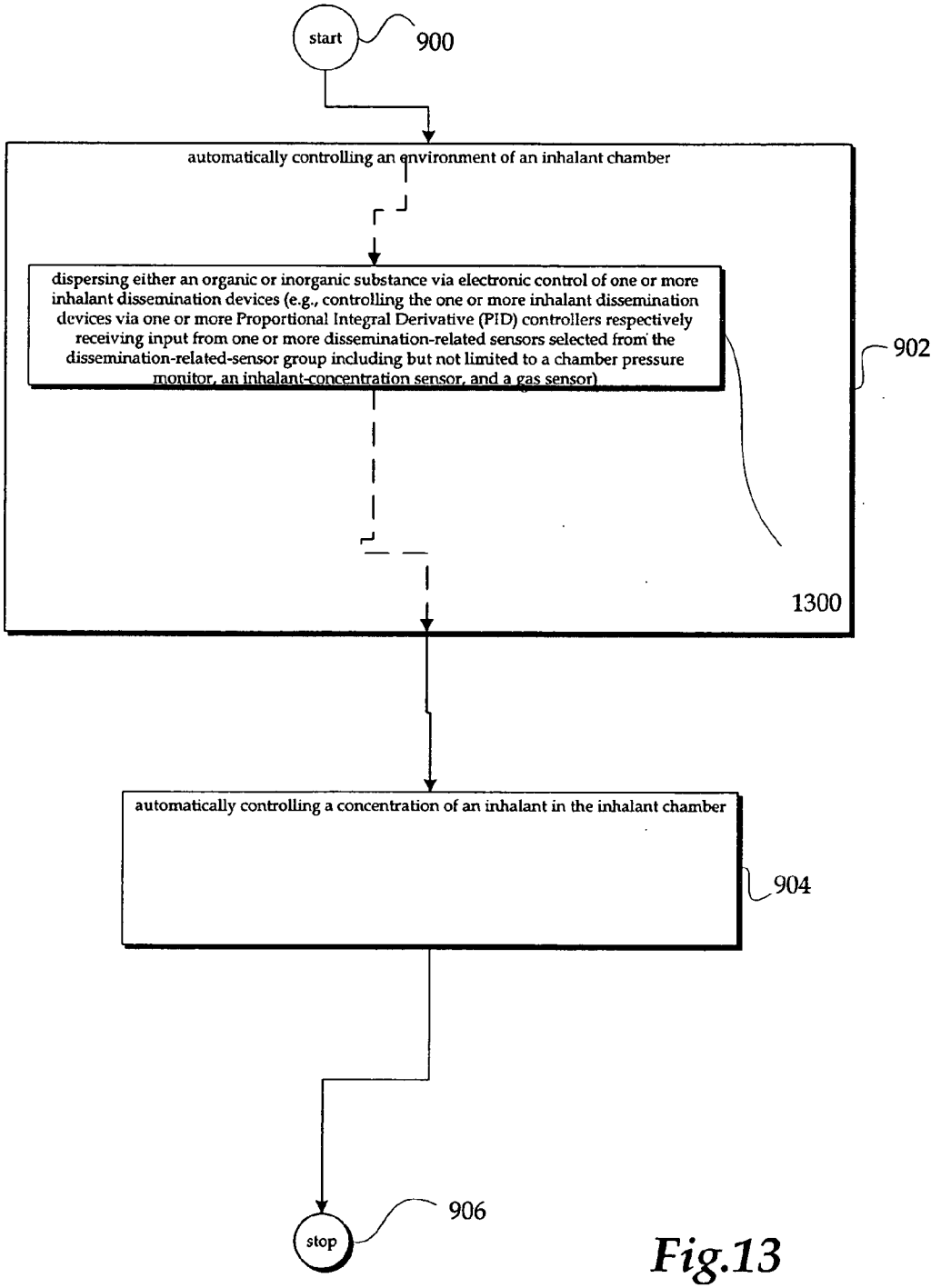

start
900
automatically controlling an environment of an inhalant chamber
dispersing either an organic or inorganic substance via electronic control of one or more inhalant dissemination devices (e.g., controlling the one or more inhalant dissemination devices via one or more Proportional Integral Derivative (PID) controllers respectively receiving input from one or more dissemination-related sensors selected from the dissemination-related-sensor group including but not limited to a chamber pressure monitor, an inhalant-concentration sensor, and a gas sensor)
902
1300
automatically controlling a concentration of an inhalant in the inhalant chamber
904
stop
906

Fig.13

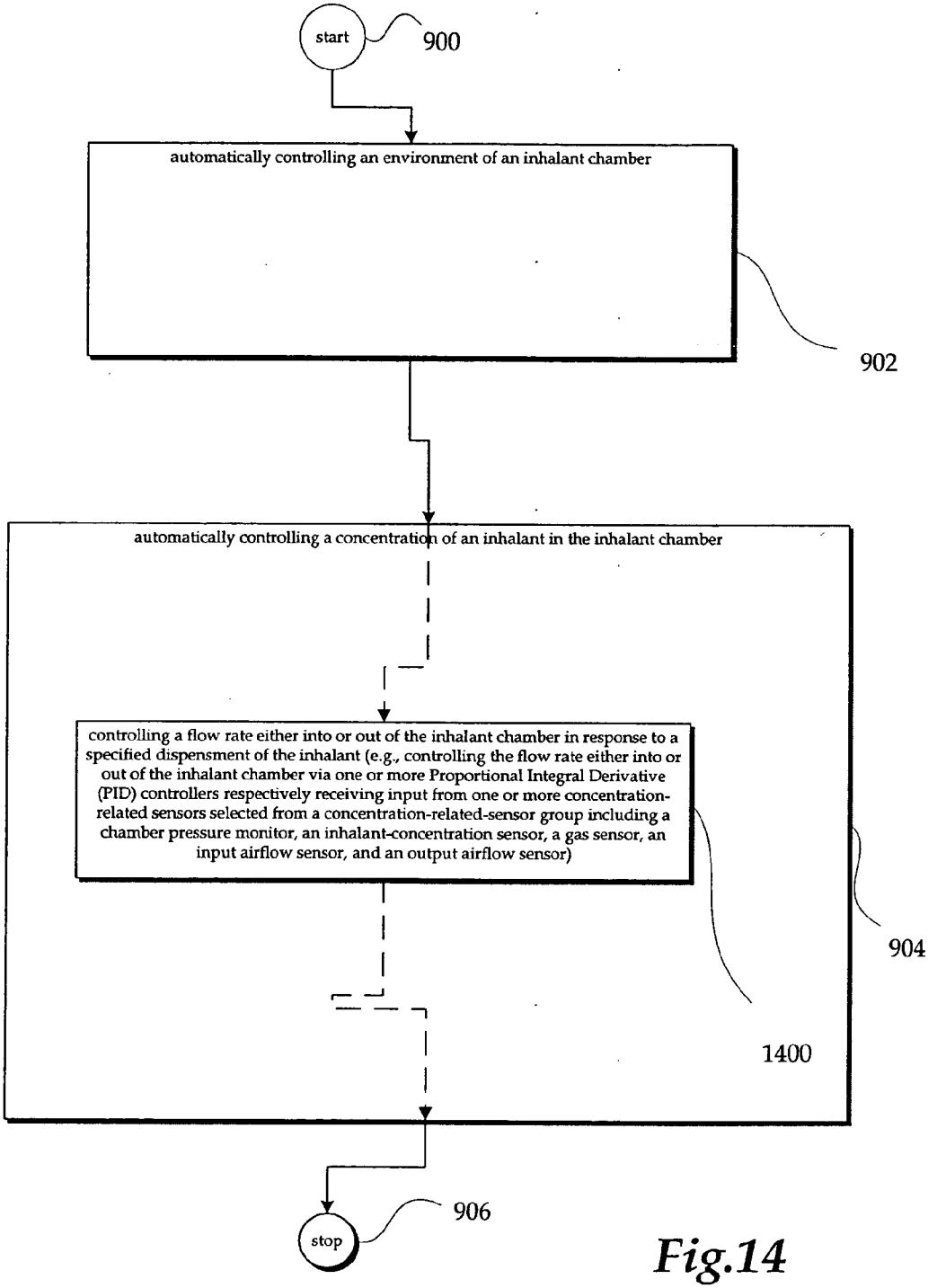

start
900
automatically controlling an environment of an inhalant chamber
902
automatically controlling a concentration of an inhalant in the inhalant chamber
controlling a flow rate either into or out of the inhalant chamber in response to a specified dispensment of the inhalant (e.g., controlling the flow rate either into or out of the inhalant chamber via one or more Proportional Integral Derivative (PID) controllers respectively receiving input from one or more concentration-related sensors selected from a concentration-related-sensor group including a chamber pressure monitor, an inhalant-concentration sensor, a gas sensor, an input airflow sensor, and an output airflow sensor)
1400
904
stop
906

