# United States Patent [19]

**Guichard**

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[54] **PORTABLE RESPIRATORY APPARATUS**


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[73] Assignee: **Felicien Jacquet,** Paris, France



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[21] Appl. No.: **392,341**

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| Oct. 19, 1972 | France | 72.37010 |
| July 16, 1973 | France | 73.25957 |

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[51] **Int. Cl.**..... **A61m 16/10**

[58] **Field of Search**..... 128/140 N, 142.3, 146.3, 128/146.4, 146.5, 146.6, 147, 192, 198, 200, 206, 207, 211, 212, 145.5, 188, 145 A, 191; 137/102, 512.15, 512.4



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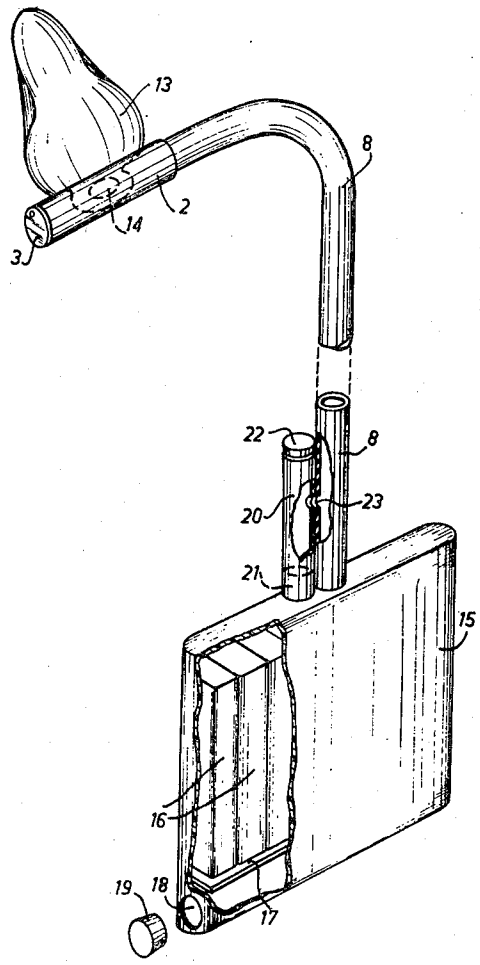
*Assistant Examiner*—Henry J. Recla
*Attorney, Agent, or Firm*—Haseltine, Lake & Waters



[57] **ABSTRACT**

A portable nasal diffuser comprising a respiratory assembly having a nasal mask to be worn over the nose, or two sleeves to be inserted into the nostrils of a user, the assembly being provided with two apertures constituting air inlet and outlet apertures respectively. First and second respective valves are mounted at the apertures, and the valves operate alternately during exhalation and inhalation by the user, such that when one aperture is open the other is closed. The outlet aperture communicates via the respective valve with the atmosphere. A reservoir is connected to the inlet aperture of the respiratory assembly by a flexible conduit and the reservoir has an air inlet and contains filter material for treating air admitted into the reservoir. Upon inhalation, the valve associated with the inlet aperture is opened and air is admitted to the reservoir and flows through the filter material to the respiratory assembly and to the user. The filter material is heated by a suitable energy source or by the body of the user.


