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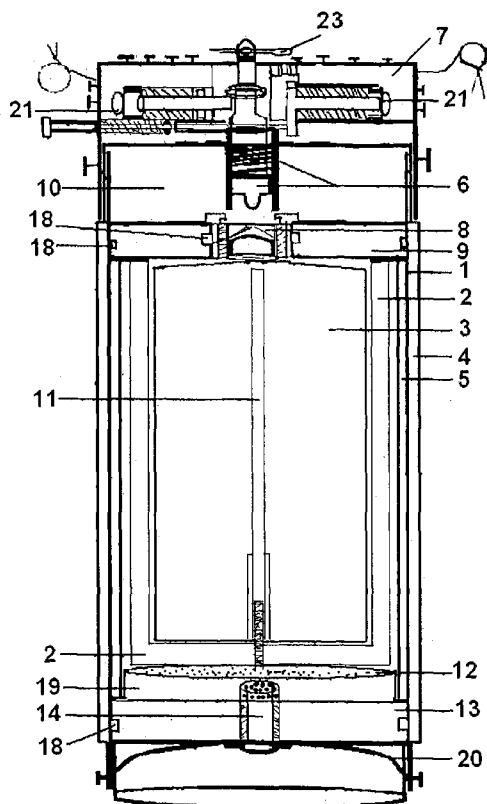
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(54) Title: CHEMICAL OXYGEN GENERATOR



(57) Abstract: Chemical oxygen generator is provided. The chemical oxygen generator comprises a container to accommodate a filter and a chemical candle therein and adapted to be disposed into an insulated casing. A reusable firing pin holding means is provided at one end of the container to hold the firing pin and release it upon getting signals so as to ignite a percussion cap provided with a solid disc to fire the chemical candle and to generate oxygen upon decomposition of the chemical candle. An insulating disc pad is provided between reusable holding means and solid disc to accommodate the firing pin and to protect reusable holding means from excessive heat regenerated during decomposition of the chemical candle. Another solid disc having a chemical oxygen supply control device is provided at the other end of the container such that to open and close supply of the chemical oxygen. A chemical oxygen supply means adapted to be secured with chemical oxygen supply control device is provided to supply oxygen as and when required by the user. Sealing means being provided around the periphery of discs to facilitate securing of the discs with the container in an air tight manner.

**Declarations under Rule 4.17:**

- as to the identity of the inventor (Rule 4.17(i))
- as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))
- as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))

— of inventorship (Rule 4.17(iv))

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CHEMICAL OXYGEN GENERATOR

FIELD OF INVENTION

5 This invention relates to a chemical oxygen generator. Particularly this invention relates to a chemical oxygen generator provided with an electro-mechanical device. The chemical oxygen generator acts like a safety device and therefore is useful to install or deploy in various carriers, for example, aircrafts and also in the industries and other places, where there are chances of terrorist attack and
10 sabotage.

BACKGROUND OF THE INVENTION;

Chemical oxygen generator units are widely used in aviation industries (e.g. aircrafts), space mission (e.g. air shuttles), under sea exploration, underground
15 mining, underground and over ground search and rescue operation, any large scale chemical disasters, at higher altitude by mountaineers and climbers and other places where normal sources of oxygen for a short duration of time is not available for human breath. Also, chemical oxygen generator units are useful in emergency for human breathing for a short period of time, where normal oxygen
20 in the surrounding area of a person is not available.

Chemical oxygen generator unit known in the art comprises chemical candles contained in a housing such that to generate oxygen when the unit is activated manually. A filter is provided inside the housing to filter oxygen to make it suitable for human consumption. The chemical decomposition of the candles in

the container produces chemical oxygen for human breathing for a limited period of time. The chemical oxygen generator unit used in the aircraft acts during emergency conditions, for example, aircraft cabin pressurization failure or aircraft cabin decompression at a higher altitude during the flight between 12000 ft. MSL
5 to 14000 ft. MSL and above.

There are disadvantages associated with the prior art. One of the disadvantages is that there exists a serious safety hazard as the chemical oxygen generator unit is manually operated at any altitude from ground itself and the miscreants can access the equipment easily.