Fig.14

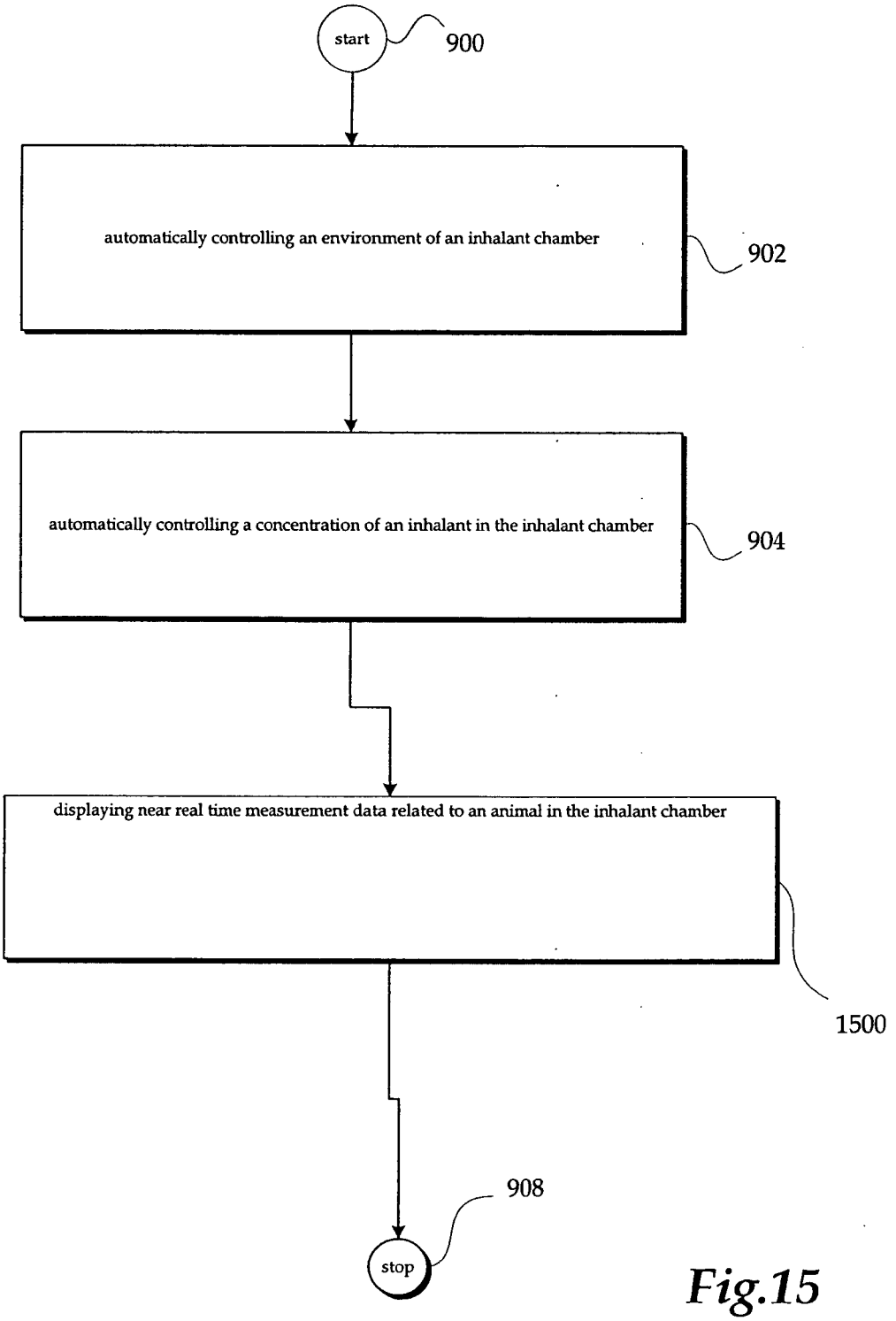

start
900
automatically controlling an environment of an inhalant chamber
902
automatically controlling a concentration of an inhalant in the inhalant chamber
904
displaying near real time measurement data related to an animal in the inhalant chamber
1500
908
stop

Fig.15

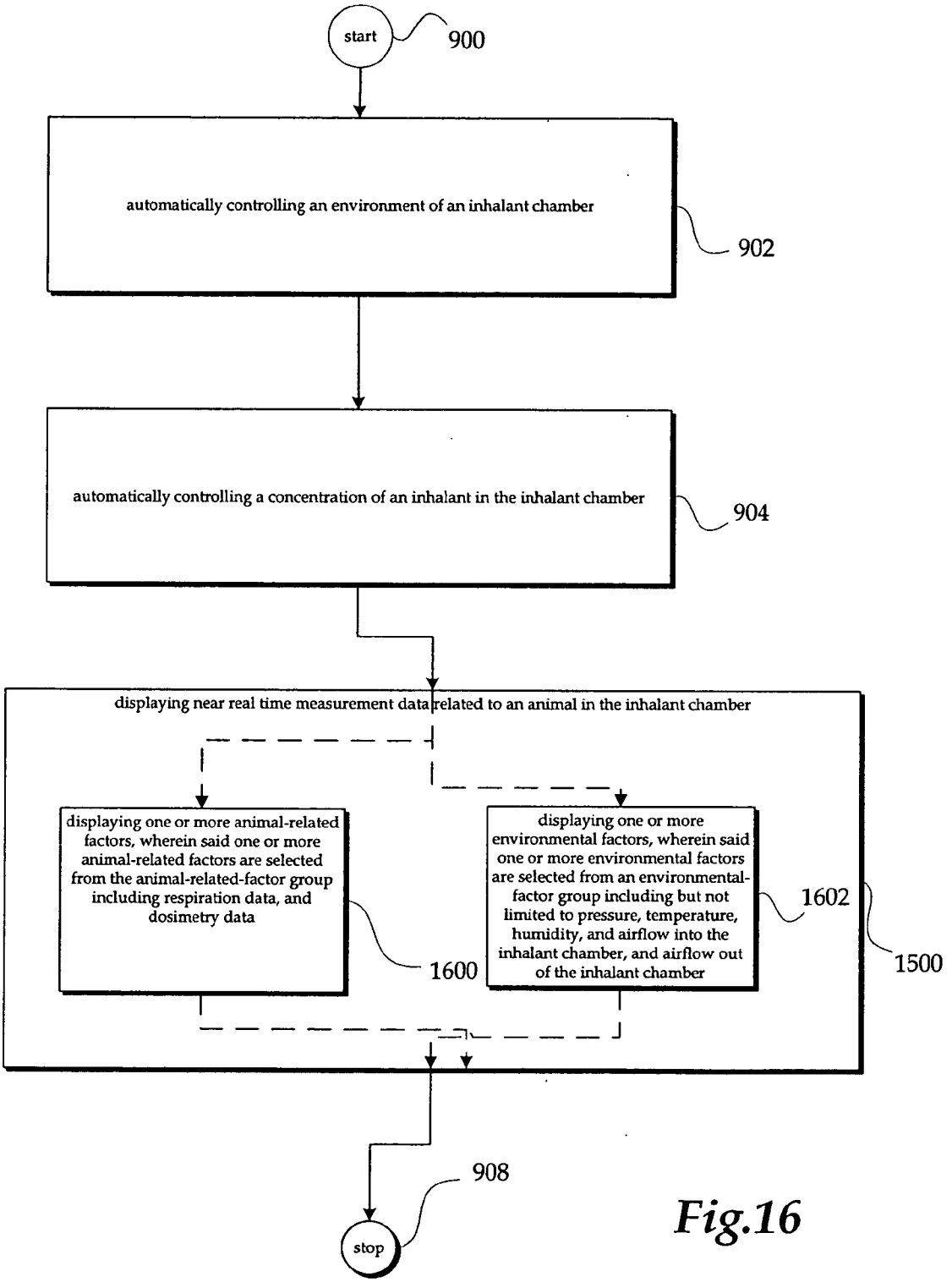

start
900
automatically controlling an environment of an inhalant chamber
902
automatically controlling a concentration of an inhalant in the inhalant chamber
904
displaying near real time measurement data related to an animal in the inhalant chamber
displaying one or more animal-related factors, wherein said one or more animal-related factors are selected from the animal-related-factor group including respiration data, and dosimetry data
1600
displaying one or more environmental factors, wherein said one or more environmental factors are selected from an environmental-factor group including but not limited to pressure, temperature, humidity, and airflow into the inhalant chamber, and airflow out of the inhalant chamber
1602
1500
908
stop