**5 Claims, 16 Drawing Figures**



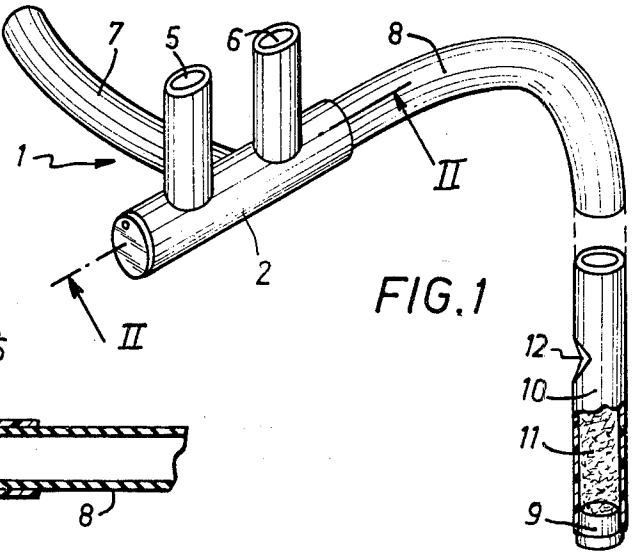



FIG. 1

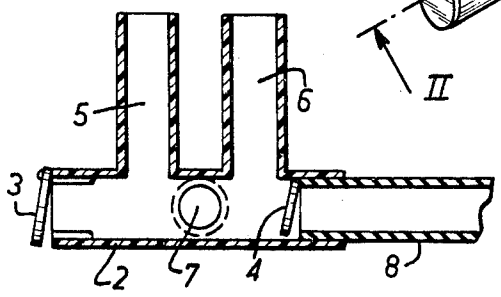



FIG. 2

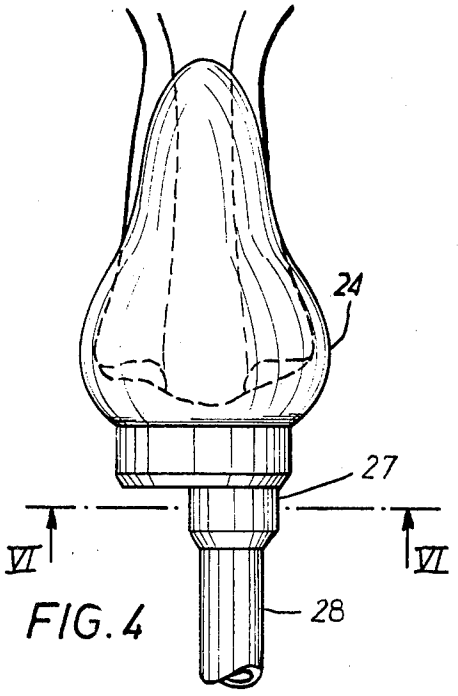



FIG. 4

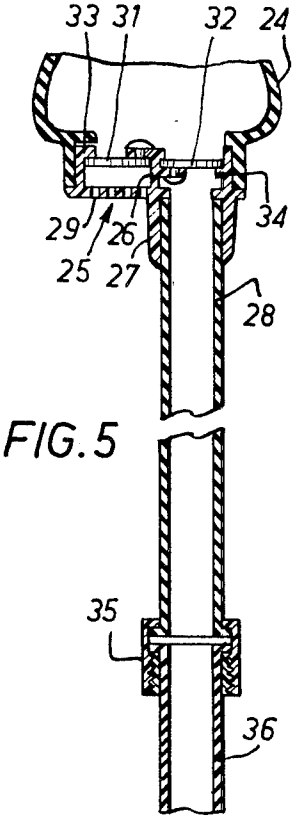



FIG. 5

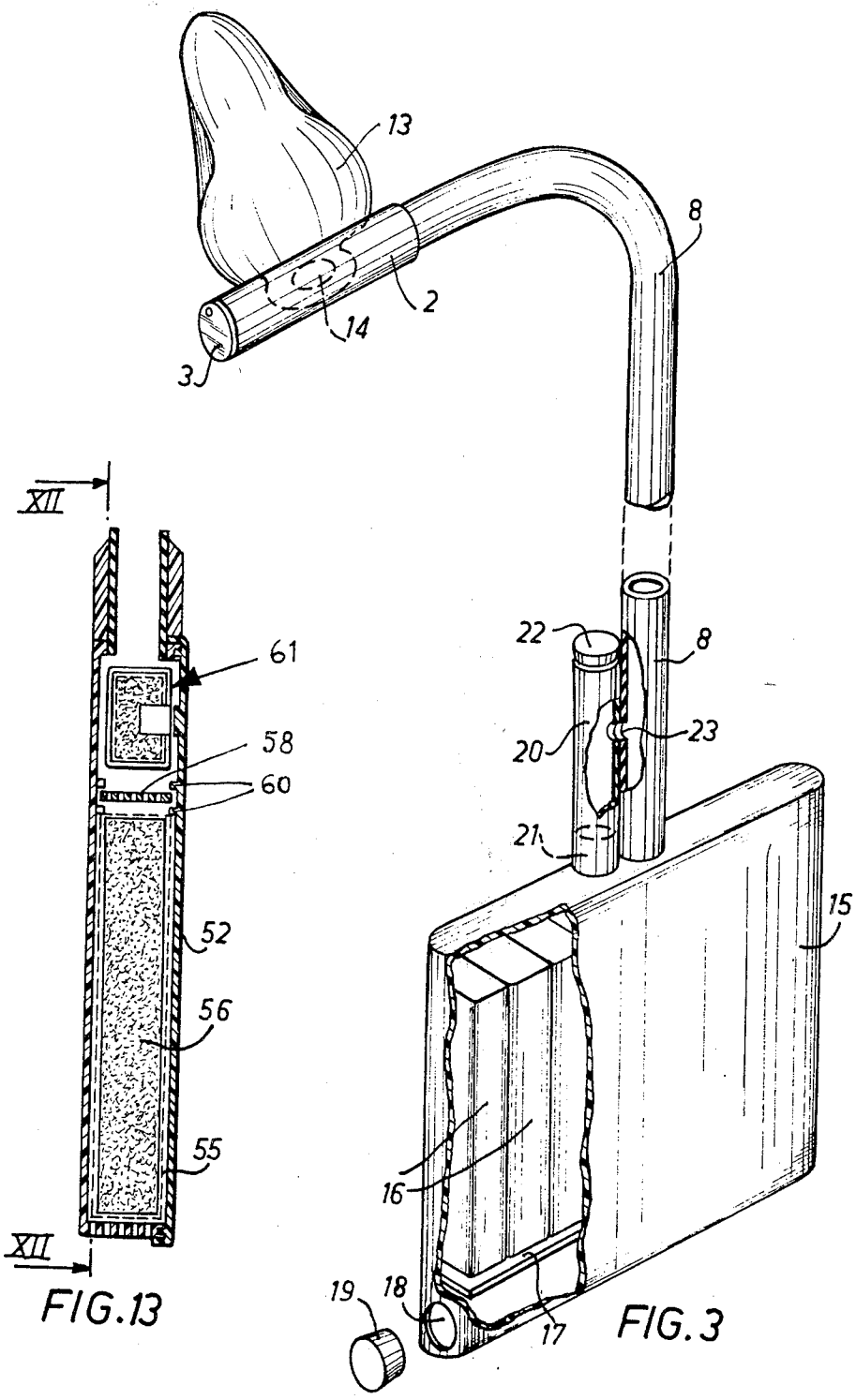



