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(54) Title: A DEVICE FOR ATOMISING A LIQUID

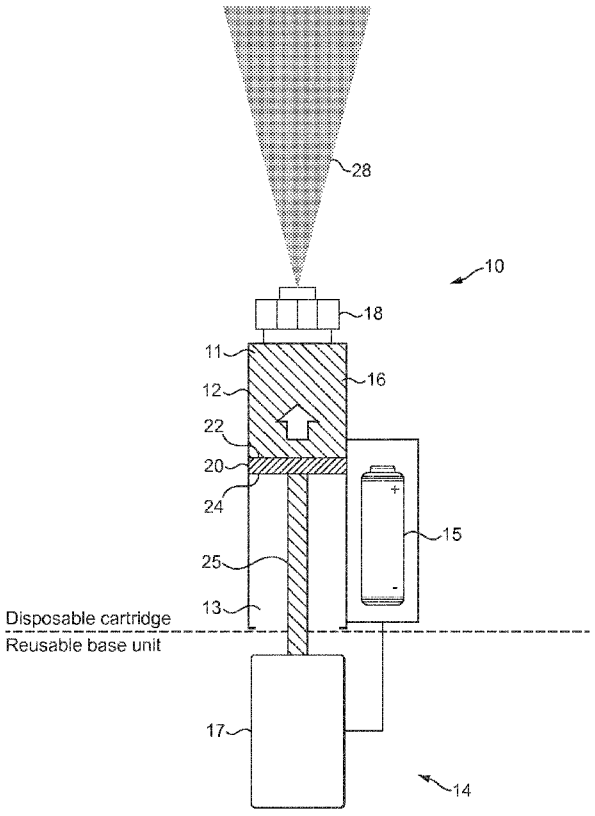


FIG. 1

(57) Abstract: A device for atomising a liquid comprising a reservoir of liquid fluidly connected to a nebulising nozzle, and comprising a motor electrically connected to a moveable barrier and a power source. The motor moves the moveable barrier to reduce the size of the reservoir so that the liquid in the reservoir is nebulised and, so that the liquid passes through the nebulising nozzle and is emitted as an aerosol.

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A DEVICE FOR ATOMISING A LIQUID

BACKGROUND OF THE INVENTION

The present invention relates to a device for atomising a liquid.

Atomised liquids are used for many purposes. One such use is for therapy, for example, by application to the skin or by inhalation. One example is the atomisation of sodium chloride for inhalation to assist with the removal of mucus and debris from the lungs. Another example is atomisation of hyaluronic acid for skin beauty purposes.

A device for atomising liquids to form a mist is disclosed in EP 2626052. It consists of a gas cylinder attached at its top end via a manifold to a separate cartridge containing a liquid to which gas is supplied in order to generate a mist. A face mask is attached at an outlet port on the top of the cartridge by which a user inhales the vapour.

In order to gain wider acceptance, there is a need for a more disposable version of such atomisers.

SUMMARY OF THE INVENTION

According to the present invention there is provided a device for atomising a liquid, the device comprising a reservoir of liquid fluidly connected to a nebulising nozzle, and comprising a motor electrically connected to a moveable barrier and a power source; wherein the motor is

actuatable to move the moveable barrier to reduce the size of the reservoir so that the liquid in the reservoir is nebulised and such that the liquid passes through the nebulising nozzle and is emitted as an aerosol. The present invention thus provides a simple device for dispensing a liquid in aerosol form.

The moveable barrier is preferably a piston or a resiliently deformable membrane.

The nozzle is preferably a swirl nozzle. The nozzle is preferably arranged to generate an aerosol which comprises droplets of a diameter of less than 10μm.

The power source may be a battery so that the device can be operated without being connected to a mains electricity supply. The power source may however be the mains.

The liquid inside the reservoir may be a saline solution, for example a solution of sodium chloride. The device is then useable to assist with the removal of mucus and debris from the lungs. The liquid may instead contain hyaluronic acid so that the device can be used for skin beauty purposes.

The device may be supplied as an assembly wherein the moveable barrier and the reservoir of liquid are located in a cartridge detachable from a base unit comprising the motor. In this case, the power source may be located in the cartridge.