Fig.16

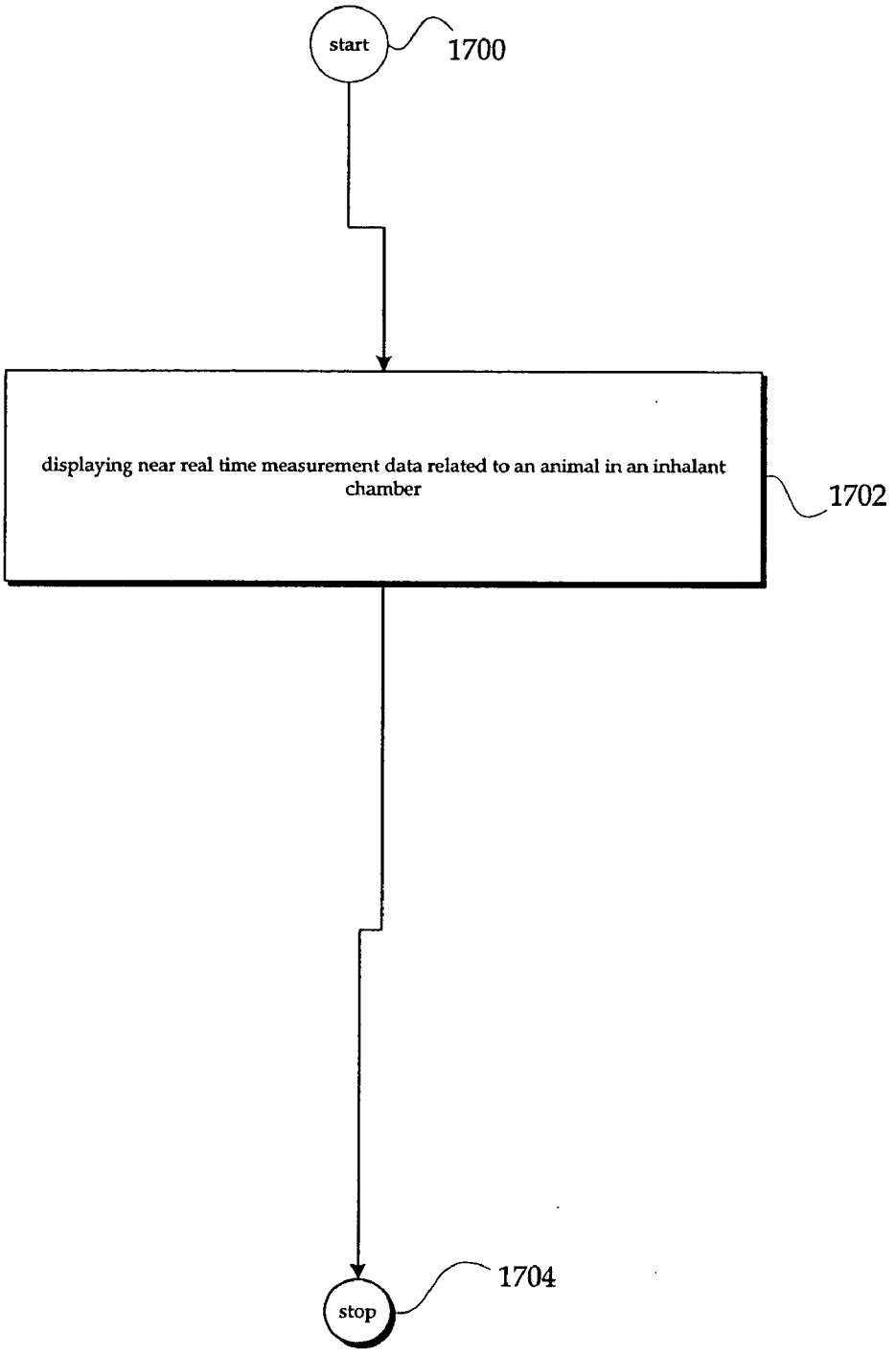

start
1700
displaying near real time measurement data related to an animal in an inhalant chamber
1702
stop
1704

Fig.17

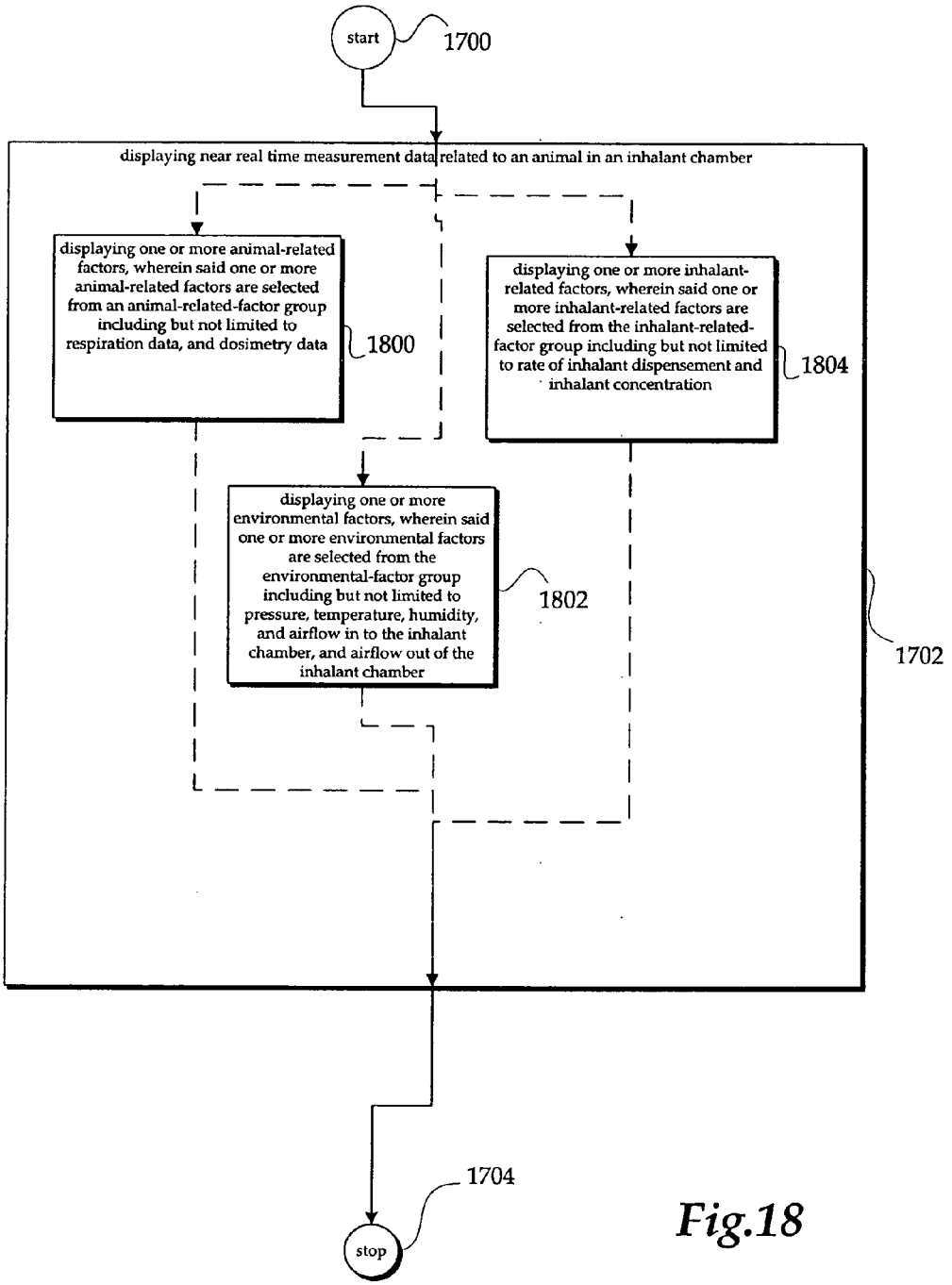

start
1700
displaying near real time measurement data related to an animal in an inhalant chamber
displaying one or more animal-related factors, wherein said one or more animal-related factors are selected from an animal-related-factor group including but not limited to respiration data, and dosimetry data
1800
displaying one or more inhalant-related factors, wherein said one or more inhalant-related factors are selected from the inhalant-related-factor group including but not limited to rate of inhalant dispensement and inhalant concentration
1804
displaying one or more environmental factors, wherein said one or more environmental factors are selected from the environmental-factor group including but not limited to pressure, temperature, humidity, and airflow in to the inhalant chamber, and airflow out of the inhalant chamber
1802
1702
1704
stop

Fig.18

AUTOMATED INHALATION TOXICOLOGY EXPOSURE SYSTEM AND METHOD

I. CROSS-REFERENCE(S) TO RELATED APPLICATION(S)

[0001] This patent application is a continuation application of U.S. application Ser. No. 09/919,741, filed Jul. 31, 2001, which claims the benefit of U.S. Provisional Application No. 60/267,233, filed Jan. 31, 2001. These patent applications are hereby incorporated by reference.

II. FIELD OF THE INVENTION

[0002] The present application relates, in general, to inhalant systems.

III. BACKGROUND OF THE INVENTION

[0003] Inhalation exposure studies are generally performed using inhalant systems. In an inhalation exposure study, an animal is usually exposed to an organic or inorganic inhalant within the confined space of an inhalant chamber forming part of an inhalant system.

[0004] In the related art, an inhalant system is typically one that provides mechanisms for exposing an animal to an inhalant. The inventors named herein ("inventors") have noticed several deficiencies and/or unmet needs associated with related-art inhalant systems, a few of which will now be set forth (other related-art deficiencies and/or unmet needs will become apparent in the detailed description below).

[0005] The inventors have discovered that related-art inhalant systems tend to provide poor reproducibility of scientific experiments. The inventors have noted that delivery of inhalants, environmental control, and monitoring in related-art inhalant systems is generally poorly controlled and/or monitored (e.g., by a human engaging in real-time manipulation of valves and motors and/or near real-time viewing and recordation of data presented on displays). Accordingly, insofar as human actions tend to be notoriously difficult to reproduce, the inventors have concluded that related-art inhalant systems tend to provide poor reproducibility. That is, precision and accuracy of inhalation experiments suffer because the users of related-art inhalant systems are neither able to exactly reproduce or actively record deviations of both intrinsic and extrinsic factors from experiment to experiment.