FIG.13

FIG.3

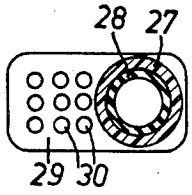



FIG.6

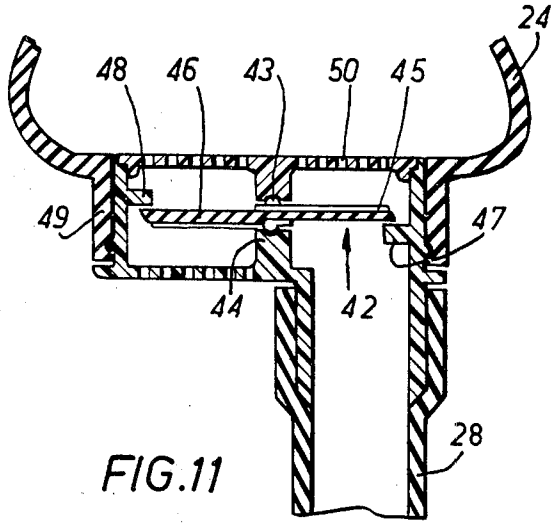



FIG.11

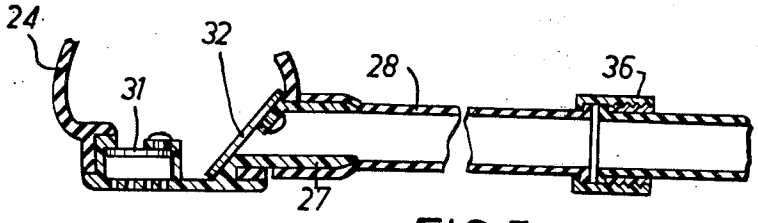



FIG.7

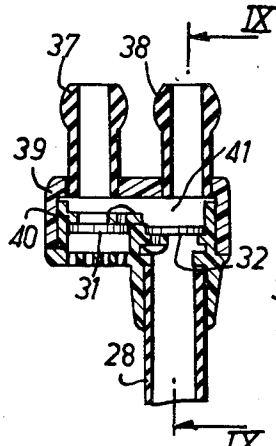



FIG.8

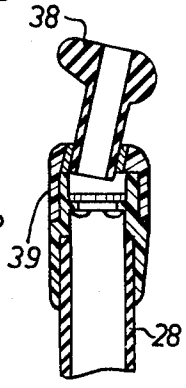