10 Another disadvantage is that the oxygen generated by the conventional chemical oxygen generator can be utilized by the miscreants to ignite fire in the aircraft and thus it can be used as a weapon to carryout sabotage operation in the aircraft. Therefore, the issue of using a chemical oxygen generator as a weapon by the miscreants is a great concern, keeping in view the safety of the aircraft
15 and the passengers on board, as well.

Yet another disadvantage is that the known chemical oxygen generator can be activated at any time with or without pressurization failure in the aircraft's cabin.

Still another disadvantage is that the known chemical oxygen generator is not capable of supplying oxygen automatically into the aircraft's cabin during
20 depressurization at higher altitude during the flight.

A further disadvantage is that the known chemical oxygen generator does not have any audio and visual indicating means to show that the chemical oxygen generator is in use and generating chemical oxygen.

Another disadvantage is that the known chemical oxygen generator does not
5 have any control means to stop generation and supply of oxygen at the time of accident of aircraft and thus to reduce chances of fire / burning of the aircraft and fatal death of passengers due to engulf of fire in quick time.

Yet another disadvantage is that the known chemical oxygen generator does not have any audio and visual indication means to show that the chemical oxygen
10 generator is tampered by the miscreants before the flight or during the flight.

Still another disadvantage is that the known chemical oxygen generator does not have an automatic means to stop oxygen supply when the aircraft is flying at an altitude of 10,000ft MSL and below.

Another disadvantage is that the known chemical oxygen generator does not
15 have an automatic means to stop oxygen supply when chemical oxygen generation is started and the aircraft has an emergency landing or met with an accident.

OBJECTS OF THE INVENTION

Therefore, an object of the present invention is to provide a chemical oxygen
20 generator which meets all national and international norms as applicable for the safety of aircraft and air passengers.

Another object of the present invention is to provide a chemical oxygen generator to generate oxygen and provide audio and visual indication about such chemical oxygen generation.

Yet another object of the present invention is to provide a chemical oxygen
5 generator which is tamper and sabotage proof.

Still another object of the present invention is to provide a chemical oxygen generator with an audio and visual warning means to indicate that either the chemical oxygen generator is in operation or has been tampered by some miscreant before or during the flight.

10 A further object of the present invention is to provide a chemical oxygen generator which can be installed in the aircraft's lavatory and all other places, with all safety features, in the aircraft's cabin due to its variable shape and size.

Another object of the present invention is to provide a chemical oxygen generator which provides supply of oxygen only when there is a physical contact
15 between the passenger and the chemical oxygen flow mask.

Yet another object of present invention is to provide a chemical oxygen generator having means which allows automatic drop down of the chemical oxygen flow mask only after the aircraft cabin pressurization failure or aircraft cabin decompression at a higher altitude during the flight.

20 Still another object of present invention is to provide a chemical oxygen generator having alternative means to deploy chemical oxygen flow mask to the

passengers after pressurization failure and in case systems fails to deploy automatically the chemical oxygen flow mask.

A further object of the present invention is to provide a chemical oxygen generator which facilitates flow of oxygen during aircraft cabin pressurization failure and cabin decompression at higher altitude during the flight.

Yet another object of the present invention is to provide a chemical oxygen generator which facilitates software based integration with enhanced ground proximity warning system (EGPWS) or ground proximity warning system (GPWS) such that to control the flow of chemical oxygen by closing operation of the integrated solenoid-sensor operated safety devices so as to CLOSE the supply of chemical oxygen to the passenger's oxygen flow mask, in case of aircraft collision or accident or obstruction of aircraft flight path at any altitude.

Still another object of the invention is to provide a chemical oxygen generator having means to display the audio and visual indication during sabotage or tamper by the miscreant before or during the flight, without having aircraft cabin pressurization failure or cabin decompression at a higher altitude during the flight.