[0006] Insofar as inhalant systems are generally used to perform scientific experiments, it is desirable that the inhalant systems provide high reproducibility of scientific experiments so that experimental claims can be checked and validated. Unfortunately, related-art inhalant systems do not provide high reproducibility of scientific experiments. Accordingly, it is apparent that a need exists for inhalant systems that provide high reproducibility of scientific experiments, and that at present this need is going unmet in the related art.

[0007] In addition to the foregoing, the inventors have discovered that related-art inhalant systems do not incorporate near real-time measurement of respiratory function of test animals for purposes of dosimetry. That is, in general, related-art methods of inhalant dose calculation rely on physiologic trends based on historical data related to animals similar to those under test. Insofar as physiology varies from animal to animal, the inventors have recognized that it would be advantageous to have methods and systems, which provide, among other things, inhalant systems capable of determining inhalant dosage via near real-time acquisition of respiration of a test animal. Unfortunately, related-art inhalant systems are not, in general, capable of determining inhalant dosage via near real-time acquisition of respiration of a test animal. Accordingly, it is apparent that a need exists for inhalant systems capable of determining inhalant dosage via near real-time acquisition of respiration of a test animal.

IV. SUMMARY OF THE INVENTION

[0008] The inventors have devised methods and systems, which provide, among other things, inhalant systems capable of achieving high reproducibility of scientific experiments. In addition, the inventors have devised methods and systems, which provide, among other things, inhalant systems capable of determining inhalant dosage via near real-time acquisition of respiration of a test animal.

[0009] In one embodiment, a method includes but is not limited to exposing an animal to an inhalant; acquiring near real time measurement of at least respiration during said exposing; and calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing.

[0010] In one embodiment, a method includes but is not limited to automatically controlling an environment of an inhalant chamber; and automatically controlling a concentration of an inhalant in the inhalant chamber.

[0011] In one embodiment, a method includes but is not limited to displaying near real time measurement data related to an animal in an inhalant chamber.

[0012] In addition to the foregoing, other method embodiments are described in the claims, drawings, and text forming a part of the present application.

[0013] In one or more various embodiments, related systems include but are not limited to circuitry and/or programming for effecting the foregoing-described method embodiments; the circuitry and/or programming can be virtually any combination of hardware, software, and/or firmware configured to effect the foregoing-described method embodiments depending upon the design choices of the system designer. In one embodiment, a system includes but is not limited to at least one inhalant chamber; and at least one animal respiration sensor integral with the at least one inhalant chamber.

[0014] The foregoing is a summary and thus contains, by necessity; simplifications, generalizations and omissions of detail; consequently, those skilled in the art will appreciate that the summary is illustrative only and is NOT intended to be in any way limiting. Other aspects, inventive features, and advantages of the devices and/or processes described herein, as defined solely by the claims, will become apparent in the non-limiting detailed description set forth herein.

V. BRIEF DESCRIPTION OF THE DRAWINGS

[0015] The foregoing aspects and many of the attendant advantages of this invention will become more readily appreciated as the same become better understood by ref-

erence to the following detailed description, when taken in conjunction with the accompanying drawings, wherein:

[0016] **FIG. 1** shows a high level pictographic representation of inhalant exposure and monitoring system **100**.

[0017] **FIG. 2** shows the start of the process of exposing an animal to an inhalant.

[0018] **FIG. 3** shows that in one implementation method step **202** can include method step **300**.

[0019] **FIG. 4** depicts that in one implementation method step **202** can include method step **400**.

[0020] **FIG. 5** shows that in one implementation method step **204** can include method step **500**.

[0021] **FIG. 6** depicts that in one implementation method step **500** can include method steps **600** and **602**.

[0022] **FIG. 7** shows that in one implementation method step **204** can include method step **700**.

[0023] **FIG. 8** shows that in one implementation method step **206** can include method step **800**, while in another implementation method step **206** can include method step **802**.

[0024] **FIG. 9** shows a process that depicts automatically controls an environment of an inhalant chamber.

[0025] **FIG. 10** shows that in one implementation method step **902** can include method step **1000**.

[0026] **FIG. 11** depicts that in one implementation method step **1000** can include method step **1100**.

[0027] **FIG. 12** shows that in one implementation method step **902** can include method step **1200**.

[0028] **FIG. 13** depicts that in one implementation method step **902** can include method step **1300**.

[0029] **FIG. 14** depicts that in one implementation method step **902** can include method step **1400**.

[0030] **FIG. 15** shows that in one alternate implementation the process includes additional method step **1500**.

[0031] **FIG. 16** shows that in one implementation method step **1500** can include method step **1600**, while in another implementation method step **1500** can include method step **1602**.

[0032] **FIG. 17** depicts a process that displays near real time measurement data related to an animal in the inhalant chamber.

[0033] **FIG. 18** shows that in one implementation method step **1702** can include method step **1800**, while in another implementation method step **1702** can include method step **1802**, while in yet another implementation method step **1702** can include method step **1804**.

[0034] The use of the same reference symbols in different drawings indicates similar or identical items.

VI. DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0035] With reference now to **FIG. 1**, shown is a high level pictographic representation of inhalant exposure and monitoring system **100**. Depicted is inhalant toxicology exposure system **100**. Illustrated is animal **102** contained within inhalant chamber **104**. Shown integral with inhalant chamber **104** is sensor **106**, which is intended to be indicative of one or more types of sensors integral with various parts of inhalant toxicology exposure system **100**. For example, sensor **106** is meant to be indicative of a variety of different types of sensors, such as temperature sensors, humidity sensors, particle count sensors, gas concentration sensors, etcetera, and even though sensor **106** is shown integral with inhalant chamber **104**, sensor **106** is meant to be indicative of sensors positioned throughout various parts of inhalant toxicology exposure system **100**.

[0036] Further with respect to **FIG. 1**, depicted is input airflow driver **108** (e.g., an air pump) connected to drive air through input air hose **110** and into inhalant chamber **104**. Illustrated is inhalant reservoir **112** (e.g., a reservoir for inhalants such as biological aerosols) that feeds nebulizer **114**, and allows nebulizer **114** to deposit an inhalant into input air hose **110**. Nebulizer **114** and inhalant reservoir **112** are meant to be collectively indicative of a variety of different types of organic or inorganic substance dispensing units, such as wet aerosol dispensing units, a dry aerosol dispensing units, a gaseous substance dispensing units, mist dispensing units, a fog dispensing units a fume dispensing units, and an airborne substance dispensing units, etc., and even though nebulizer **114** is shown integral with input air hose **110**, nebulizer **114** and inhalant reservoir **112** are meant to be collectively indicative of dispensing units positioned throughout various parts of inhalant toxicology exposure system **100**. Further depicted is input airflow sensor **116**, which detects input airflow volume, and even though input airflow sensor **116** is shown integral with input air hose **110**, input airflow sensor **116** is meant to be indicative of input airflow sensors positioned throughout various parts of inhalant toxicology exposure system **100**, where such various parts are in the air inflow path.

[0037] Further with respect to **FIG. 1**, depicted is output airflow driver **118** (e.g., a fan, or a vacuum pump) connected to drive air through output air hose **120** and into exhaust sink **122** (e.g., a chlorine bleach reservoir sufficient to kill/neutralize organic inhalants such as biological aerosols). Illustrated is output airflow sensor **124**, which detects output airflow volume, airflow and even though output airflow sensor **124** is shown integral with output air hose **120**, output airflow sensor **124** is meant to be indicative of output airflow sensors positioned throughout various parts of inhalant toxicology exposure system **100**, where such various parts are in the air outflow path.

[0038] Further with respect to **FIG. 1**, shown integral with inhalant chamber **104** is driver **126**, which is intended to be indicative of one or more types of drivers integral with various parts of inhalant toxicology exposure system **100**. For example, driver **126** is meant to be indicative of a variety of different types of drivers, such as temperature drivers (e.g., heaters and/or coolers), humidity drivers (e.g., humidifiers and/or dehumidifiers), inhalant concentration drivers (e.g., the various types of organic and inorganic dispensing units described herein), etc. and even though driver **126** is shown integral with inhalant chamber **104**, driver **126** is meant to be indicative of drivers positioned throughout various parts of inhalant toxicology exposure system **100**.

[0039] Lastly with respect to **FIG. 1**, shown is that the various sensors and drivers of inhalant toxicology and

exposure system are operably connected (e.g., via electrical connections capable of carrying digital and/or analog information) with interface card **128**. Depicted is that interface card **128** is operably connected with data processing system **130** which includes system unit housing **132**, video display device **134** (shown as displaying a graphical user interface (GUI) **135**), keyboard **136**, and mouse **138**. In one implementation, one or more control programs **140** reside within and run on data processing system **130**, where such one or more control programs control the various sensors and drivers shown in order to effect the processes described herein. Data processing system **130** may be implemented utilizing any suitable computer such as a DELL portable computer system, a product of Dell Computer Corporation, located in Round Rock, Tex.; Dell is a trademark of Dell Computer Corporation.