FIG.9

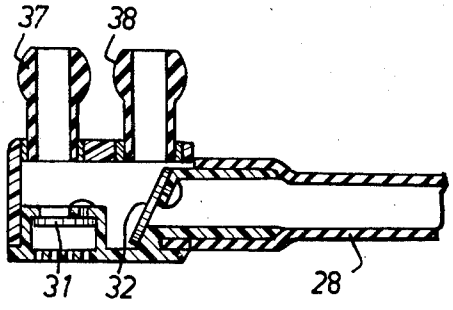



FIG.10

FIG.12

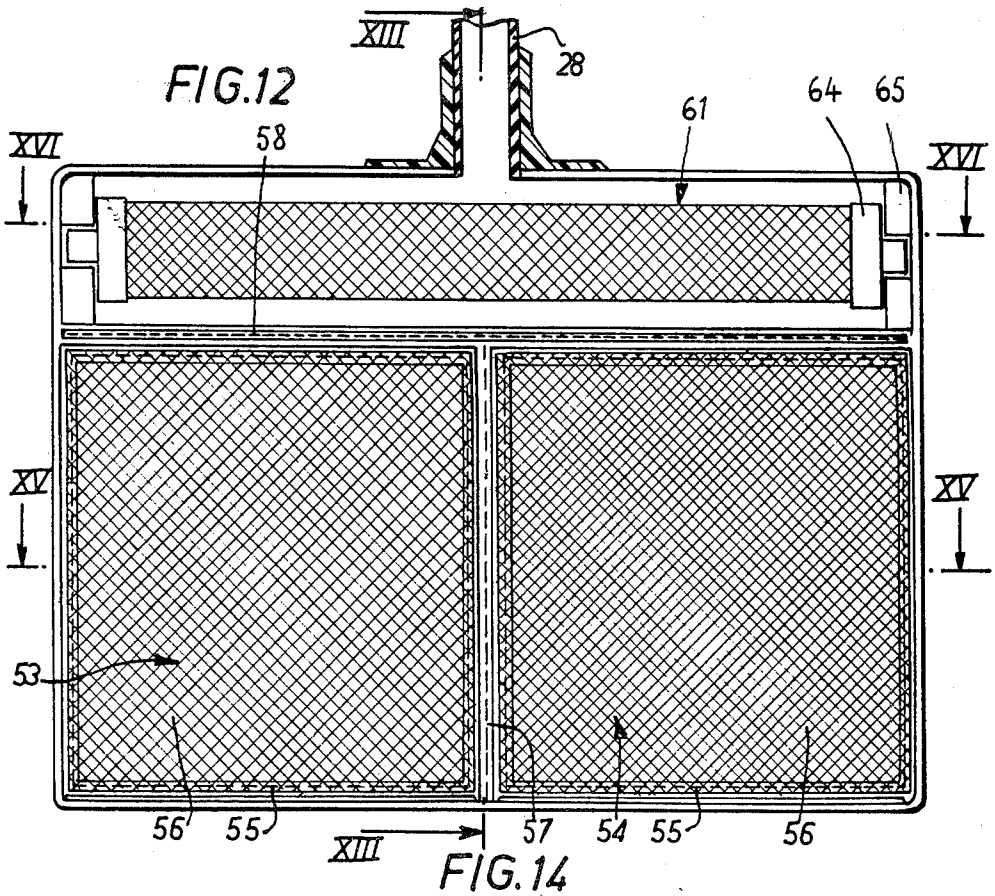



FIG.14

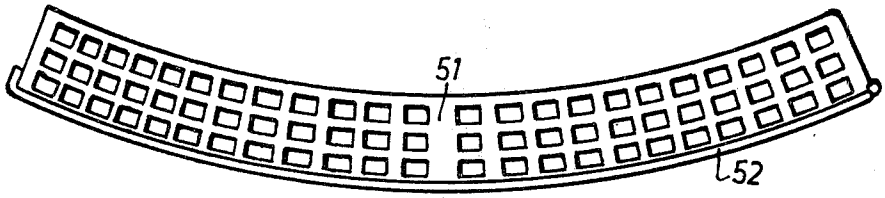



FIG.15

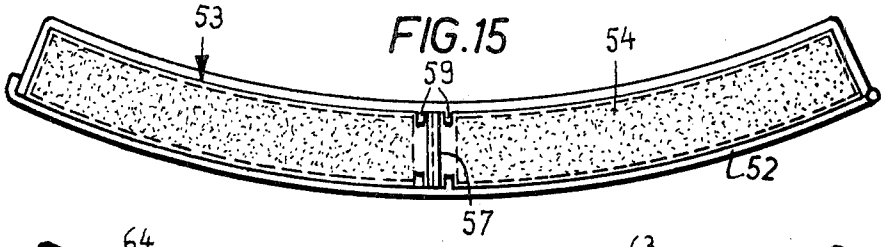
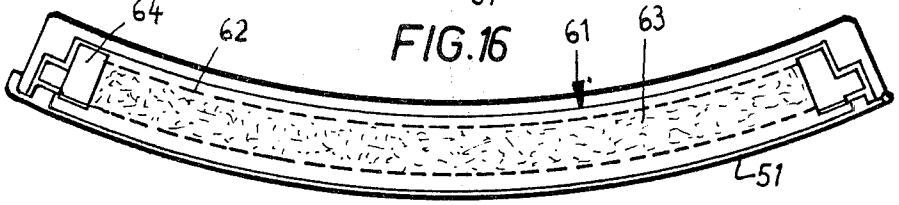