STATEMENT OF THE INVENTION

According to this invention there is provided a chemical oxygen generator comprising a container to accommodate a filter and a chemical candle therein and adapted to be disposed into an insulated casing, a reusable firing pin holding means being provided at one end of the container to hold the firing pin

and release it upon getting signals about (i) required pressure failure in the cabin, (ii) switching on of an audio and visual warning display device and (iii) physical contact of an electronic tactile sensor with passenger so as to ignite a percussion cap provided with a solid disc to fire the chemical candle and to
5 generate oxygen upon decomposition of the chemical candle, an insulating disc pad being provided between reusable holding means and solid disc to accommodate the firing pin and to protect reusable holding means from excessive heat regenerated during decomposition of the chemical candle, another solid disc having a chemical oxygen supply control device being
10 provided at the other end of the container such that to OPEN and CLOSE supply of the chemical oxygen, a chemical oxygen supply means adapted to be secured with chemical oxygen supply control device being provided to supply oxygen as and when required by the user, sealing means being provided around the periphery of discs to facilitate securing of the discs with the container in an air
15 tight manner.

BRIEF DESCRIPTION OF THE ACCOMPANYING DRAWINGS

Chemical oxygen generator according to a preferred embodiment is herein described and illustrated in the accompanying drawings, wherein:

Fig. 1 illustrates a sectional view of the chemical oxygen generator,

20 Fig. 2 illustrates a sectional view of the chemical oxygen generator according another embodiment,

Fig. 3 illustrates a sectional view of the chemical oxygen generator according to yet another embodiment,

Fig. 4 illustrates plan view of firing pin holding means,

Figs. 5 A illustrates sectional view of chemical oxygen outlet control means in closed position,

Figs. 5 B illustrates sectional view of chemical oxygen outlet control means in open position,

5 Fig. 6 illustrates perspective view of chemical oxygen supply means,

Fig. 7 illustrates perspective view of oxygen mask with electronic tactile sensor,

DETAILED DESCRIPTION

Chemical oxygen generator is herein described with numerous specific details so as to provide a complete understanding of the invention. However these specific
10 details are exemplary details and should not be treated as the limitation to the scope of the invention. Throughout this specification the word "comprise" or variations such as "comprises or comprising", will be understood to imply the inclusions of a stated element, integer or step, or group of elements, integers or steps, but not the exclusions of any other element, integer or step or group of
15 elements, integers or steps.

Referring to the drawings, figure 1 shows a chemical oxygen generator. The chemical oxygen generator comprises a cylindrical container 1 such that to accommodate a filter element 2 and a chemical candle 3, therein. The cylindrical container 1 is made of a metal and is adapted to be disposed in an insulated
20 casing 4. The insulate casing 4 may comprise an outer layer made of metal or composite material. Another cylindrical container 5, made of an bad conducting material, for example, ceramic material, glass wool pad, mica sheet, silica pad and / or asbestos pad etc. is disposed between the cylindrical container 1 and

the filter element 2 such that to stop transfer of heat to the outer casing 4 during chemical oxygen generation. The chemical candle 3 is provided to generate chemical oxygen in the container 1. A spring loaded firing pin 6, adapted to be secured with a replaceable and reusable firing pin holding means 7, is provided
5 at one end of the container 1 such that to ignite a percussion cap 8 provided with a solid disc 9 in order to fire the candle 3. An insulating disc pad 10 is provided between reusable holding means 7 and solid disc 9 to accommodate the firing pin 6 and to protect reusable holding means 7 from excessive heat regenerated during decomposition of the chemical candle 3. The candle 3 is kept in position
10 by means of a holding pin 11 secured with a perforated disc 12 provided at the other end of the container 1. The perforated disc 12 also provides support to the filter element 2. A solid disc 13 having a passage / outlet 14 is secured at the other end of the container 1 such that to accommodate a chemical oxygen outlet control means 15 (please see figure 5A and 5B) provided to OPEN and CLOSE
15 the supply of the chemical oxygen flow and also to make the end of the container 1 as a leak proof end. A chemical oxygen supply means 16, as shown in figure 6, adapted to be connected with the oxygen outlet control means 15 is provided to supply the chemical oxygen to passengers as and when required through an oxygen supply mask 17 (please see figure 7). Sealing means 18, made of
20 ceramic fiber rope, glass fiber rope or asbestos rope, being provided around the periphery of the discs 9 and 13 to facilitate securing of the discs 9 and 13 with the container 1 in an air tight manner. In one embodiment a filter disc 19 is provided between perforated disc 12 and solid disc 13 to further filter the chemical oxygen to be supplied to the passengers. A support disc 20 is provided

after the disc 13 such that to avoid bulging of the end of the container 1 due to heat and pressure generated during the oxygen generation.