The cartridge of such an assembly may be single-use and may be disposable.

BRIEF DESCRIPTION OF THE FIGURES

The invention will now be described with reference to the accompanying Figures in which:

Figure 1 which shows a cross section view of an atomiser device; and

Figure 2 shows a first side view and a second cross section view of nozzle for use with the atomiser device of Figure 1.

DETAILED DESCRIPTION

With reference to Figure 1, there is shown an atomiser device 10 which comprises a cartridge 11 defining a generally cylindrical housing 12 within which is located a reservoir 16 for liquid, and a cavity 13.

The atomiser device 10 also comprises a base unit 14 which is separate from the cartridge 11. The base unit 14 comprises a motor 17 which is powered by a battery 15 located in the cartridge 11.

The cartridge 11 also comprises a nozzle 18 which is connected to the housing 12 and which is fluidly connected to the liquid contained in the reservoir 16 such to define an outlet for the liquid from the cartridge 11. A closure means (not shown in the Figures), such as a valve or a peelable film, is located between the reservoir 16 and the

nozzle 18 to control the flow of liquid through the nozzle 18 when the device is not in use.

The size of each of the reservoir 16 and the cavity 13 is controlled by a moveable barrier 20 located in the housing 12 of the cartridge 11. As shown in Figure 1, the moveable barrier 20 is a piston which acts as a common wall for both the reservoir 16 and the cavity 13. A first face 22 of the piston is in contact with the liquid from the reservoir 16 whilst a second face 24 of the piston is in fluid communication with the gas contained in the cavity 13. In use, the piston is slideable along the length of the cylindrical housing to vary the size of each of the reservoir 16 and the cavity 13.

Extending through the cavity 13 is a rod 25 which is connected at one end to the second face 24 of the piston and which is connectable at its other end to the motor 17 located in the base unit 14.

In use of the device 10, a cartridge 11 containing liquid to be nebulised connects to the base unit 14 by coupling the rod 25 to the motor 17. In this position, the motor 17 electrically connects to the battery located in the cartridge 11. The motor 17 is then operated to force the piston 20 to slide inside the housing 12 to a positon where the size of the cavity 13 is increased but where the size of the reservoir 16 is reduced. Due to the reduction in size of the reservoir, some of the liquid contained in the reservoir 16 forces open, and passes through, the closure means into the nozzle 18 and out of the device 10 as an aerosol spray 28.

An exemplary nozzle 18 for use with the device 10 is shown in Figure 2. The nozzle 18 is generally cylindrically shaped and comprises a screw thread 30 on a portion of its outer surface which engages with a corresponding thread (not shown) on the housing 12 so that the nozzle can be releasably connected to the housing.

It will be appreciated that other types of nozzle could be used with the device 10, for instance a nozzle which utilises an impingement pin, or a nozzle involving liquid jet impingement technology (for instance the nozzle used on the Respimat® Soft Mist™ Inhaler).

The interior of the nozzle 18 defines a channel 32 into which liquid from the reservoir 16 enters (signified by the arrow shown in Figure 2) when the closure means is open. As the liquid flows through the nozzle, the nozzle induces a swirling motion on the liquid to generate an aerosol spray 28 with droplets having a diameter of less than 10µm.

The liquid contained within the reservoir is any liquid which can be atomised. Exemplary liquids which can be used include a solution of sodium chloride for when the device is used assisting with the removal of mucus and debris from the lungs, and hyaluronic acid for use in skin beauty purposes.

CLAIMS

1. A device for atomising a liquid, the device comprising a reservoir of liquid fluidly connected to a nebulising nozzle, and comprising a motor electrically connected to a moveable barrier and a power source; wherein the motor is actuatable to move the moveable barrier to reduce the size of the reservoir so that the liquid in the reservoir is nebulised and such that the liquid passes through the nebulising nozzle and is emitted as an aerosol.

2. A device according to any preceding claim wherein the moveable barrier is a piston.

3. A device according to claim 1 wherein the moveable barrier is a resiliently deformable membrane.

4. A device according to any preceding claim wherein the nozzle is a swirl nozzle.

5. A device according to any preceding claim wherein the nozzle is arranged to generate an aerosol which comprises droplets of a diameter of less than 10µm.