FIG.16



# PORTABLE RESPIRATORY APPARATUS

## BRIEF SUMMARY OF THE INVENTION

This invention relates to portable respiratory apparatus, and particularly a nasal diffuser adapted to be worn by a user for the purification of air for breathing. The apparatus is intended to provide effective interception of germs, pathogens and noxious gases to prevent their introduction into the respiratory tract of the user, and to supply to the user the thus treated air also with medicaments and/or fragrant substances and with a magnetic charge.

The apparatus according to the invention comprises a respiratory assembly including means adaptable to the openings of the respiratory tract of a user and provided with two apertures, first and second respective valve means at said apertures operating alternately during exhalation and inhalation by the user, such that when one aperture is open the other is closed, one of said apertures communicating via the respective valve means with the atmosphere, a reservoir having an air inlet and containing means for treating air admitted into the reservoir, means connecting the reservoir to the respiratory assembly at the other of the apertures thereof, such that upon inhalation said valve means associated with said other aperture is opened and air is admitted to the reservoir and flows through the treating means therein to the respiratory assembly and to the user and means for effecting heating of the air supplied to the reservoir.

The means for effecting heating of the air can be any suitable natural or artificial source of energy.

According to one embodiment, the reservoir is either disposed on the skin or against the clothing of the user, to collect warm, humid air from the human body at normal body temperature.

At the time of inhalation, the aperture communicating with the atmosphere is closed by the associated valve means whereas the other aperture is open to permit supply to the user of treated air from the reservoir which is heated naturally by the human body. At the time of exhalation the valve means for the discharge aperture is opened to allow exhaled air to pass to the atmosphere while the other valve means is closed to isolate the reservoir from the respiratory assembly.

Advantageously, the reservoir contains a filter adapted to remove from the supplied air all pollutant material in the form of solids, liquids or gases which are suspended in the aspirated air. For example, the reservoir can contain cartridges of cotton or preferably activated charcoal. Additionally, the reservoir can contain volatile aromatic oils or medicaments adapted for preventative or therapeutic action of afflictions of the respiratory tract including the throat, nasal passages, and the chest, such as asthma, bronchitis, sinusitis, laryngitis and the like.

The inhalation air which is at the temperature of the human body without recourse to a separate artificial heat source, contains natural water vapor which assures its indispensible hydration within the human body. Additionally, thanks to the apparatus according to the invention, it becomes possible to administer via the respiratory tract, volatile medicaments for the treatment of various conditions resulting from overwork, such as nervousness, insomnia, depression or even psychoneuroses or cardiovascular ailments.



The apparatus of the invention can be constructed of a lightweight and economical material which is of minimum encumbrance and allows it to be carried separately and even permanently without substantially interfering with the freedom of movement of the user and with minimum intrusion in appearance.

According to a particular embodiment the means adaptable to the openings of the respiratory tract of the user comprises two flexible tubular elements adapted for insertion into the nostrils of the user, and/or a tubular flexible element insertable into the mouth of the user. In the case where the flexible elements for the nostrils and the mouth are used, the apparatus is employed under conditions where the user must not eat, smoke or speak as for example in highly polluted environments. In situations where the pollution is less severe, the apparatus can employ only the flexible elements for the nostrils, leaving the mouth of the user free.

According to a preferred embodiment of the invention, the means adaptable to the openings of the respiratory tract of the user comprises two flexible tubular elements adapted for insertion into the nostrils of the user, a flexible nasal mask adapted for engagement over the nose of the user. The nasal mask is constructed of a flexible material, such as rubber or plastic, capable of adapting itself to the shape of the nose or the user and secured in place by means of suitable attachments, for example, by two elastic bands passing behind the head and a further elastic band passing on the front and fixed to the back of the head with the two other bands. The respiratory assembly with the nasal mask can be fitted onto the face of the user in sealing relation in order to prevent direct penetration of ambient polluted air.

