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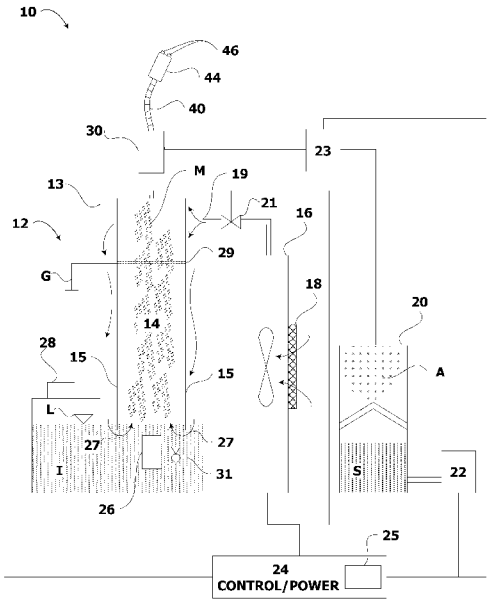


Fig. 1

(57) Abstract: An apparatus for preparing a mixture suitable for a hyperthermal inhalational treatment of an upper portion of respiratory tract is disclosed. The apparatus includes a vertical wall defining an interior compartment, wherein a mixture of mist and vapors of an inhalant is formed. A preferably added module for a hyperthermal inhalational treatmen combined with administration of pharmaceuticals and/or saline is disclosed as well.

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# SYSTEMS AND METHODS OF PREPARING A CONTROLLED MIXTURE FOR HYPERTHERMAL TREATMENT

## TECHNICAL FIELD

[001] In general, the present invention pertains to the arts of medical devices. In particular, the invention relates to systems and methods of preparing a mixture suitable for hyperthermal treatment, preferably combined with administration of pharmaceuticals.

## BACKGROUND ART

[002] It is believed that the pertinent state-of-the-art is represented by: US patents Ser. No. 4649911, 3387607, 4110419, 4303601, 5769071, 5267555 7228859 and 7523751; French patent/s or patent application/s Ser. Nos 4029781, 661696, 19541483 and 4109269; French patent Ser. No. 2543442; GB patent 1359280; Japanese patent publications Ser. No. 2010240189, 5345027 and 5000162; Chinese patents/utility models 2083936U, 2146252Y, 201020125Y 2822668Y and 2535068Y; Canadian patent application CA2689364 as well as by international patent applications having publication No.WO0054892 and WO2008036801.

## SUMMARY OF THE INVENTION

[003] There is provided in accordance with embodiments of the present invention systems and methods for hyperthermal treatment combined with administration of pharmaceuticals, comprising a blower that is powered and activated by electrical power supply block and control system. The blower draws an inflow of air, filtered by an air filter, providing a pressurized airflow into the inhalation module. The low pressure airflow into the inhalation module, encircles an interior compartment from the outside, in-between cylindrical walls, defining the interior compartment, and exterior housing 13 of inhalation module.

[004] The pressurized airflow is thereafter forced to overflow underneath cylindrical walls, into the interior compartment. The level of inhalant in the bottom of the exterior housing of the inhalation module, is somewhat higher than the bottom edge of cylindrical walls, thereby the low pressure airflow is forced to circulate through the solution of inhalant, in the vicinity of an electrical heating element.

[005] The vapors of inhalant produced by the electrical heating element, as well as the mist of inhalant produced by a forced circulation of the pressurized airflow through the solution of inhalant underneath the bottom edge of the cylindrical walls, are supplied into the interior compartment from the bottom, rise upwards within compartment and pass via a grating, providing for electrical grounding of the static charge from the mix of vapors and mist of the inhalant.

[006] An air pressure compressor, which is powered and activated by the electrical power supply block and control system, is optionally employed for providing a higher pressure airflow into pharmaceuticals nebulizer module. The pharmaceuticals nebulizer module, is any type of a nondestructive nebulizer, which typically does not employ heating, ultrasonic or vibratory effect or another destructive mechanical or other effect on pharmaceuticals solution or saline. The pharmaceuticals nebulizer module is preferably a Venturi nebulizer, known in the art. The pharmaceuticals nebulizer module contains pharmaceuticals solution or saline.

[007] The pharmaceuticals nebulizer module produces aerosols of nebulized pharmaceuticals solution, which is thereafter supplied into the mixing module. In the mixing module, aerosols of nebulized pharmaceuticals solution are mixed with vapors and mist of the inhalant. The mixture of aerosols of nebulized pharmaceuticals solution with vapors and mist of the inhalant is supplied from mixing module via a flexible hose into a handpiece and discharged from nozzles therein.

[008] Optionally, the electric engine powering the blower also powers the higher pressure compressor. In such case a coupling mechanism is employed to controllably convey the rotational torque to the compressor.

## DESCRIPTION OF THE DRAWINGS

[009] The present invention will be understood and appreciated more comprehensively from the following detailed description taken in conjunction with the appended drawings in which:

**FIG 1** is a schematic cross-sectional diagram of an embodiment of the system of the invention for preparing a mixture suitable for hyperthermal treatment and administration of pharmaceuticals;

**FIG 2** is a schematic cross-sectional diagram of an embodiment of the mixing module of the invention;

**FIG 3** is a schematic diagram of an embodiment of the handpiece of the invention;

**FIG 4** is a high-level flowchart diagram, visualizing an embodiment of the method of the invention, of preparing a mixture suitable for hyperthermal treatment and administration of pharmaceuticals;

**FIG 5A** to **5C** are schematic diagram of embodiments of the handpiece of the invention.

## DETAILED DESCRIPTION OF EMBODIMENTS

[010] In accordance with some embodiments of the present invent, reference is now made to **FIG 1**, showing system **10**, for preparing a mixture suitable for hyperthermal treatment and/or administration of pharmaceuticals. System **10** for preparing a mixture suitable for hyperthermal treatment, optionally combined with administration of pharmaceuticals, is preferably employed for inhalational treatment; however other treatment indications, such as oral, topical, ontological, rectal, vaginal, are explicitly emphasized. System **10** is particularly adapted for preparing a mixture suitable for hyperthermal inhalational treatment of optionally combined with administration of pharmaceuticals into the upper respiratory tract. System **10** comprises inhalation module **12**, blower module **16**, pharmaceuticals nebulizer module **20** and mixing module **30** as well as electrical power supply block and control system **24**, powering the aforesaid modules and controlling the operation thereof. Power supply block and control system **24** preferably comprises a user interface **25**, typically including a display and operation buttons.

### Inhalation and Blower Modules

[011] System **10** comprises inhalation module **12**, which is encompassed within exterior housing **13**. Inhalation module **12** further comprises vertical walls **15**. Walls **15** extend within exterior housing **13**, essentially vertically, typically from the top portion of housing **13** but not to the bottom of housing **13**. Consequently, at the bottom, walls **15** terminate with at least one butt-end, which is disposed at a predetermined distance from the bottom of housing **13**. Walls **15** define interior compartment **14** of inhalation module **12**, where the inhalant vapors and mist are formed, as will be elaborated infra.

[012] Walls **15** are typically disposed at some distance, interiorly to exterior housing **13** of inhalation module **12**; thereby allowing circulation of incoming airflow in-between walls **15** and exterior housing **13**. In some preferred embodiments walls **15** embody an essentially cylindrical shape, thereby facilitating a more homogenous or

laminar circulation of airflow in-between walls **15** and exterior housing **13**, essentially within the direction of arrows, as shown in **FIG 1**. It should be noted however that the preferred instance of an essentially cylindrically shaped walls **15** is merely exemplary and other shapes of walls **15** are as well possible and contemplated by this disclosure.