6. A device according to any preceding claim wherein the power source is a battery.

7. A device according to any preceding claim wherein the liquid inside the reservoir is a saline solution.

8. An assembly comprising the device of any preceding claim wherein the moveable barrier and the reservoir of liquid are located in a cartridge detachable from a base unit comprising the motor.

9. An assembly according to claim 8 wherein the power source is located in the cartridge.

10. An assembly according to claims 8-9 wherein the cartridge is single-use and is disposable.

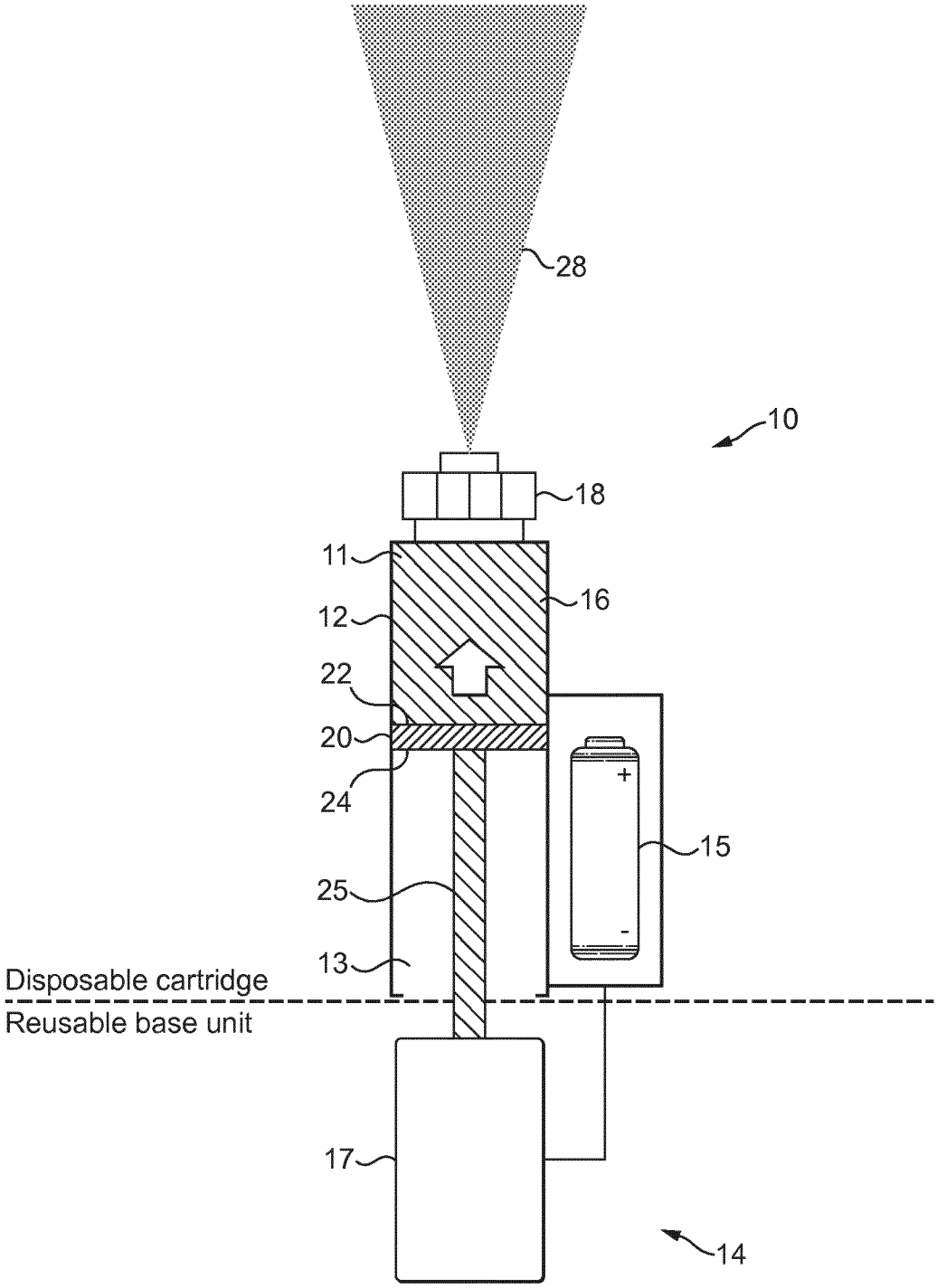

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Disposable cartridge
Reusable base unit
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FIG. 1