Advantageously, the flexible material of the nasal mask as well as the material of all exposed parts of the assembly is of the same color as the skin of the user. As a result, the mask and exposed parts are not greatly intrusive in the appearance of the user. The material can also be constituted of a transparent plastic.

## BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a schematic perspective view, partly broken away and in section, of a first embodiment of respiratory apparatus according to the invention;

FIG. 2 is a sectional view taken on line II—II in FIG. 1;

FIG. 3 is a perspective view, partly broken away and in section, of a portion of a second embodiment according to the invention;

FIG. 4 is a front view of a portion of a third embodiment including a vertical conduit for conducting air to a nose-piece;

FIG. 5 is a longitudinal sectional view taken through the apparatus of FIG. 4;

FIG. 6 is a sectional view taken along line VI—VI in FIG. 4;

FIG. 7 is a longitudinal sectional view of a fourth embodiment wherein the air conduit extends laterally of the nose-piece;

FIG. 8 is a sectional view showing a distributor employed in a fifth embodiment of the invention;

FIG. 9 is a sectional view taken on line IX—IX in FIG. 8;

FIGS. 10 and 11 are sectional views of portions of sixth and seventh embodiments of the invention;

FIG. 12 is a sectional view taken on line XII—XII of FIG. 13 showing a reservoir for the purification and modification of the aspirated air;

FIG. 13 is a sectional view taken on line XIII—XIII in FIG. 12;

FIG. 14 is a bottom plan view of the reservoir of FIG. 12;

FIG. 15 is a sectional view taken on line XV—XV in FIG. 12; and

FIG. 16 is a sectional view taken on line XVI—XVI in FIG. 12.

## DETAILED DESCRIPTION

Referring to FIG. 1 of the drawing, therein is shown a respiratory apparatus including a respiratory assembly or distributor designated by reference numeral 1 and including a tubular member 2 having open ends with control valves 3 and 4 at these ends, which open and close in alternation as will be explained later. Integral with tubular member 2 are tubular sleeves or studs 5 and 6 adapted for insertion into the nostrils of a user, and a tubular element 7 adapted for insertion into the mouth of the user. A flexible tubular conduit 8 is engaged with the member 2 at the end thereof with valve 4, and the free end of flexible conduit 8 is closed with a stopper 9 to form a reservoir 10 at the bottom of the conduit. In the reservoir 10 there is disposed material 11 for filtering or purifying the air, such as cotton, which can be saturated with a volatile substance such as a medicament or fragrent composition. The wall of the reservoir 10 is provided with an aperture 12 through which air can be aspirated.

The assembly 1 is advantageously constructed of a plastic material, the conduit 8 of flexible rubber, and the valves 3 and 4 of rubber. The valves 3 and 4 are fixed at a point along their peripheries to the tubular member 2 and the valves normally close the respective ends of the member 2. During inhalation, valve 3 is applied against the corresponding open end of member 2 to form an air-tight seal thereat which prevents entry of ambient air therethrough, while valve 4 is moved from its seat and opened under the flow of air which has entered through aperture 12 and has been purified and conditioned by the material 11 in reservoir 10. At the time of exhalation, the valve 3 is opened to permit the expired air to pass to the atmosphere, and the valve 4 is closed to isolate the reservoir from the expired air.

According to a characteristic feature of the invention, the reservoir 10 is adapted to be carried in the clothing of the user, the only requirement being that the aperture 12 be positioned to aspirate the warm, humid air coming from the human body. The conduit 8 therefore, must be sufficiently flexible and long so as not to interfere with movements of the user. It is to be understood that the principle of the invention is applicable to the use of any suitable portable heating source, battery powered for example, to reheat the expired air.

Thanks to the small size and weight of the device, and its simple construction, it can be carried permanently by people suffering from respiratory ailments and the like. It can also be used by bicycle riders, motocyclists, skiers and people allergic to cold air. Its low cost and efficiency makes it suitable for preventitive use against atmospheric pollution and air-borne communicable diseases.