[**0040**] Following are a series of flowcharts depicting implementations of processes. For ease of understanding, the flowcharts are organized such that the initial flowcharts present implementations via an overall "big picture" viewpoint and thereafter the following flowcharts present alternate implementations and/or expansions of the "big picture" flowcharts as either substeps or additional steps building on one or more earlier-presented flowcharts. Those having ordinary skill in the art will appreciate that the style of presentation utilized herein (e.g., beginning with a presentation of a flowchart(s) presenting an overall view and thereafter providing additions to and/or further details in subsequent flowcharts) generally allows for a rapid and easy understanding of the various process implementations.

[**0041**] With reference now to **FIG. 2**, shown is an implementation of a high-level logic flowchart depicting a process. Method step **200** shows the start of the process. Method step **202** depicts exposing an animal to an inhalant (e.g., exposing an animal of a type drawn from a gas-breathing-members-of-phylum-chordata group which includes an avian, a rodent, a primate, a feline, a canine, a porcine, an equine). In one device implementation, method step **202** is achieved by introducing an inhalant (e.g., an aerosolized form of a pathogen, such as anthrax or smallpox) from an inhalant reservoir (e.g., inhalant reservoir **112**) into an inhalant chamber (e.g., inhalant chamber **104**) containing all or part of an animal.

[**0042**] Method step **204** illustrates acquiring near real time measurement of at least respiration during said exposing. In one device implementation, method step **204** is achieved by via a respiration sensor (e.g., a pressure sensor implementation of sensor **106**) integral with an inhalant chamber (e.g., inhalant chamber **104**).

[**0043**] Method step **206** shows calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing. In one device implementation, method step **206** is achieved via a processor (e.g., a processor internal to data processing system **130**) running software that calculates a dose of the inhalant received by the animal, where such calculation is based at least in part on the near real time measurement of respiration.

[**0044**] Method step **208** illustrates the end of the process.

[**0045**] For additional examples of the process of **FIG. 2** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233.

[**0046**] With reference now to **FIG. 3**, shown is an implementation of the high-level logic flowchart shown in **FIG. 2**. Depicted in **FIG. 3** is that in one implementation method step **202** can include method step **300**. Illustrated is that in one implementation exposing an animal to an inhalant can include, but is not limited to, dispersing either an organic or inorganic substance (e.g., dispersing a substance having a form selected from an inhalant-form group including but not limited to a wet aerosol form, a dry aerosol form, a gaseous substance form, mist form, a fog form, a fume form, and an airborne substance form). In one device implementation, method step **300** is achieved by activation of a nebulizer (e.g., nebulizer **114**) that feeds an input airflow (e.g., input airflow flowing from input air hose **110** into inhalant chamber **104**) into an inhalant chamber (e.g., inhalant chamber **104**).

[**0047**] For additional examples of the process of **FIG. 3** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 3** function substantially as described elsewhere herein.

[**0048**] With reference now to **FIG. 4**, shown is an implementation of the high-level logic flowchart shown in **FIG. 2**. Depicted in **FIG. 4** is that in one implementation method step **202** can include method step **400**. Illustrated is that in one implementation exposing an animal to an inhalant can include, but is not limited to, dispersing the inhalant into an inhalant chamber (e.g., dispersing the inhalant into an inhalant chamber having a configuration selected from an exposure-target group including but not limited to a configuration to house a nose of the animal, a configuration to house a head of the animal, a configuration to house a part of the animal, and a configuration to house the entire animal; however, with respect to the foregoing, those skilled in the art will appreciate that the part of the animal that expands/contracts appreciably during respiration is preferably substantially isolated from the inhalant-chamber space where pressure measurement is taken, so that the expansion/contraction of the part of the animal that expands/contracts appreciably during respiration does not unduly interfere with the pressure measurement (e.g., if the inhalant chamber houses the entire animal, a second enclosure could be used to enclose and isolate the animal's thoracic cage from the space of the inhalant chamber where the pressure is to be measured.). In one device implementation, method step **400** is achieved by activation of a nebulizer (e.g., nebulizer **114**) which feeds an input airflow (e.g., input airflow flowing from input air hose **110** into inhalant chamber **104**) into an inhalant chamber (e.g., inhalant chamber **104**) constructed to enclose either the nose, head, part, or all of the animal in a fashion such that gaseous input and egress from the inhalant chamber are controlled.

[**0049**] For additional examples of the process of **FIG. 4** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 4** function substantially as described elsewhere herein.

[**0050**] With reference now to **FIG. 5**, shown is an implementation of the high-level logic flowchart shown in **FIG. 2**. Depicted in **FIG. 5** is that in one implementation method step **204** can include method step **500**. Illustrated is that in one implementation acquiring near real time measurement

of at least respiration during said exposing can include, but is not limited to, calculating the at least respiration via detecting at least one change in an inhalant chamber pressure (e.g., by acquiring pressure readings at about 30×per second). In one device implementation, method step **500** is achieved via a processor (e.g., a processor internal to data processing system **130**) running software which calculates either or both inspiration and expiration by an animal in response to a pressure reading detected by a pressure transducer (e.g., a pressure sensor implementation of sensor **106**) integral with an inhalation chamber (e.g., inhalation chamber **104**). Those skilled in the art will recognize that the change in the inhalant chamber pressure caused by the animal's respiratory function could also be measured indirectly by detecting a change in pressure in a second enclosure which isolates the animal's thoracic cage.

[**0051**] For additional examples of the process of **FIG. 5** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 5** function substantially as described elsewhere herein.

[**0052**] With reference now to **FIG. 6**, shown is an implementation of the high-level logic flowchart shown in **FIG. 5**. Depicted in **FIG. 6** is that in one implementation method step **500** can include method steps **600** and **602**. Illustrated is that in one implementation calculating the at least respiration via detecting at least one change in a chamber pressure can include, but is not limited to, converting the at least one change in the inhalant chamber pressure into at least one change in an inhalant chamber volume via use of the Ideal Gas Law. In one device implementation, method step **600** is achieved via a processor (e.g., a processor internal to data processing system **130**) running software, which calculates either or both inspiration and expiration by an animal in response to a pressure reading detected by a pressure transducer (a pressure sensor implementation of sensor **106**) integral with an inhalation chamber (e.g., inhalation chamber **104**), via use of the Ideal Gas Law (e.g., PV=nRT, where p is the pressure, V is the volume, n is the number of moles, R is the gas constant, and T is the temperature.). Further illustrated is that in one implementation calculating the at least respiration via detecting at least one change in a chamber pressure can include, but is not limited to, calculating the respiration from the at least one change in the inhalant chamber volume. In one device implementation, method step **602** is achieved via a processor (e.g., a processor internal to data processing system **130**) running software, which calculates either or both inspiration and expiration by an animal in response to the calculated change in volume such as was described in relation to method step **600**.

[**0053**] For additional examples of the process of **FIG. 6** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 6** function substantially as described elsewhere herein.

[**0054**] With reference now to **FIG. 7**, shown is an implementation of the high-level logic flowchart shown in **FIG. 2**. Depicted in **FIG. 7** is that in one implementation method step **204** can include method step **700**. Illustrated is that in one implementation acquiring near real time measurement of at least respiration during said exposing can include, but is not limited to, acquiring near real time measurement of at least one exposing parameter selected from an exposing-parameter group including humidity, temperature, pressure, flow volume, and inhalant concentration. In one device implementation, method step **700** is achieved via a processor (e.g., a processor internal to data processing system **130**) running software, which monitors and collects data from humidity, pressure, flow volume, and/or inhalant concentration sensors (e.g., humidity sensor, pressure sensor, flow volume sensor, and inhalant concentration sensor, etc. implementations of sensor **106**) integral with an inhalation chamber (e.g., inhalation chamber **106**).

[**0055**] For additional examples of the process of **FIG. 7** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 7** function substantially as described elsewhere herein.

[**0056**] With reference now to **FIG. 8**, shown are alternate implementations of the high-level logic flowchart shown in **FIG. 2**. Depicted in **FIG. 8** is that in one implementation method step **206** can include method step **800**, while in another implementation method step **206** can include method step **802**. Illustrated in method step **800** is that in one implementation calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing can include, but is not limited to, multiplying a measured inhalant concentration by a volume inhaled by an animal. In one device implementation, method step **800** is achieved via a processor (e.g., a processor internal to data processing system **130**) running software which uses measured data in conjunction with a calculated volume of air inhaled by an animal in an inhalant chamber **104**). Depicted in method step **802** is that in another implementation calculating a received dose of the inhalant in response to the near real time measurement of the at least respiration during said exposing can include, but is not limited to, multiplying an inferred inhalant concentration by a volume inhaled by an animal. In one device implementation, method step **800** is achieved via a processor (e.g., a processor internal to data processing system **130**) running software which uses inferred data (e.g., data inferred from directions to a nebulizer to dispense a certain aerosol concentration) in conjunction with a calculated volume of air inhaled by an animal in an inhalant chamber **104**).