[013] System **10** further comprises blower module **16**. Blower module **16** is adapted to generate airflow of a relatively lower pressure, in a continuous manner. Blower module **16** is connected to, powered and actuated by electrical power supply block and control system **24** of system **10**. Blower module **16** is typically a type of fan-like device, known in the art. Blower module **16** is typically furnished with air filter **18**, adapted to filter the air drawn into blower module **16**. Ambient air is drawn into blower module **16**, essentially within the direction of arrows, as shown in **FIG 1**.

[014] Thereafter the airflow of a relatively lower pressure generated by blower module **16** is conducted into inhalation module **12**, essentially within the direction of arrows, as shown in **FIG 1**. Inlet **19**, for the incoming airflow, conducted from blower module **16**, is preferably located at the top portion of inhalation module **12**. Inlet **19** is typically located in-between walls **15** and exterior housing **13** of inhalation module **12**; whereby the airflow incoming into inhalation module **12** from blower module **16** is optimally distributed in the space in-between walls **15** and exterior housing **13**, essentially within the direction of arrows, as shown in **FIG 1**. Optionally baffle **21** is disposed in-between from blower module **16** and inlet **19** for the incoming airflow. Baffle **21** is connected, powered and controlled by electrical power supply block and control system **24**.

[015] Inhalation module **12** contains liquid and/or inhalant **I**. Inhalant **I** is typically water or an aqueous solution. Inhalant **I** is typically contained within the bottom portion exterior housing **13**; however a particularly dedicated receptacle (not shown) is optionally provided at the bottom portion exterior housing **13** to accommodate liquid and/or inhalant **I** at the bottom portion exterior housing **13**.

[016] As previously noted, system **10** is preferably employed for inhalational treatment; however since other treatment indications, such as topical, ontological, rectal, vaginal, are existent – the terms inhalation, inhalation module and/or inhalant are not to be construed as entailing an implementation for inhalational treatment but rather as terms describing a mixture suitable for hyperthermal treatment.

[017] Among various implementations of system **10** of the present invention, inhalational treatment is merely a typical or preferable medical indication therefor; whereas numerous other indications, non-related to inhalation, such as topical and ontological, are existent and contemplated in the scope of the present invention. Therefore the use of the

term terms inhalation and/or inhalant is intended to describe the physical output of system **10**, comprising a mixture of vapors and mist - without signifying the implementation of system **10** in a particular medical indication.

[018] The level of inhalant **I** in inhalation module **12** is denoted as **L**. Inlet **28** is dedicated for filling inhalant **I** into inhalation module **12**. Preferably, inlet **28** is furnished with a mechanism which limits the supply of inhalant **I** into inhalation module **12** above the predetermined level **L**. Instances of such mechanisms that limit the supply of inhalant **I** into inhalation module **12** above the predetermined level **L** inter alia include inverted-reservoir type devices, such as inverted-reservoir device disclosed in US7523751.

[019] The predetermined level **L** of inhalant **I** in inhalation module **12**, which is typically maintained rater constant by the aforementioned mechanism, is preferably somewhat higher than the level of the butt-end at the bottom of walls **15**, defining interior compartment **14** of inhalation module **12**. Consequently, the airflow incoming into inhalation module **12** from blower module **16** is forced to overflow underneath walls **15** and through inhalant **I**, within the direction of arrows **27**, before entering into interior compartment **14** of inhalation module **12**; whereby mist **M** of inhalant **I** is produced within interior compartment **14** inter alia due to the bubbling of the airflow through inhalant **I** underneath walls **15**, within the direction of arrows **27**.

[020] Inhalation module **12** further comprises electrical heating element **26**. Electrical heating element **26** is connected to, powered and actuated by electrical power supply block and control system **24** of system **10**. Electrical heating element **26** is typically disposed within inhalant **I**, electrically insulated from the latter. Electrical heating element **26** is typically disposed somewhat concentrically to interior compartment **14** and within the vicinity of the bottom of walls **15**. Consequently the airflow that is forced to overflow underneath walls **15** through inhalant **I**, within the direction of arrows **27**, circulates within vicinity of electrical heating element **26** and sweeps away the bubbles of vapor of inhalant **I** produced on the surface of the latter within the current thereof.

[021] Moreover, the aforementioned circulation of the airflow underneath walls **15** into interior compartment **14**, within the direction of arrows **27**, facilitates an enhanced circulation of liquid inhalant **I** about heating element **26** (not shown). The enhanced circulation of liquid inhalant **I** around heating element **26** facilitates an enhanced convective cooling of the later; whereby a more powerful electrical heating element, with a higher production of vapor, can be employed, without the concern of overheating, which might have been occurred in a non-circulating or static environment of inhalant **I**.

[022] In light of the foregoing, the airflow into interior compartment **14** after the

aforementioned circulation underneath walls **15** through inhalant **I** and within vicinity of electrical heating element **26** is characterized by a relatively high content of mist of inhalant **I** as well as by a relatively high content of vapor of inhalant **I**, forming a rich mixture of mist and vapor of inhalant **I**, denoted as **M**. Mixture **M** of mist and vapor of inhalant **I** raises within interior compartment **14**, essentially as shown in **FIG 1**.

[023] As it was surprisingly discovered by the developers of this invention that mixture **M** of mist and vapor of inhalant **I**, raising within interior compartment **14**, is capable of exhibiting a substantial difference of potentials, relatively to the grounding or ambient air, due to a static electrical charge or a conduction of electrical current from an insufficiently electrically insulated heating element **26**. Therefore and in order to prevent an electrocution of a patient, grating **29** is disposed across the essentially the entire cross-section of interior compartment **14** of inhalation module **12**, for discharging an excessive difference of potentials of mixture **M**, relatively to the ground or ambient air. Accordingly, grating **29** is coupled to a grounding source, as schematically shown in **FIG 1**, for achieving the discharging of mixture **M**. In favor of these who shall engage in an experimentation guided by this disclosure, it is disclosed that the developers of this invention have empirically discovered that a grating with a substantially spaced apart or non dense arrangement of inter-crossing members, which essentially neither capture particles of the mist from mixture **M** nor condense the vapors from mixture **M**, can be used in order to achieve an efficient electrical discharging and grounding of mixture **M**. From an outlet at the top of interior compartment **14**, mixture **M**, preferably after grounding by grating **29**, is conducted from of inhalation module **12** into mixing module **30**.

[024] Typically, a thermal sensor **31** is disposed in inhalation module **12**, preferably within vicinity or adjacently to electrical heating element **26**. Thermal sensor **31** is connected, powered and controlled by electrical power supply block and control system **24**. Thermal sensor **31** is employed to monitor and control the operation of electrical heating element **26** and/or for shutting the power to electrical heating element **26** off, upon overheating of the latter.

**Pharmaceuticals Nebulizer Module**

[025] System **10** comprises pharmaceuticals nebulizer module **20**. Pharmaceuticals nebulizer module **20** is adapted to produce fine aerosols **A** of nebulized pharmaceuticals solution or saline **S**, wherein the former is thereafter supplied into mixing module **30**. Pharmaceuticals nebulizer module **20** is typically contains pharmaceuticals solution or saline **S**; however in some instances pharmaceuticals solution or saline **S** is contained in a separate reservoir and supplied into the nebulizer module (not shown). It

should be acknowledged that system **10** optionally comprises a plurality of different pharmaceuticals nebulizer modules **20**, optionally preloaded with different pharmaceuticals solutions or different types of saline **S**.