In the embodiment of FIG. 3, there is no tubular element for insertion into the mouth of the user and the two nostril insert members 5 and 6 have been replaced by a nasal mask or nosepiece 13 of flexible rubber, preferably of the same color as the skin of the user. The nosepiece 13 is in sealing communication with an orifice 14 in tubular member 2 and the reservoir of the embodiment of FIG. 1 is replaced by a flat container 15, for example of plastic material, in which are disposed replaceable cartridges filled with an absorbant or filter material, such as activated charcoal. The casing of the cartridges is constituted by a perforate material, such as a metallic grid. The cartridges are secured between two perforated flanges of which only one is seen at 17, the flanges being respectively spaced at the top and the bottom of container 15. The flanges are made of a black rubber substance which is permanently magnetized and is known in the art by the trademark FERRIFLEX 3. The bottom of the container 15 is provided with at least one aperture 18 through which air can be aspirated. In periods of non-use, the aperture 18 is closed with a stopper 19. A small tubular reservoir 20 containing a medicament or fragrent substance 21 is fixed on the container 15 and closed by a removable stopper 22. The reservoir 20 is adjacent conduit 8 and in contact therewith and two openings 23 respectively formed in reservoir 20 and conduit 8 face one another and provide a sealed passageway for air from the reservoir 20 to the conduit 8.

At the time of inhalation, air enters aperture 18, traverses the cartridges 16 where the air is filtered and purified and then the air passes into conduit 8 where it is supplied with medicament or fragrant substance from reservoir 20 via holes 23.

The nosepiece can be held in position by means of elastic bands or the like (not shown) which can engage around the head or be secured to eyeglasses or secured behind the ears.

The respiratory assembly shown in FIGS. 4 and 5 represent a modification of that in FIG. 2. The nasal mask 24 in FIGS. 4 and 5 is sealed around an assembly 25 which is made of a rigid plastic material of relatively small size. The assembly 25 is formed with two distinct sections by a separation element including a median partition 26. At the right side of partition 26 in FIG. 5, said element includes a vertical sleeve 27 which is sealably engaged with the end of tubular conduit 28 which conducts air vertically. The left side of partition 26 of the separate element is closed by a wall with perforations 30 as best seen in FIG. 6.

On the median partition 26 there are pivotably mounted two rubber valves 31 and 32 controlling the passage of air in the two sections of the assembly. The separating element is formed with two abutments 33 and 34 on its inner peripheral wall as shown in FIG. 5, and by reason of the disposition of these abutments, the valve 32 can be lifted from a horizontal position but not lowered therebelow, whereas inversely, the valve 31 can be lowered from its horizontal position but not raised. Advantageously, the conduit 28 can be connected by means of a seal 35 to a second conduit 36 connected to a reservoir or container as previously described or to one to be described later. Due to this connection, the respiratory assembly can be very easily coupled to or uncoupled from the purification means.

The operation of this embodiment is clear from the disclosure and is simple. Upon inhalation, filtered and pure air with addition of medicaments, fragrant substances or the like travels through conduit 28 and

passes through the raised valve **32.** Simultaneously, valve **31** is applied, by the aspiration of the air, against abutment **33** to form a seal therewith. At the time of exhalation, the valve **32** is lowered thereby to seal off the purification reservoir and the valve **31** opens to allow the expelled air to pass to the atmosphere.

In the embodiment illustrated in FIG. **7,** the respiratory assembly is similar to that in FIG. **5,** except for the construction wherein the sleeve **27** extends from the assembly laterally. As a consequence of this, the conduit **28** is adapted for being horizontally engaged on the sleeve.

FIGS. **8** and **9** show another embodiment of the respiratory assembly which differs from that of FIG. **5** in that the nasal mask is replaced by two tubular elements **37, 38,** constructed of flexible rubber for being introduced into the nostrils of the user. The elements **37** and **38** are sealably engaged in two orifices of a cap member **39** constructed of flexible rubber and mounted on the peripheral wall **40** of a distributor member. By reason of the flexibility of the cap member **39** and of elements **37** and **38,** the latter can be deformed and inclined in order to take the position and form most suitable for maximum comfort of the user. The inhaled air travels past the aspiration valve **32** to enter chamber **41** where it is distibuted to the members **37, 38.**

FIG. **10** shows a modification of the embodiment of FIG. **8** in which the conduit **28** extends laterally from the cap member instead of therebelow.

In the embodiment illustrated in FIG. **11,** there is shown a modification residing in the construction wherein the two valves **31** and **32** are replaced by a single plate **42,** constructed of rubber and provided in the central portion with a flange **43** by which the plate is anchored in a recess of complementary shape provided in the median partition **44** of the distributor. The plate **42** is normally horizontal and its free ends situated on opposite sides of flange **43,** serve the function of aspiration and expiration valves. The valves face respective abutments **47** and **48** which limit the movement of the valves and on the surfaces of the valves opposite the abutments there are formed ribs adapted to augment the rigidity of the plate. The respiratory assembly is molded in four parts of plastic material. To the assembly is sealably connected the end of conduit **28** and tubular sleeve end **49** integrally formed with the nasal mask **24.** The respiratory assembly finally includes a cover **50** at its upper end which is perforated over its entire surface.