[**0057**] For additional examples of the process of **FIG. 8** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 8** function substantially as described elsewhere herein.

[**0058**] With reference now to **FIG. 9**, shown is an implementation of a high-level logic flowchart depicting a process. Method step **900** shows the start of the process. Method step **902** depicts automatically controlling an environment of an inhalant chamber. Method step **904** illustrates automatically controlling a concentration of an inhalant in the inhalant chamber. Method step **906** shows the end of the process.

[**0059**] For examples of the process of **FIG. 9**, please see the discussion here. For additional examples of the process of **FIG. 9** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233.

[0060] With reference now to **FIG. 10**, shown is an implementation of the high-level logic flowchart shown in **FIG. 9**. Depicted in **FIG. 10** is that in one implementation method step **902** can include method step **1000**. Illustrated is that in one implementation automatically controlling an environment of an inhalant chamber can include, but is not limited to, maintaining one or more environmental factors via feedback control, wherein said one or more environmental factors are selected from an environmental-factor group including but not limited to pressure, temperature, humidity, airflow in to the inhalant chamber, and airflow out of the inhalant chamber. In one device implementation, method step **1000** is achieved via control software running on a processor (e.g., a processor internal to data processing system **130**), where the control software maintains the one or more environmental factors at levels specified via user input to a graphical user interface.

[0061] For additional examples of the process of **FIG. 10** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 10** function substantially as described elsewhere herein.

[0062] With reference now to **FIG. 11**, shown is an implementation of the high-level logic flowchart shown in **FIG. 10**. Depicted in **FIG. 11** is that in one implementation method step **1000** can include method step **1100**. Illustrated is that in one implementation maintaining one or more environmental factors via feedback control, wherein said one or more environmental factors are selected from an environmental-factor group including but not limited to pressure, temperature, humidity, airflow in to the inhalant chamber, and airflow out of the inhalant chamber can include, but is not limited to, controlling the one or more environmental factors via monitoring one or more environmental sensors selected from an environmental-sensor group including a pressure sensor, a temperature sensor, a humidity sensor, an input airflow sensor, and an output airflow sensor (e.g., controlling the one or more environmental factors via one or more Proportional Integral Derivative (PID) controllers respectively receiving input from the one or more environmental sensors and respectively adjusting one or more environmental drivers selected from the environmental-driver group including a pressure driver, a temperature driver, a humidity driver, an input airflow driver, and an output airflow driver). In one device implementation, method step **1100** is achieved via control software running on a processor (e.g., a processor internal to data processing system **130**), where the control software collects data from one or more environmental sensors and uses one or more PID algorithms to adjust one or more devices which drive the one or more environmental factors.

[0063] For additional examples of the process of **FIG. 11** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 11** function substantially as described elsewhere herein.

[0064] With reference now to **FIG. 12**, shown is an implementation of the high-level logic flowchart shown in **FIG. 9**. Depicted in **FIG. 12** is that in one implementation method step **902** can include method step **1200**. Illustrated is that in one implementation automatically controlling an environment of an inhalant chamber can include, but is not limited to, dispersing either an organic or inorganic substance via electronic control of one or more inhalant dissemination devices (e.g., dispersing a substance having a form selected from an inhalant-form group including but not limited to a wet aerosol form, a dry aerosol form, a gaseous substance form, mist form, a fog form, a fume form, and an airborne substance form). In one device implementation, method step **1200** is achieved by activation of a nebulizer (e.g., nebulizer **114**) that feeds an input airflow (e.g., input airflow flowing from input air hose **110** into inhalant chamber **10**) into an inhalant chamber (e.g., inhalant chamber **104**).

[0065] For additional examples of the process of **FIG. 12** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 12** function substantially as described elsewhere herein.

[0066] With reference now to **FIG. 13**, shown is an implementation of the high-level logic flowchart shown in **FIG. 9**. Depicted in **FIG. 13** is that in one implementation method step **902** can include method step **1300**. Illustrated is that in one implementation automatically controlling an environment of an inhalant chamber can include, but is not limited to, dispersing either an organic or inorganic substance via electronic control of one or more inhalant dissemination devices (e.g., controlling the one or more inhalant dissemination devices via one or more Proportional Integral Derivative (PID) controllers respectively receiving input from one or more dissemination-related sensors selected from the dissemination-related-sensor group including but not limited to a chamber pressure monitor, an inhalant-concentration sensor, and a gas sensor). In one device implementation, method step **1300** is achieved via control software running on a processor (e.g., a processor internal to data processing system **130**), where the control software collects data from one or more dissemination-related sensors (e.g., various and sundry implementations of sensor(s) **106**) and uses one or more PID algorithms to adjust one or more inhalant dissemination devices (e.g., one or more implementations of the drivers and/or dissemination devices described herein).

[0067] For additional examples of the process of **FIG. 13** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 13** function substantially as described elsewhere herein.

[0068] With reference now to **FIG. 14**, shown is an implementation of the high-level logic flowchart shown in **FIG. 9**. Depicted in **FIG. 14** is that in one implementation method step **904** can include method step **1400**. Illustrated is that in one implementation automatically controlling a concentration of an inhalant in the inhalant chamber, but is not limited to, controlling a flow rate either into or out of the inhalant chamber in response to a specified discernment of the inhalant (e.g., controlling the flow rate either into or out of the inhalant chamber via one or more Proportional Integral Derivative (PID) controllers respectively receiving input from one or more concentration-related sensors selected from a concentration-related-sensor group including a chamber pressure monitor, an inhalant-concentration sensor, a gas sensor, an input airflow sensor, and an output airflow sensor). In one device implementation, method step

1400 is achieved via control software running on a processor (e.g., a processor internal to data processing system **130**), where the control software collects data from one or more concentration-related sensors (e.g., various and sundry concentration-related implementations of sensor(s) **106**) and uses one or more PID algorithms to adjust one or more flow rate control devices (one or more implementations of the drivers and/or dissemination devices described herein).

[**0069**] For additional examples of the process of **FIG. 14** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 14** function substantially as described elsewhere herein.

[**0070**] With reference now to **FIG. 15**, shown is an alternate implementation of the high-level logic flowchart of **FIG. 9**. Shown is that in one alternate implementation the process includes additional method step **1500**. Method step **1500** depicts displaying near real time measurement data related to an animal in the inhalant chamber. In one device implementation, method step **1500** is achieved via display of the near real time measurement data via a Graphical User Interface (e.g., GUI **135**) displayed on a screen (e.g., display device **134**) of a computer (e.g., data processing system **130**).

[**0071**] For additional examples of the process of **FIG. 15** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 15** function substantially as described elsewhere herein.

[**0072**] With reference now to **FIG. 16**, shown are alternate implementations of the high-level logic flowchart shown in **FIG. 15**. Depicted in **FIG. 16** is that in one implementation method step **1500** can include method step **1600**, while in another implementation method step **1500** can include method step **1602**. Illustrated in method step **1600** is that in one implementation displaying near real time measurement data related to an animal in the inhalant chamber can include, but is not limited to, displaying one or more animal-related factors, wherein said one or more animal-related factors are selected from the animal-related-factor group including respiration data and dosimetry data. In one device implementation, method step **1600** is achieved via display of the one or more animal-related factors a Graphical User Interface (e.g., GUI **135**) displayed on a screen (e.g., display device **134**) of a computer (e.g., data processing system **130**).

[**0073**] Further depicted in method step **1602** is that in another implementation displaying near real time measurement data related to an animal in the inhalant chamber can include, but is not limited to, displaying one or more environmental factors, wherein said one or more environmental factors are selected from an environmental-factor group including but not limited to pressure, temperature, humidity, and airflow into the inhalant chamber, and airflow out of the inhalant chamber. In one device implementation, method step **1602** is achieved via display of the one or more environmental factors a Graphical User Interface (e.g., GUI **135**) displayed on a screen (e.g., display device **134**) of a computer (e.g., data processing system **130**).

[**0074**] For additional examples of the process of **FIG. 16** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 16** function substantially as described elsewhere herein.

[**0075**] With reference now to **FIG. 17**, shown is a high-level logic flowchart depicting a process. Method step **1700** depicts the start of the process. Method step **1702** illustrates displaying near real time measurement data related to an animal in the inhalant chamber. In one device implementation, method step **1700** is achieved via display of the near real time measurement data a Graphical User Interface (e.g., GUI **135**) displayed on a screen (e.g., display device **134**) of a computer (e.g., data processing system **130**). Method step **1704** shows the end of the process.

[**0076**] For additional examples of the process of **FIG. 17** and device implementations thereof, please see herein incorporated by reference Provisional Patent Application No. 60/267,233.

[**0077**] With reference now to **FIG. 18**, shown are alternate implementations of the high-level logic flowchart shown in **FIG. 17**. Depicted in **FIG. 18** is that in one implementation method step **1702** can include method step **1800**, while in another implementation method step **1702** can include method step **1802**, while in yet another implementation method step **1702** can include method step **1804**. Illustrated in method step **1800** is that in one implementation displaying near real time measurement data related to an animal in the inhalant chamber can include, but is not limited to, displaying one or more animal-related factors, wherein said one or more animal-related factors are selected from the animal-related-factor group including respiration data and dosimetry data. In one device implementation, method step **1600** is achieved via display of the one or more animal-related factors a Graphical User Interface (e.g., GUI **135**) displayed on a screen (e.g., display device **134**) of a computer (e.g., data processing system **130**).