[026] Pharmaceuticals nebulizer module **20** optionally comprises air pressure compressor **22**. Air pressure compressor **22** is connected to, powered and actuated by electrical power supply block and control system **24** of system **10**. Air pressure compressor **22** is any type of compressor known in the art. Air pressure compressor **22** is typically furnished with air filter (not shown), adapted to filter the air drawn by compressor **22**. Ambient air is drawn into air pressure compressor **22** and thereafter conducted into pharmaceuticals nebulizer module **20**, essentially as shown in **FIG 1**.

[027] In pharmaceuticals nebulizer module **20**, pharmaceuticals solution or saline **S** is nebulized into fine aerosols **A**, which are further forced by the pressurized air from air compressor **22** into the mixing module **30**. The pharmaceuticals nebulizer module, is any type of a nondestructive nebulizer. A nondestructive nebulizer as referred to herein is any type of nebulizer that does not have a harmful affect on the quality of pharmaceuticals solution or saline **S**. A nondestructive nebulizer, as referred to herein, is any type of nebulizer that does not employ excessive heating, powerful ultrasonic or vibratory effect or another destructive mechanical or other effect, which may be harmful to the composition of a pharmaceuticals solution and/or may cause a sedimentation or precipitation of the substances dissolved therein, e.g. with a saline. It should be acknowledged, however, that the nature of the nebulizer, being a destructive or nondestructive, is determined by the type of pharmaceuticals solution or saline **S**. Thus for instance an ultrasonic nebulizer can be destructive for pharmaceuticals solution containing protein or other sensitive molecules; whereas the very same ultrasonic nebulizer can be nondestructive for a saline.

[028] The pharmaceuticals nebulizer module is preferably comprises a Venturi-type of nebulizer, known in the art. A venturi-type of nebulizer is disclosed in US2004/60556 entitled DOWNDRAFT NEBULIZER and elsewhere. In the instances of a Venturi-type of nebulizer, the air pressure itself achieves the nebulization of solution or saline **S** into fine aerosols **A**.

[029] Optionally, the blower of blower module **16** as well as air compressor **22** of nebulizer module **20** are driven by a shaft of a single electric engine. In such case a coupling means is preferably employed to controllably operate air compressor **22** of nebulizer module **20** apart the blower of blower module **16**.

[030] Optionally, a baffle and/or sensors sub-module **23** is disposed in-between pharmaceuticals nebulizer module **20** and mixing module **30**. Baffle and/or sensors sub-

module **23** is connected, powered and controlled by electrical power supply block and control system **24**. Baffle and/or sensors sub-module **23** is employed to monitor and control the aerosols **A** flow into mixing module **30**.

**Mixing Module**

[031] System **10** comprises mixing module **30**. To illustrate a preferred embodiment of mixing module **30**, reference is now made to **FIG 2** and **3**. Mixing module **30** receives mixture **M** from inhalation module **12** and aerosols **A** from pharmaceuticals nebulizer module **20** and mixes the former with the latter into mixture **M+A**, suitable for hyperthermal treatment with mist and vapor of inhalant **I** combined with administration of nebulized pharmaceuticals solution or saline **S**. A unidirectional check-valve (not shown) is typically disposed in-between mixing module **30** and inhalation module **12**, to prevent backward flow pharmaceuticals solution or saline **S** from mixing module **30** to inhalation module **12**. Mixing module **30** preferably employs a Venturi-tube configuration. Mixture **M** is supplied from inhalation module **12** into the portion of the Venturi-tube having a wider cross-section. With advancement into mixing module **30** the cross-section of the Venturi-tube narrows, whereby the flow increases and a relatively negative pressure is formed.

[032] Aerosols **A** are supplied from pharmaceuticals nebulizer module **20** into the portion of mixing module **30** where the cross-section of the Venturi-tube is narrower, whereby aerosols **A** are drawn by the relatively negative pressure and forcefully sucked into the flow of mixture **M**, essentially within the direction of arrows, as shown in **FIG 2**. Consequently an essentially homogenous master mixture **M+A**, of mixture **M** and aerosols **A**, suitable for hyperthermal treatment with mist and vapor of inhalant **I** combined with administration of nebulized pharmaceuticals solution or saline **S**, is formed and thereafter supplied into hose **40**.

[033] Hose **40** is preferably a corrugated type of hose, capable of substantial flexibility. Master mixture **M+A** is further conducted by hose **40** into handpiece **44**. Handpiece **44** is preferably thermally insulating master mixture **M+A** from the exterior surface thereof; thereby allowing to conveniently grip handpiece **44** during the administration of master mixture **M+A**. Handpiece **44** terminates with nozzles **46** which are adapted to be positioned vis-à-vis the nostrils of a patent; thereby supplying master mixture **M+A** directly into the upper respiratory tract.

[034] Optionally, mixing module **30** comprises a baffle and/or sensors connected, powered and controlled by electrical power supply block and control system **24**. Baffle and/or sensors of mixing module **30** are employed to monitor and control the outflow of master mixture **M+A** into hose **40** and/or mixing ratio between aerosols **A** and mixture **M**

[035] To illustrate a preferred embodiment of handpiece **44**, reference is now made to **FIG 3**. Optionally, handpiece **44** is furnished with extension add-on **70**. Extension add-on **70** comprises covering portion **72** and a couple of nasal extensions **74**. Covering portion **72** of add-on **70** is adapted to conform to the anterior portion of handpiece **44**, adjoining the bases of nasal extensions **74** to nozzles **46** of handpiece **44**. Nasal extensions **74** are adapted to be inserted into nostrils; thereby upon adjoining the bases of nasal extensions **74** to nozzles **46**, extensions **74** conduct master mixture **M+A** directly into deeper superior portion of nasal cavity.

**Method of the Invention**

[036] To visualize an embodiment of the method of the invention, of preparing a mixture suitable for hyperthermal treatment and administration of pharmaceuticals, reference is now made to **FIG 4**. The process of preparing a mixture suitable for hyperthermal treatment and administration of pharmaceuticals commences at step **102**, with actuation of the means for airflow production. Upon actuation of the means for airflow production at step **102**, an airflow is produced at step **104**.

[037] Thereafter, at step **106**, the airflow produced at step **104**, is forced to circulate through inhalant. Additionally, at step **108**, the inhalant is heated, while the airflow produced at step **104** is forced to circulate through the inhalant. Consequently a mixture of mist of the inhalant and vapors of the inhalant, suitable for hyperthermal treatment, is produced at step **110**. The mere mixture of mist and vapors of the inhalant, produced at step **110**, is optionally used for solely a hyperthermal treatment, without administration of pharmaceuticals; whereby the method is optionally terminates at step **110**.

[038] Optionally, the temperature mixture of mist and vapors of the inhalant, produced at step **110**, is monitored during step **112**. If the temperature has not reached a predetermined threshold, the heating of the inhalant at step **108** is repeated or intensified. If the temperature has reached a predetermined threshold, the method proceeds to step **114**. Optionally, if at step **114**, a manual activation is received, the method proceeds to step **116**; whereas if at step **114**, a manual activation is not received, the method returns to step **110** and a mixture of mist and vapors of the inhalant is constantly produced. Optionally there is possibility to manually suppress steps **112** and/or **114** and forcefully proceed to step **116**.

[039] At step **116** an air compressor is optionally activated and pressurized air is produced. Concomitantly or thereafter a pharmaceuticals solution and/or saline is nebulized into final aerosols, at step **118**. The aerosols of nebulized pharmaceuticals solution and/or saline, produced at step **118**, are then premixed during step **120**, with the

mixture of mist and vapors of the inhalant, produced at step **110**.