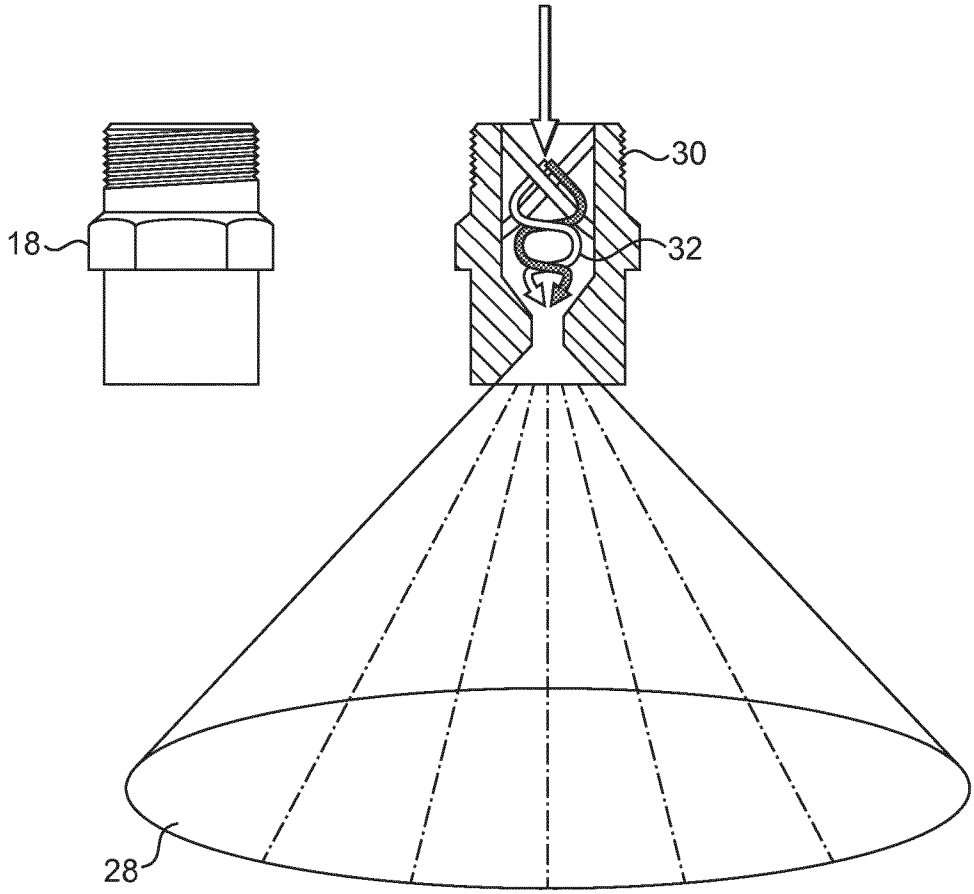


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/055319

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61M11/00
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 427 682 B1 (KLIMOWICZ MIKE [US] ET AL) 6 August 2002 (2002-08-06)	1-3,5-8, 10
A	abstract; figures 12,13 column 15, line 5 - column 16, line 6	9
X	WO 2008/129866 A1 (DAIKIN IND LTD [JP]; OBATA KOUEI [JP]; INOKUCHI YUME [JP]; OKUMOTO MAM) 30 October 2008 (2008-10-30)	1-3,6
A	abstract; figure 1 paragraphs [0038] - [0042], [0043]	9
X	US 2011/041840 A1 (DUNNE STEPHEN T [GB]) 24 February 2011 (2011-02-24)	1-5
A	abstract; figures 1-4 paragraphs [0030] - [0067]	9

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
31 May 2016	09/06/2016

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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