[**0078**] Further depicted in method step **1804** is that in another implementation displaying near real time measurement data related to an animal in the inhalant chamber can include, but is not limited to, displaying one or more environmental factors, wherein said one or more environmental factors are selected from an environmental-factor group including but not limited to pressure, temperature, humidity, and airflow into the inhalant chamber, and airflow out of the inhalant chamber. In one device implementation, method step **1802** is achieved via display of the one or more environmental factors a Graphical User Interface (e.g., GUI **135**) displayed on a screen (e.g., display device **134**) of a computer (e.g., data processing system **130**).

[**0079**] Yet further depicted in method step **1804** is that in another implementation displaying near real time measurement data related to an animal in the inhalant chamber can include, but is not limited to, displaying one or more inhalant-related factors, wherein said one or more inhalant-related factors are selected from the inhalant-related-factor group including but not limited to rate of inhalant discernment and inhalant concentration. In one device implementation, method step **1804** is achieved via display of the one or more environmental factors a Graphical User Interface (e.g., GUI **135**) displayed on a screen (e.g., display device **134**) of a computer (e.g., data processing system **130**).

[**0080**] For additional examples of the process of **FIG. 18** and device implementations thereof, please see herein incor-

porated by reference Provisional Patent Application No. 60/267,233. The remaining method steps of **FIG. 18** function substantially as described elsewhere herein.

[**0081**] Those having ordinary skill in the art will appreciate that in the discussion herein the same factors and/or sensors have sometimes appeared in different categories of sensors (e.g., the same sensors categorized as environmental sensors or inhalant-concentration sensors). Those skilled in the art will appreciate that this is because in some instances the factors and/or sensors have been designated as environmental (e.g., hold humidity constant at 66%) which usually (but not always) mitigates the ability to use such factors and/or sensors to control dispersement. The converse is also true. Hence, those having ordinary skill in the art will recognize that the categorization of a particular factor and/or sensor will depend upon the context of use of the factor and/or sensor. That is, if one designates that "something" be held constant or variable in an environment, one typically loses the ability to disseminate on the basis of that "something," and vice versa.

[**0082**] Those having ordinary skill in the art will recognize that the state of the art has progressed to the point where there is little distinction left between hardware and software implementations of aspects of systems; the use of hardware or software is generally (but not always, in that in certain contexts the choice between hardware and software can become significant) a design choice representing cost vs. efficiency tradeoffs. Those having ordinary skill in the art will appreciate that there are various vehicles by which processes and/or systems described herein can be effected (e.g., hardware, software, and/or firmware), and that the preferred vehicle will vary with the context in which the processes are deployed. For example, if an implementer determines that speed and accuracy are paramount, the implementer may opt for a hardware and/or firmware vehicle; alternatively, if flexibility is paramount, the implementer may opt for a solely software implementation; or, yet again alternatively, the implementer may opt for some combination of hardware, software, and/or firmware. Hence, there are several possible vehicles by which the processes described herein may be effected, none of which is inherently superior to the other in that any vehicle to be utilized is a choice dependent upon the context in which the vehicle will be deployed and the specific concerns (e.g., speed, flexibility, or predictability) of the implementer, any of which may vary.

[**0083**] The foregoing detailed description has set forth various embodiments of the devices and/or processes via the use of block diagrams, flowcharts, and examples. Insofar as such block diagrams, flowcharts, and examples contain one or more functions and/or operations, it will be understood as notorious by those within the art that each function and/or operation within such block diagrams, flowcharts, or examples can be implemented, individually and/or collectively, by a wide range of hardware, software, firmware, or any combination thereof. In one embodiment, the present invention may be implemented via Application Specific Integrated Circuits (ASICs). However, those skilled in the art will recognize that the embodiments disclosed herein, in whole or in part, can be equivalently implemented in standard Integrated Circuits, as one or more computer programs running on one or more computers (e.g., as one or more server programs running on one or more computer systems), as one or more programs running on one or more processors (e.g., as one or more thin client programs running on one or more processors), as firmware, or as virtually any combination thereof, and that designing the circuitry and/or writing the code for the software or firmware would be well within the skill of one of ordinary skill in the art in light of this disclosure. In addition, those skilled in the art will appreciate that the mechanisms of the present invention are capable of being distributed as a program product in a variety of forms, and that an illustrative embodiment of the present invention applies equally regardless of the particular type of signal bearing media used to actually carry out the distribution. Examples of a signal bearing media include, but are not limited to, the following: recordable type media such as floppy disks, hard disk drives, CD ROMs, digital tape, and transmission type media such as digital and analogue communication links using TDM or IP based communication links (e.g., packet links).

[**0084**] In a general sense, those skilled in the art will recognize that the various embodiments described herein which can be implemented, individually and/or collectively, by a wide range of hardware, software, firmware, or any combination thereof can be viewed as being composed of various types of "electrical circuitry." Consequently, as used herein "electrical circuitry" includes, but is not limited to, electrical circuitry having at least one discrete electrical circuit, electrical circuitry having at least one integrated circuit, electrical circuitry having at least one application specific integrated circuit, electrical circuitry forming a general purpose computing device configurable by a computer program (e.g., a general purpose computer configurable by a computer program or a microprocessor configurable by a computer program), electrical circuitry forming a memory device (e.g., any and all forms of random access memory), and electrical circuitry forming a communications device (e.g., a modem, communications switch, or optical-electrical equipment).

[**0085**] Those skilled in the art will recognize that it is common within the art to describe devices and/or processes in the fashion set forth herein, and thereafter use standard engineering practices to integrate such described devices and/or processes into data processing systems. That is, the devices and/or processes described herein can be integrated into a data processing system via a reasonable amount of experimentation. **FIG. 1** shows an example representation of a data processing system into which at least a part of the herein described devices and/or processes may be integrated with a reasonable amount of experimentation.

[**0086**] With reference now again to **FIG. 1**, depicted is a pictorial representation of a conventional data processing system in which portions of the illustrative embodiments of the devices and/or processes described herein may be implemented. It should be noted that a graphical user interface systems (e.g., Microsoft Windows 98 or Microsoft Windows NT operating systems) and methods can be utilized with the data processing system depicted in **FIG. 1**. Data processing system **130** is depicted which includes system unit housing **132**, video display device **134**, keyboard **136**, mouse **138**, and microphone (not shown). Data processing system **130** may be implemented utilizing any suitable computer such as a DELL portable computer system, a product of Dell Computer Corporation, located in Round Rock, Tex.; Dell is a trademark of Dell Computer Corporation.

[0087] The foregoing described embodiments depict different components contained within, or connected with, different other components. It is to be understood that such depicted architectures are merely exemplary, and that in fact many other architectures can be implemented which achieve the same functionality. In a conceptual sense, any arrangement of components to achieve the same functionality is effectively "associated" such that the desired functionality is achieved. Hence, any two components herein combined to achieve a particular functionality can be seen as "associated with" each other such that the desired functionality is achieved, irrespective of architectures or intermedial components. Likewise, any two components so associated can also be viewed as being "operably connected", or "operably coupled", to each other to achieve the desired functionality.

[0088] While particular embodiments of the present invention have been shown and described, it will be obvious to those skilled in the art that, based upon the teachings herein, changes and modifications may be made without departing from this invention and its broader aspects and, therefore, the appended claims are to encompass within their scope all such changes and modifications as are within the true spirit and scope of this invention. Furthermore, it is to be understood that the invention is solely defined by the appended claims. It will be understood by those within the art that, in general, terms used herein, and especially in the appended claims (e.g., bodies of the appended claims) are generally intended as "open" terms (e.g., the term "including" should be interpreted as "including but not limited to," the term "having" should be interpreted as "having at least," the term "includes" should be interpreted as "includes but is not limited to," etc.). It will be further understood by those within the art that if a specific number of an introduced claim element is intended, such an intent will be explicitly recited in the claim, and in the absence of such recitation no such intent is present. For example, as an aid to understanding, the following appended claims may contain usage of the introductory phrases "at least one" and "one or more" to introduce claim elements. However, the use of such phrases should not be construed to imply that the introduction of a claim element by the indefinite articles "a" or "an" limits any particular claim containing such introduced claim element to inventions containing only one such element, even when the same claim includes the introductory phrases "one or more" or "at least one" and indefinite articles such as "a" or "an"; the same holds true for the use of definite articles used to introduce claim elements. In addition, even if a specific number of an introduced claim element is explicitly recited, those skilled in the art will recognize that such recitation should typically be interpreted to mean at least the recited number (e.g., the bare recitation of "two elements," without other modifiers, typically means at least two elements, or two or more elements).

We claim:

1. A method comprising:

automatically controlling an environment of an inhalant chamber; and

automatically controlling a concentration of an inhalant in the inhalant chamber.

2. The method of claim 1, wherein at least a portion of an animal is inserted into the inhalant chamber.

3. The method of claim 1, wherein automatically controlling an environment of an inhalant chamber includes:

controlling gaseous input and gaseous egress from the inhalant chamber.