[040] The method of the invention ends at step **122** with production of the master-mixture of aerosols of nebulized pharmaceuticals solution/saline, from step **118**, and the mixture of mist and vapors of the inhalant, at step **110**.

[041] To illustrate another preferred embodiment of handpiece **44**, reference is now made to **FIG 5A**. Optionally, handpiece **44** is furnished with extension add-on **130**. Extension add-on **130** comprises covering portion **132** and singular widespread nozzle **134**. Covering portion **132** of add-on **130** is adapted to conform to the anterior portion of handpiece **44**, adjoining the bases of singular widespread nozzle **134** to nozzles **46** of handpiece **44**. Widespread nozzle **134** is adapted for oral inhalational administration and/or topical application of master mixture **M+A**; thereby upon adjoining the bases of covering portion **132** to nozzles **46**, widespread nozzle **134** conducts mixture **M+A** directly into the oral cavity or onto the site of topical application.

[042] To illustrate another preferred embodiment of handpiece **44**, reference is now made to **FIG 5B**. Optionally, handpiece **44** is furnished with extension add-on **140**. Extension add-on **140** comprises covering portion **142** and singular centric extension **144**. Covering portion **132** of add-on **130** is adapted to conform to the anterior portion of handpiece **44**, adjoining the bases of centric extension **144** to nozzles **46** of handpiece **44**. Centric extension **144** is intended for ontological, rectal and/or vaginal applications and adapted to be inserted into an orifice of a patient; thereby upon adjoining the bas of centric extension **144** to nozzles **46**, centric extension **144** conducts master mixture **M+A** directly into deeper into an orifice of a patient.

[043] To illustrate another preferred embodiment of handpiece **44**, reference is now made to **FIG 5C**. Optionally, handpiece **44** is furnished with extension add-on **150**. Extension add-on **150** comprises covering portion **152** and miscellaneous connector **154**. Covering portion **152** of add-on **150** is adapted to conform to the anterior portion of handpiece **44**, adjoining the bases of miscellaneous connector **154** to nozzles **46** of handpiece **44**. Centric extension **154** is intended for connection to inhalators, respiratory machines and/or general anesthesia systems; thereby upon adjoining the bases of miscellaneous connector **154** to nozzles **46**, miscellaneous connector **154** conducts master mixture **M+A** into an appliance. Miscellaneous connector **154** optionally includes rib **155**, for firm connection with compatible connection or inlet of an appliance.

## CLAIMS

1. A system for preparing a mixture, suitable for a hyperthermal inhalational treatment of and administration of pharmaceuticals into an upper portion of respiratory tract, said system comprising:
   (a) an inhalation module, said inhalation module comprises:
      (i) an exterior housing encompassing said inhalation module;
      (ii) at least one substantially vertical wall disposed within said housing, wherein the distance from a bottom portion of said wall to the bottom of said housing is greater than zero;
      (iii) an interior compartment within said housing, defined by said at least one substantially vertical wall;
      (iv) an inhalant contained within said housing, wherein said bottom portion of said wall is disposed within a lower than the upper level of said inhalant;
      (v) an air flow inlet, disposed exteriorly to said interior compartment;
      (vi) an inhalant inlet, for supplying said inhalant into said housing;
      (vii) an outlet, disposed within said interior compartment, and
      (viii) an electrical heating element, disposed adjacently to said bottom portion of said wall;
   (b) a blower module, adapted to generate an airflow of a low pressure; said blower module is connected to said inhalation module and supplies said airflow in a continuous manner thereto;
   (c) a nebulizer module, adapted to produce aerosols of at least one selected from the group consisting of: a nebulized pharmaceutical solution and nebulized saline; said nebulizer module comprises:
      (i) an air pressure compressor, capable of generating a pressurized air of a higher pressure;
      (ii) a non-distractive nebulizer;
      (iii) at least one selected from the group consisting of: a pharmaceutical solution and saline;
   (d) a mixing module, said mixing module is connected to said inhalation module and said nebulizer module, said mixing module comprises:
      (i) a flexible hose, to conduct a mixture produced in said mixing module;
      (ii) a handpiece, at a terminal of said hose;
      (iii) at least one nozzle, at the anterior of said handpiece.

2. The system for preparing a mixture, as set forth in claim 1, wherein said bottom portion of said wall is a butt-end at the bottom of said wall.

3. The system for preparing a mixture, as set forth in claim 1, wherein a mixture of mist and vapors of said inhalant is formed inside said interior compartment of said inhalation module.

4. The system for preparing a mixture, as set forth in claim 1, wherein said walls is typically disposed at some distance, interiorly to said housing of inhalation module; thereby allowing a circulation of airflow in-between said wall and said housing.

5. The system for preparing a mixture, as set forth in claim 1, wherein said wall embodies a cylindrical shape.

6. The system for preparing a mixture, as set forth in claim 1, wherein said blower module is a type of a fan-like device.

7. The system for preparing a mixture, as set forth in claim 1, wherein said blower module is furnished with an air filter.

8. The system for preparing a mixture, as set forth in claim 1, wherein said inhalant is at least one selected from the group consisting of: water and a substantially aqueous.

9. The system for preparing a mixture, as set forth in claim 1, wherein said inhalant inlet is furnished with a mechanism which limits the supply of said inhalant above a predetermined level.

10. The system for preparing a mixture, as set forth in claim 9, wherein said mechanism which limits the supply of said inhalant above a predetermined level is an inverted-reservoir type of device.

11. The system for preparing a mixture, as set forth in claim 9, wherein said predetermined level of said inhalant is higher than the level of said bottom portion of said wall.

12. The system for preparing a mixture, as set forth in claim 1, wherein said airflow incoming into said inhalation module is forced to overflow underneath said walls and

through said inhalant before entering into said interior compartment; whereby a mist of said inhalant is produced within said interior compartment.

13. The system for preparing a mixture, as set forth in claim 1, wherein said electrical heating element is typically disposed within said inhalant, electrically insulated therefrom.

14. The system for preparing a mixture, as set forth in claim 1, wherein said electrical heating element is disposed essentially concentrically relatively to said interior compartment and within the vicinity of the bottom portion of said wall.

15. The system for preparing a mixture, as set forth in claim 1, wherein a circulation of said airflow underneath said wall is adapted to sustain an enhanced convective cooling of a more powerful electrical heating element having higher vapor production.

16. The system for preparing a mixture, as set forth in claim 1, further comprising a grating disposed across an essentially entire cross-section of said interior compartment, for discharging an excessive difference of potentials therefrom.

17. The system for preparing a mixture, as set forth in claim 1, further comprising a grating disposed across an essentially entire cross-section of said interior compartment is characterized by a substantially spaced apart arrangement of members.

18. The system for preparing a mixture, as set forth in claim 1, wherein said non-destructive nebulizer is a venturi-type of nebulizer.

19. The system for preparing a mixture, as set forth in claim 1, wherein said pressure of said airflow generated by said blower is lower relatively to an air pressure generated by said compressor.

20. The system for preparing a mixture, as set forth in claim 1, wherein said blower module and said air compressor are driven by a shaft of a single electric engine.

21. The system for preparing a mixture, as set forth in claim 1, wherein said mixing module employs a Venturi-tube configuration.

22. The system for preparing a mixture, as set forth in claim 1, wherein said hose is a type of a corrugated hose, capable of substantial flexibility.

23. The system for preparing a mixture, as set forth in claim 1, wherein said handpiece is furnished with an extension add-on, said extension add-on comprises at least a couple of nasal extensions adapted to be inserted into nostrils.