According to a further characteristic feature of the invention, the reservoir in which the aspirated air is filtered and purified is constituted by a container of narrow, curved form in a shape capable of being fixed at the level of the belt of the user. Such a container is illustrated in FIGS. **12–16.** The container has a lower wall **51** which is perforated over its entire surface as shown in FIG. **14** and it is connected at its upper end to the conduit **28** which leads to the respiratory assembly. The container is closed on its front face by means of a detachable cover **52.** At the interior of the container are mounted two cartridges **53, 54,** each comprising a housing **55,** of a perforated material, for example, a metal screen, or a perforated plastic material. The housings are filed with a filter material **56,** for example, activated charcoal contained in woven cotton, or a cotton template, or a porous material which is absorbent of benzene. These porous materials, serving as filters and absorbents, are enclosed in a casing whose walls are made of Ferriflex **3.**

The cartridges are separated by a perforated plate **57** also constituted of Ferriflex **3.** Similarly, above the cartridges is fixedly mounted another plate **58** of Ferriflex **3.** The plates **57** and **58** are secured between slides **59** (FIG. **15**) and **60** (FIG. **13**) formed on the container.

Above the cartridges **53** and **54,** there is mounted a cartridge **61** adapted to provide a medicament or fragrant substance to the air being fed to the user. The cartridge **61** is carried in a housing **62** which may be constituted as a metal screen, or a perforated plastic material filled with woven cotton saturated with a volatile medicament or fragrant substance. The cartridge **61** is provided with ferrules **64** at its ends by which the cartridge can be fixed in slides **65** formed in the container.

In utilization, the container is fixed at the level of the waist of the user under his clothing, the conduit **28** exiting from under the collar of his shirt and being adapted for being directly connected to one of the respiratory assemblies previously described, or indirectly connected thereto through the intermediary of a coupling. At the time of inhalation, warm air previously expelled enters through the perforated surface **51** of the container, passes the filter cartridges **53** and **54** in which the air is purified and then the plate **58** of Ferriflex **3** where it is charged magnetically and finally the cartridge **61.**

It goes without saying that numerous modifications and variations of the embodiments disclosed hereinabove can be undertaken by those skilled in the art without departing from the scope and spirit of the invention as defined in the appended claims.

What is claimed is:

**1.** Portable nasal diffuser apparatus comprising a respiratory assembly including means for communicating with the respiratory tract of a user and provided with two apertures, first and second respective valve means at said apertures operating alternately during exhalation and inhalation by the user such that when one aperture is open the other is closed, one of said apertures communicating via the respective valve means with the atmosphere, a reservoir having an inlet and containing means for treating air admitted into the reservoir, means connecting the reservoir to the respiratory assembly at the other of the apertures thereof, such that upon inhalation said valve means associated with the said other aperture is opened and air is admitted to the reservoir and flows through the treating means therein to the respiratory assembly and to the user, and means for effecting heating of the air supplied to the reservoir including means for enabling the reservoir to be positioned proximate the body of the user to capture heat therefrom, said treating means comprising a filter substance and a housing containing said filter substance and having openings for passage of air through said filter substance, said means for communicating with the respiratory tract of the user comprising a flexible nasal mask engagable over the nose of the user, a hollow body of relatively small size coupled to said nasal mask, said body including a first portion with said one aperture therein, and a second portion connected to said connecting means, said first and second valve means being supported in said body, each said valve means comprising a flat member pivotably connected in said body adjacent its respective aperture, said flat mem-

bers being disposed horizontally, said one aperture being disposed in said one portion of said body below its respective flat member, said connecting means extending below the other flat member, and abutment means extending internally in said body proximate said apertures to support the respective valve members in a position of rest such that each valve member is movable in one direction only to be opened.

**2.** Apparatus as claimed in claim **1** wherein said means for communicating with the respiratory tract of the user comprises two flexible tubular elements adapted for insertion into the nostrils of the user.

**3.** Apparatus as claimed in claim **1** wherein said treating means includes a volatile substance in said reservoir adapted for being entrained in the air flow.

**4.** Apparatus as claimed in claim **1** wherein the flat members of the valve means are joined together as a single element centrally anchored in said body with free opposite ends constituting valves.

**5.** Apparatus as claimed in claim **1** wherein said means connecting the reservoir to the respiratory assembly comprise a flexible conduit.

* * * * *