4. The method of claim 1, wherein said automatically controlling an environment of an inhalant chamber includes:

maintaining an environmental factor via feedback control, wherein the environmental factor includes a pressure of the inhalant chamber.

5. The method of claim 4, wherein said maintaining an environmental factor via feedback control includes:

controlling the environmental factor via monitoring a pressure sensor of the inhalant chamber.

6. The method of claim 5, wherein said controlling the environmental factor includes:

controlling the environmental factor via a controller receiving input from the pressure sensor and adjusting a pressure driver.

7. The method of claim 1 further comprising:

displaying near real time measurement data related to an animal in the inhalant chamber.

8. The method of claim 7, wherein said displaying near real time measurement data includes:

displaying animal-related respiration data.

9. The method of claim 7, wherein said displaying near real time measurement data includes:

displaying a pressure of the inhalant chamber.

10. The method of claim 7, wherein said displaying near real time measurement data includes:

displaying a temperature of the inhalant chamber.

11. The method of claim 7, wherein said displaying near real time measurement data includes:

displaying a humidity of the inhalant chamber.

12. The method of claim 7, wherein said displaying near real time measurement data includes:

displaying an airflow into the inhalant chamber.

13. The method of claim 7, wherein said displaying near real time measurement data includes:

displaying an airflow out of the inhalant chamber.

14. The method of claim 1, wherein said automatically controlling a concentration of an inhalant in the inhalant chamber includes:

dispersing a substance via electronic control of one or more inhalant dissemination devices.

15. The method of claim 14, wherein said dispersing a substance includes:

dispersing a substance having a wet aerosol form.

16. The method of claim 14, wherein said dispersing a substance includes:

dispersing a substance having a dry aerosol form.

17. The method of claim 14, wherein said dispersing a substance includes:

dispersing a substance having an aerosol form.

18. The method of claim 14, wherein said dispersing a substance includes:

dispersing a substance having a gaseous substance form.

19. The method of claim 14, wherein said dispersing a substance includes:

dispersing a substance having a mist form.

20. The method of claim 14, wherein said dispersing a substance includes:

dispersing a substance having a fog form.

21. The method of claim 14, wherein said dispersing a substance includes:

dispersing a substance having a fume form.

22. The method of claim 14, wherein said dispersing a substance includes:

dispersing a substance having an airborne substance form.

23. The method of claim 14, wherein said dispersing a substance includes:

controlling the one or more inhalant dissemination devices via a controller receiving input from a chamber pressure monitor.

24. The method of claim 14, wherein said dispersing a substance includes:

controlling the one or more inhalant dissemination devices via a controller receiving input from an inhalant-concentration sensor.

25. The method of claim 14, wherein said dispersing a substance includes:

controlling the one or more inhalant dissemination devices via a controller receiving input from a gas sensor.

26. The method of claim 1, wherein said automatically controlling an environment of an inhalant chamber includes:

automatically controlling a plurality of environmental factors.

27. A computer-readable medium having computer-executable instructions for the method steps recited in claim 1.

28. A computer data signal embodied in a carrier wave readable by a computing system and encoding a computer program of instructions for executing a computer process performing the method steps recited in claim 1.

29. A system comprising:

means for automatically controlling an environment of an inhalant chamber; and

means for automatically controlling a concentration of an inhalant in the inhalant chamber.

30. The system of claim 29, wherein said inhalant chamber is configured to receive at least a portion of an animal.

31. The system of claim 29, wherein means for automatically controlling an environment of an inhalant chamber includes:

means for controlling gaseous input and gaseous egress from the inhalant chamber.

32. The system of claim 29, wherein said means for automatically controlling an environment of an inhalant chamber includes:

means for maintaining an environmental factor via feedback control, wherein the environmental factor includes a pressure of the inhalant chamber.

33. The system of claim 32, wherein said means for maintaining an environmental factor via feedback control includes:

a pressure sensor of the inhalant chamber; and

means for controlling the environmental factor via monitoring the pressure sensor.

34. The system of claim 33, wherein said means for controlling the environmental factor includes:

a pressure driver; and

means for controlling the environmental factor via a controller receiving input from the pressure sensor and adjusting the pressure driver.

35. The system of claim 29 further comprising:

displaying means for displaying near real time measurement data related to an animal in the inhalant chamber.

36. The system of claim 35, wherein said displaying means includes:

means for displaying animal-related respiration data.

37. The system of claim 35, wherein said displaying means includes:

means for displaying a pressure of the inhalant chamber.

38. The system of claim 35, wherein said displaying means includes:

means for displaying a temperature of the inhalant chamber.

39. The system of claim 35, wherein said displaying means includes:

means for displaying a humidity of the inhalant chamber.

40. The system of claim 35, wherein said displaying means includes:

means for displaying an airflow into the inhalant chamber.

41. The system of claim 35, wherein said displaying means includes:

means for displaying an airflow out of the inhalant chamber.

42. The system of claim 29, wherein said means for automatically controlling a concentration of an inhalant in the inhalant chamber includes:

dispersing means for dispersing a substance via electronic control of one or more inhalant dissemination devices.

43. The system of claim 42, wherein said dispersing means includes:

means for dispersing a substance having a dry aerosol form.

44. The system of claim 42, wherein said dispersing means includes:

means for dispersing a substance having an aerosol form.

45. The system of claim 42, wherein said dispersing means includes:

means for dispersing a substance having a gaseous substance form.

46. The system of claim 42, wherein said dispersing means includes:

means for dispersing a substance having a mist form.

47. The system of claim 42, wherein said dispersing means includes:

means for dispersing a substance having a fog form.

48. The system of claim 42, wherein said dispersing means includes:

means for dispersing a substance having a fume form.

49. The system of claim 42, wherein said dispersing means includes:

means for dispersing a substance having an airborne substance form.

50. The system of claim 42, wherein said dispersing means includes:

an inhalant chamber pressure monitor; and

means for controlling the one or more inhalant dissemination devices via a controller receiving input from the chamber pressure monitor.

51. The system of claim 42, wherein said dispersing means includes:

an inhalant concentration sensor; and

means for controlling the one or more inhalant dissemination devices via a controller receiving input from the inhalant-concentration sensor.

52. The system of claim 42, wherein said dispersing means includes:

a gas sensor; and

means for controlling the one or more inhalant dissemination devices via a controller receiving input from the gas sensor.

53. The system of claim 29, wherein said means for automatically controlling an environment of an inhalant chamber includes:

means for automatically controlling a plurality of environmental factors.

54. The system of claim 29, wherein said means for automatically controlling an environment of an inhalant chamber includes:

means for maintaining an environmental factor via feedback control, wherein the environmental factor is a temperature of the inhalant chamber.

55. The system of claim 54, wherein said means for maintaining an environmental factor via feedback control includes:

a temperature sensor; and

means for controlling the environmental factor via monitoring the temperature sensor.

56. The system of claim 54, wherein said means for controlling the environmental factor includes:

a temperature driver; and

means for controlling the environmental factor via a controller receiving input from the temperature sensor and adjusting the temperature driver.

57. The system of claim 29, wherein said means for automatically controlling an environment of an inhalant chamber includes:

means for maintaining an environmental factor via feedback control, wherein the environmental factor includes a humidity of the inhalant chamber.

58. The system of claim 57, wherein said means for maintaining an environmental factor via feedback control includes:

a humidity sensor; and

means for controlling the environmental factor via monitoring the humidity sensor.

59. The system of claim 58, wherein said means for controlling the environmental factor includes:

a humidity driver; and

means for controlling the environmental factor via a controller receiving input from the humidity sensor and adjusting the humidity driver.

60. A system comprising:

an inhalant chamber;

at least two environmental sensors, each environmental sensor monitors an environmental factor of the inhalant chamber;

a concentration sensor for monitoring an inhalant concentration of the inhalant chamber;

a data processor operably connected to the environmental and concentration sensors for automatically controlling the at least two environmental factors and the inhalant concentration in the inhalant chamber.

61. The system of claim 60, wherein the environmental sensors include at least two of a temperature sensor, a humidity sensor, an airflow sensor, and a pressure sensor.

62. The system of claim 60, further comprising:

an inhalant concentration driver operably connected to the data processor for adjusting the inhalant concentration; and

at least one environmental factor driver operably connected to the data processor for adjusting at least one environmental factor.

63. The system of claim 62, wherein the at least one environmental factor driver includes at least one of a temperature driver, a humidity driver, an airflow driver, and a pressure driver.

64. The system of claim 62, further comprising:

a proportional integral derivative controller for receiving input from the inhalant concentration sensor and adjusting the inhalant concentration driver, and for receiving input from the environmental factor sensor and adjusting the environmental factor driver.

65. A system for controlling an inhalant exposure system comprising:

an environmental controller having a plurality of inputs for environmental conditions of the inhalant exposure system and a plurality of outputs for controlling environmental conditions of the inhalant exposure system based on predefined environmental parameters, and

an inhalant controller having at least one input for inhalant concentration of the inhalant exposure system and at least one output for controlling a concentration of the inhalant in the inhalant exposure system based on at least one predefined parameter.

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