24. An apparatus for preparing a mixture of vapors and mist, suitable for at least a hyperthermal inhalational treatment of an upper portion of respiratory tract, said apparatus comprising:
    (a) an exterior housing encompassing said apparatus;
    (b) at least one substantially vertical wall disposed within said housing, wherein the distance from a bottom portion of said wall to the bottom of said housing is greater than zero;
    (c) at least one an interior compartment within said housing, defined by said at least one substantially vertical wall;
    (d) an inhalant contained within said housing, wherein said bottom portion of said wall is disposed lower than the upper level of said inhalant;
    (e) an air flow inlet, disposed exteriorly to said interior compartment;
    (f) an inhalant inlet, for supplying said inhalant into said housing;
    (g) an outlet, disposed within said interior compartment, and
    (h) at least one electrical heating element, disposed within a adjacently to said bottom portion of said wall;
    (i) at least one blower, adapted to generate an airflow of a lower pressure at said air flow inlet;
    (j) a flexible hose, to conduct a mixture produced in said interior compartment;
    (k) a handpiece, at a terminal of said hose;
    (l) at least one nozzle, at the anterior of said handpiece;

    wherein said lower pressure airflow, generated by said blower, flows from said air flow inlet underneath said bottom portion of said wall and through said inhalant, adjacently to said electrical heating element, is adopted to sustain an enhanced convective cooling of said electrical heating element.

25. The apparatus for preparing a mixture, as set forth in claim 24, further comprises:
    (a) at least one nebulizer module, adapted to produce aerosols of at least one selected from the group consisting of: a nebulized pharmaceutical solution and

nebulized saline; said at least one nebulizer module comprises:

(iv) a non-distractive nebulizer;

(v) at least one selected from the group consisting of: a pharmaceutical solution and saline;

(b) at least one mixing module, said mixing module is connected to said apparatus and said nebulizer module and mixes the product of the former with the product of the latter.

26. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said at least one nebulizer module further comprises an air pressure compressor, capable of generating a pressurized air.

27. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said bottom portion of said wall is a butt-end at the bottom of said wall.

28. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein a mixture of mist and vapors of said inhalant is formed inside said interior compartment.

29. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said wall is disposed interiorly to said housing of said apparatus; thereby allowing a circulation of airflow in-between said wall and said housing.

30. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said wall embodies a cylindrical shape.

31. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said blower is a type of a fan-like device.

32. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said blower is furnished with an air filter.

33. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said inhalant is at least one selected from the group consisting of: water and a substantially aqueous.

34. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said inhalant inlet is furnished with a mechanism which limits the supply of

said inhalant above a predetermined level.

35. The apparatus for preparing a mixture, as set forth in claim 34, wherein said mechanism which limits the supply of said inhalant above a predetermined level is an inverted-reservoir type of device.

36. The apparatus for preparing a mixture, as set forth in claim 34, wherein said predetermined level of said inhalant is higher than the level of said bottom portion of said wall.

37. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said airflow is forced to overflow underneath said walls and through said inhalant before entering into said interior compartment; whereby a mist of said inhalant is produced within said interior compartment.

38. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said electrical heating element is disposed within said inhalant, electrically insulated therefrom.

39. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said electrical heating element is disposed essentially concentrically relatively to said interior compartment and adjacently to said bottom portion of said wall.

40. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein a circulation of said airflow underneath said wall is adapted to sustain an enhanced convective cooling of a more powerful electrical heating element having higher vapor production.

41. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, further comprising a grating disposed across an essentially entire cross-section of said interior compartment, for discharging an excessive difference of potentials therefrom.

42. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, further comprising a grating disposed across an essentially entire cross-section of said interior compartment, said grating is characterized by a substantially spaced

apart arrangement of members.

43. The apparatus for preparing a mixture, as set forth in claim 25, wherein said non-destructive nebulizer is a Venturi-type of nebulizer.

44. The apparatus for preparing a mixture, as set forth in claim 26, wherein said pressure of said airflow generated by said blower is lower relatively to an air pressure generated by said compressor.

45. The apparatus for preparing a mixture, as set forth in claim 26, wherein said blower and said air compressor are driven by a shaft of a single electric engine.

46. The apparatus for preparing a mixture, as set forth in claim 25, wherein said mixing module employs a Venturi-tube configuration.

47. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said hose is a type of a corrugated hose, capable of substantial flexibility.

48. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said handpiece is furnished with an extension add-on, said extension add-on comprises at least a couple of nasal extensions adapted to be inserted into nostrils.

49. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said handpiece is furnished with an add-on, said extension add-on comprises a widespread nozzle, adapted for topical application.

50. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said handpiece is furnished with an extension add-on, said extension add-on comprises a singular extension adapted to be inserted into an orifice.

51. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, wherein said handpiece is furnished with a miscellaneous connector add-on, said miscellaneous connector add-on comprises a miscellaneous connector adapted to be connected to an appliance.

52. The apparatus for preparing a mixture, as set forth in any of the claims 24 or 25, further comprises a baffle, disposed in-between said blower and said at least one an

interior compartment, to control the air inflow into said interior compartment.

53. A system for preparing a mixture, suitable for a hyperthermal treatment and administration of pharmaceuticals, said system comprising:
    (a) an inhalation module, said inhalation module comprises:
        (i) an exterior housing encompassing said inhalation module;
        (ii) at least one substantially vertical wall disposed within said housing, wherein the distance from a bottom portion of said wall to the bottom of said housing is greater than zero;
        (iii) an interior compartment within said housing, defined by said at least one substantially vertical wall;
        (iv) an inhalant contained within said housing, wherein said bottom portion of said wall is disposed within a lower than the upper level of said inhalant;
        (v) an air flow inlet, disposed exteriorly to said interior compartment;
        (vi) an inhalant inlet, for supplying said inhalant into said housing;
        (vii) an outlet, disposed within said interior compartment, and
        (viii) an electrical heating element, disposed within adjacently to said bottom portion of said wall;
    (b) a blower module, adapted to generate an airflow of a low pressure; said blower module is connected to said inhalation module and supplies said airflow in a continuous manner thereto;
    (c) a nebulizer module, adapted to produce aerosols of at least one selected from the group consisting of: a nebulized pharmaceutical solution and nebulized saline; said nebulizer module comprises:
        (i) a non-distractive nebulizer;
        (ii) at least one selected from the group consisting of: a pharmaceutical solution and saline;
    (d) a mixing module, said mixing module is connected to said inhalation module and said nebulizer module, said mixing module comprises:
        (i) a flexible hose, to conduct a mixture produced in said mixing module;
        (ii) a handpiece, at a terminal of said hose;
        (iii) at least one nozzle, at the anterior of said handpiece.

54. The system for preparing a mixture, as set forth in claim 53, wherein said nebulizer module further comprises an air pressure compressor, capable of generating a

pressurized air of a higher pressure.

55. The system for preparing a mixture, as set forth in any one of the claims 53 or 54, wherein said bottom portion of said wall is a butt-end at the bottom of said wall.

56. The system for preparing a mixture, as set forth in any one of the claims 53 to 55, wherein a mixture of mist and vapors of said inhalant is formed inside said interior compartment of said inhalation module.

57. The system for preparing a mixture, as set forth in any one of the claims 53 to 56, wherein said walls is typically disposed at some distance, interiorly to said housing of inhalation module; thereby allowing a circulation of airflow in-between said wall and said housing.

58. The system for preparing a mixture, as set forth in any one of the claims 53 to 57, wherein said wall embodies a cylindrical shape.

59. The system for preparing a mixture, as set forth in any one of the claims 53 to 58, wherein said blower module is a type of a fan-like device.

60. The system for preparing a mixture, as set forth in any one of the claims 53 to 59, wherein said blower module is furnished with an air filter.

61. The system for preparing a mixture, as set forth in any one of the claims 53 to 60, wherein said inhalant is at least one selected from the group consisting of: water and a substantially aqueous.

62. The system for preparing a mixture, as set forth in any one of the claims 53 to 61, wherein said inhalant inlet is furnished with a mechanism which limits the supply of said inhalant above a predetermined level.

63. The system for preparing a mixture, as set forth in any one of the claims 53 to 62, wherein said mechanism which limits the supply of said inhalant above a predetermined level is an inverted-reservoir type of device.

64. The system for preparing a mixture, as set forth in any one of the claims 53 to 63, wherein said predetermined level of said inhalant is higher than the level of said bottom portion of said wall.

65. The system for preparing a mixture, as set forth in any one of the claims 53 to 64, wherein said airflow incoming into said inhalation module is forced to overflow underneath said walls and through said inhalant before entering into said interior compartment; whereby a mist of said inhalant is produced within said interior compartment.

66. The system for preparing a mixture, as set forth in any one of the claims 53 to 65, wherein said electrical heating element is typically disposed within said inhalant, electrically insulated therefrom.

67. The system for preparing a mixture, as set forth in any one of the claims 53 to 66, wherein said electrical heating element is disposed essentially concentrically relatively to said interior compartment and within the vicinity of the bottom portion of said wall.

68. The system for preparing a mixture, as set forth in any one of the claims 53 to 67, wherein a circulation of said airflow underneath said wall is adapted to sustain an enhanced convective cooling of a more powerful electrical heating element having higher vapor production.

69. The system for preparing a mixture, as set forth in any one of the claims 53 to 68, further comprising a grating disposed across an essentially entire cross-section of said interior compartment, for discharging an excessive difference of potentials therefrom.

70. The system for preparing a mixture, as set forth in any one of the claims 53 to 69, further comprising a grating disposed across an essentially entire cross-section of said interior compartment is characterized by a substantially spaced apart arrangement of members.

71. The system for preparing a mixture, as set forth in any one of the claims 53 to 70, wherein said non-destructive nebulizer is a venturi-type of nebulizer.

72. The system for preparing a mixture, as set forth in any one of the claims 53 to 71, wherein said pressure of said airflow generated by said blower is lower relatively to an air pressure generated by said compressor.

73. The system for preparing a mixture, as set forth in any one of the claims 53 to 72, wherein said blower module and said air compressor are driven by a shaft of a single electric engine.

74. The system for preparing a mixture, as set forth in any one of the claims 53 to 73, wherein said mixing module employs a Venturi-tube configuration.

75. The system for preparing a mixture, as set forth in any one of the claims 53 to 74, wherein said hose is a type of a corrugated hose, capable of substantial flexibility.

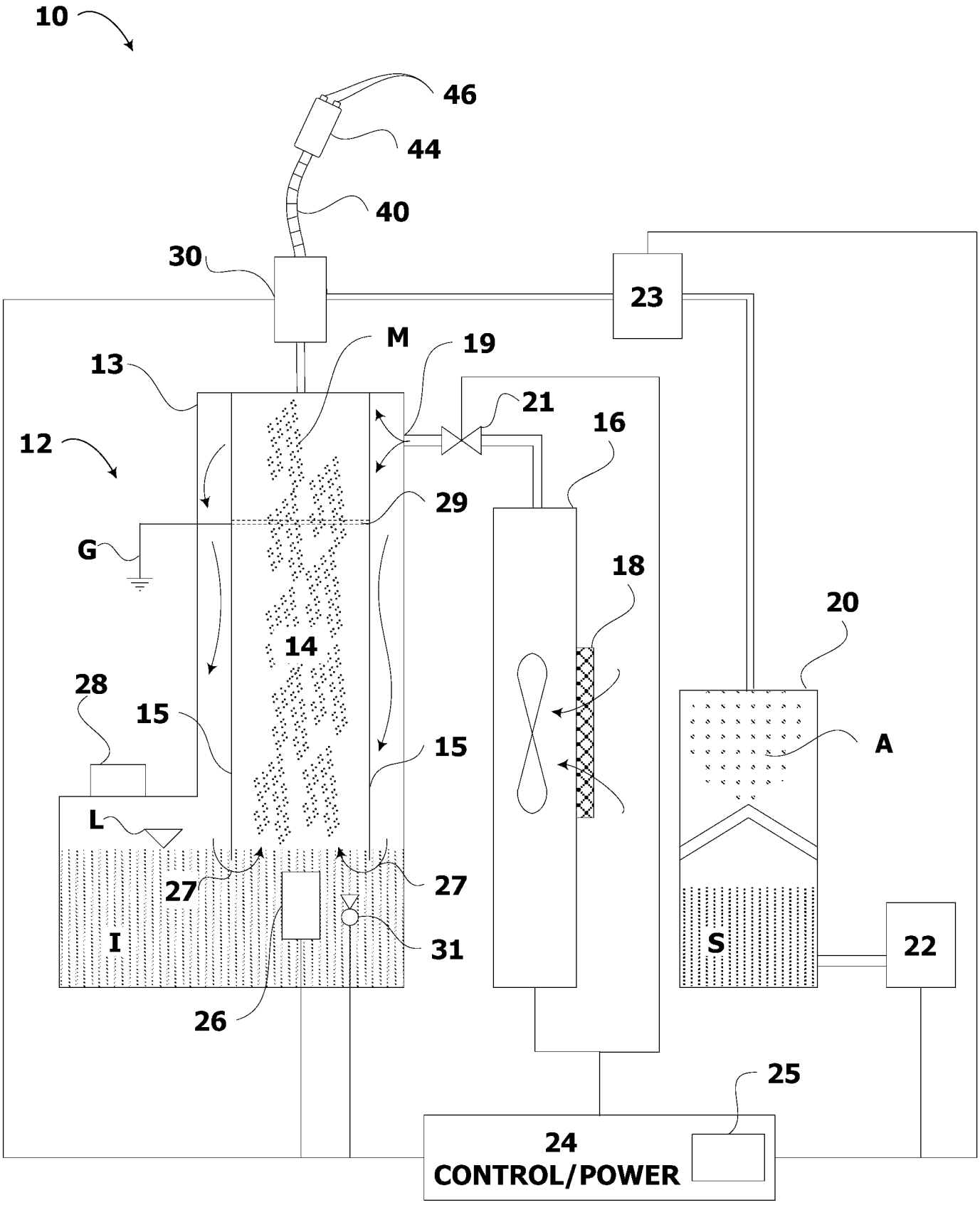
76. The system for preparing a mixture, as set forth in any one of the claims 53 to 75, wherein said handpiece is furnished with an extension add-on, said extension add-on comprises at least a couple of nasal extensions adapted to be inserted into nostrils.

77. The system for preparing a mixture, as set forth in any one of the claims 53 to 76, wherein said handpiece is furnished with an add-on, said extension add-on comprises a widespread nozzle, adapted for topical application.

78. The system for preparing a mixture, as set forth in any one of the claims 53 to 77, wherein said handpiece is furnished with an extension add-on, said extension add-on comprises a singular extension adapted to be inserted into an orifice.

79. The system for preparing a mixture, as set forth in any one of the claims 53 to 78, wherein said handpiece is furnished with a miscellaneous connector add-on, said miscellaneous connector add-on comprises a miscellaneous connector adapted to be connected to an appliance.

80. The system for preparing a mixture, as set forth in any one of the claims 53 to 79, further comprises a baffle, disposed in-between said blower and said at least one an interior compartment, to control the air inflow into said interior compartment.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G
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A
L
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I
31
S
22
26
25
24
CONTROL/POWER

Fig. 1

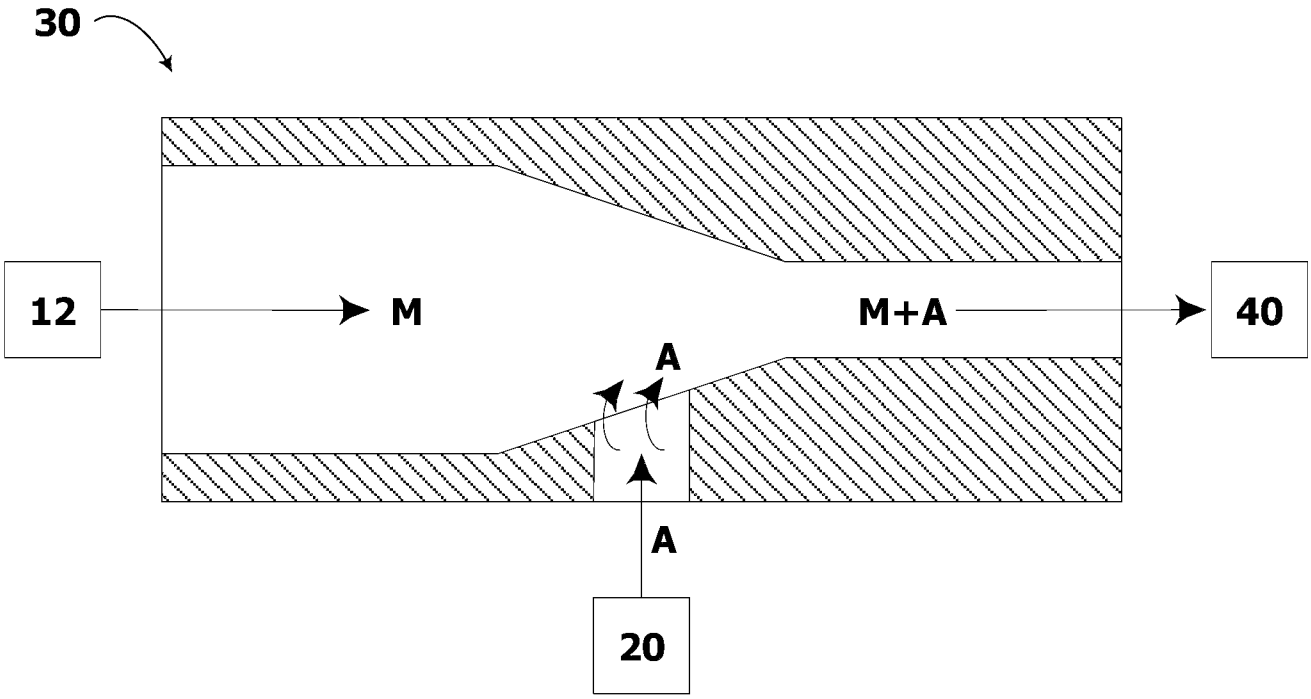


Fig. 2

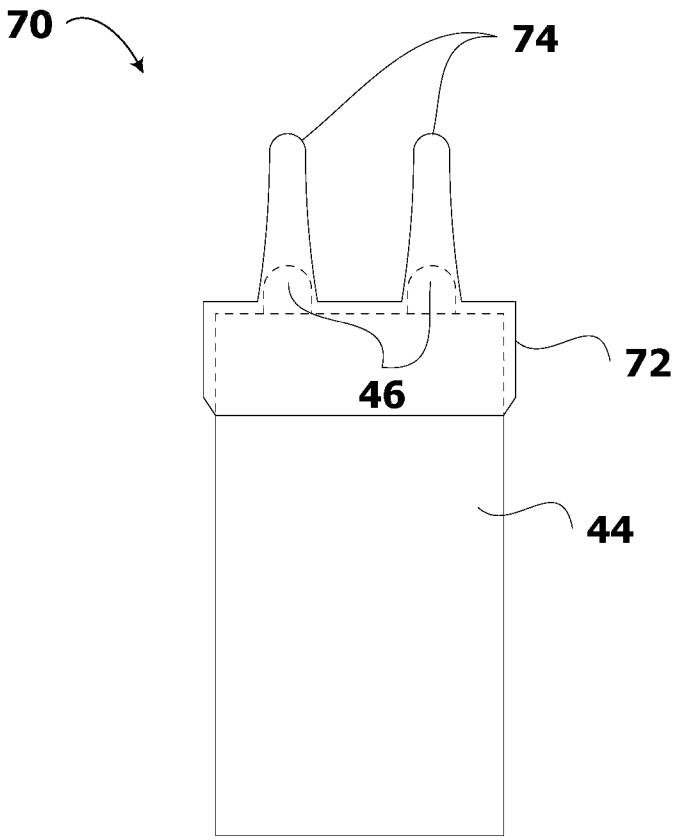


Fig. 3

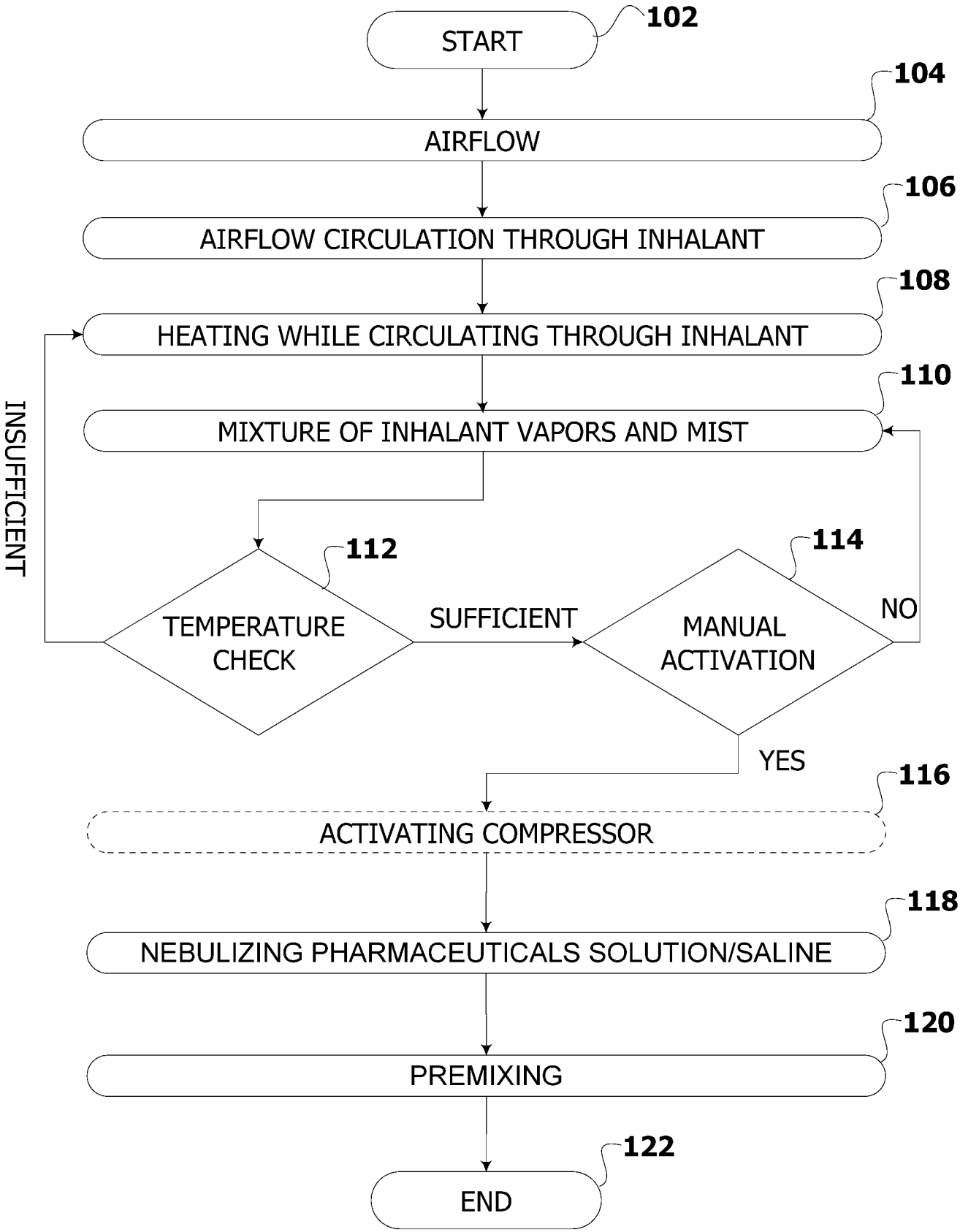
START
102
AIRFLOW
104
AIRFLOW CIRCULATION THROUGH INHALANT
106
HEATING WHILE CIRCULATING THROUGH INHALANT
108
MIXTURE OF INHALANT VAPORS AND MIST
110
INSUFFICIENT
TEMPERATURE CHECK
112
SUFFICIENT
MANUAL ACTIVATION
114
NO
YES
ACTIVATING COMPRESSOR
116
NEBULIZING PHARMACEUTICALS SOLUTION/SALINE
118
PREMIXING
120
END
122

Fig. 4

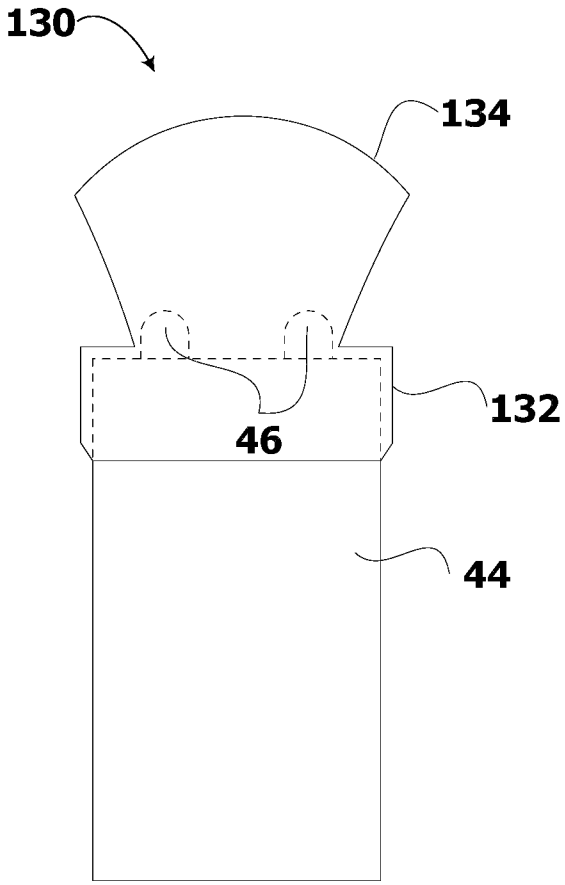


Fig. 5A

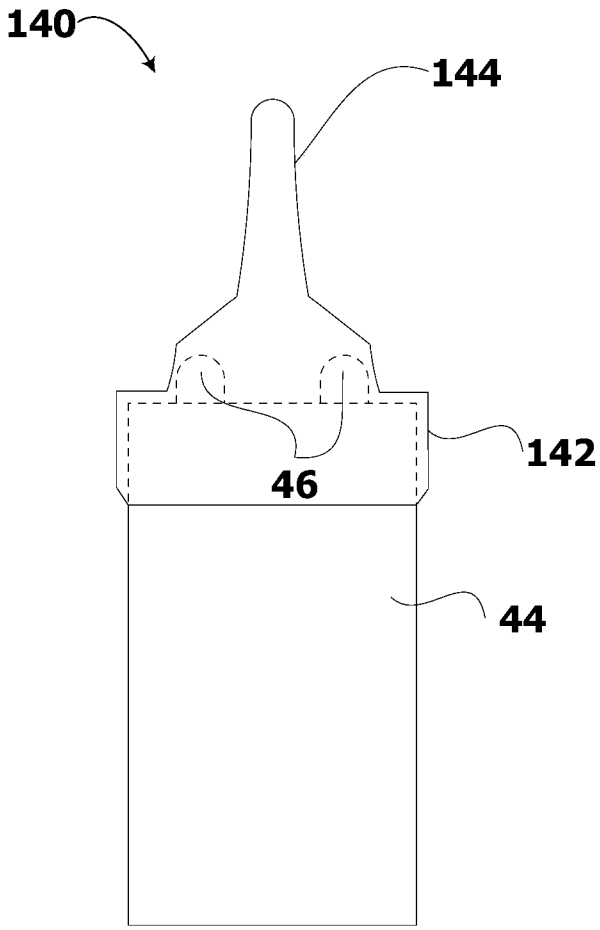


Fig. 5B

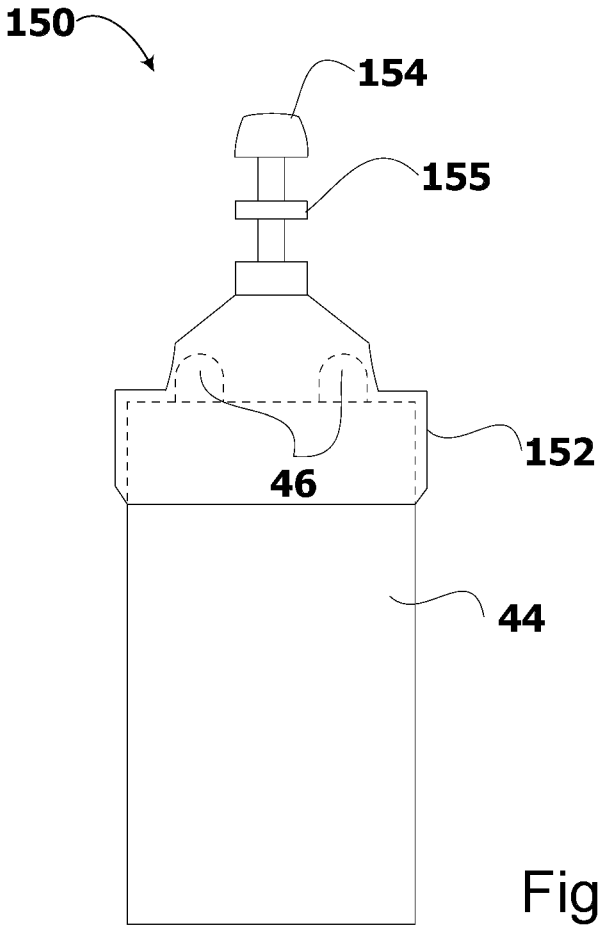


Fig. 5C