The filter element 2, according to an embodiment, comprises a wire mesh having a layer of porous material provided, for example, porous material comprises ceramic fiber porous material, glass fiber porous material, ceramic porous material. The filter element 2 is provided to remove impurities, if any, from the chemical oxygen before passing out from the passage 14 to the oxygen mask 17 for use by the passenger. In one embodiment, the filter element 2 may be provided in the form of a pouch such that to accommodate the chemical candle 3, therein.

In one embodiment, the chemical candle 3 is secured with a threaded or any other type of holder, such as, pin type or slot type holder secured with a perforated separator. The chemical candle 3 is secured in such a way that the candle is secured firmly and does not move in any direction inside the filter element 2.

The replaceable and reusable firing pin holding means 7 comprises a plurality of electronic solenoid 21 (please see figure 4) such that to release the firing pin 6 upon receiving signals about (i) required pressure failure in the cabin, (ii) switching on of an audio and visual display device and (iii) physical contact of an electronic tactile sensor 22 provided with an oxygen mask 17 as shown in figure 7. A locking pin 23 is provided with the reusable holding means 7 to facilitate installation of the holding means 7. The locking pin has to be removed once the holding means 7 are installed and to make the holding means workable so as to

release the firing pin. In one embodiment, the replaceable and reusable firing pin holding means 7 is made of a thermal insulating material, for example, ceramic fiber material such that to protect all electronic components from the heat generated during generation of the chemical oxygen.

- 5 The chemical oxygen outlet control means 15, as shown in figure 5 A and 5B, comprises a multifunctional solenoid 22 such that to OPEN the supply of chemical oxygen to the oxygen supply mask upon receiving signals about cabin pressurization failure, cabin decompression at a higher altitude, 12000 ft mean sea level (MSL) during the flight. The multifunctional solenoid 22 is adapted to
- 10 CLOSE supply of oxygen when cabin pressurization is restored, when aircraft cruise or descent 10000 ft. MSL and below and / or upon receiving signals from enhanced ground proximity warning system (EGPWS) or ground proximity warning system (GPWS) at any altitude.

- The chemical oxygen supply means 16, as shown in figure 6, comprises a
- 15 unidirectional flow valve 25 secured with a chamber 26 such that to allow flow of chemical oxygen in one direction only, that is, to the passenger through oxygen supply outlets 27. The oxygen supply 27 are provided with respective solenoids (not shown) to OPEN supply of oxygen upon getting signals about the physical contact of tactile sensors 28 (Please see figure 7) provided with each individual
- 20 oxygen masks 17 and to close the supply of oxygen as soon as the tactile sensor 28 is not in physical contact with the passenger. The unidirectional flow valve 25 is provided to prevent unwanted material to be injected, by the miscreants, into the chemical oxygen supply means 16 to make the chemical

oxygen gas hazardous for the use by the passenger. Also, the unidirectional flow valve 27 prevents tampering of the chemical oxygen generator by a miscreant to get unwanted oxygen which may be used by the miscreants to do a mischief, for example, fire. The chemical oxygen supply means 16 can be reused in the
5 chemical oxygen generator.

The oxygen supply mask 17, as shown on figure 7, comprises an electronic tactile sensor 28 provided at the outer periphery of the mask such that when the mask is donned the tactile sensor comes in physical contact t with the face of the user and thus generates electronic signals about such contact. A cable 29 is
10 provided with the mask 17 such that to activate the audio and visual system / device upon pulling the cable.

In one embodiment, means comprising a switch is provided to deploy the oxygen supply mask in case of malfunctioning of the automatic mask deployment.

Referring to figure 2, the chemical oxygen generator according to other
15 embodiment is shown. The chemical oxygen generator is the same in construction as described herein except that the insulating cylinder 5 is not provided within the container 1.

Referring to figure 3, the chemical oxygen generator according to another embodiment is shown. The chemical oxygen generator is the same in
20 construction but has the filter element 2 in the shape of a pouch 2A. The filter element pouch 2a is integrated with the insulated cylinder 5a.

When the pressure inside the air craft drops or there is a need of oxygen inside cabin of the air craft a signal is sent to the safety device to release the firing pin so as to ignite the chemical candle provided inside the container and the oxygen supply mask drop down automatically. The user takes the mask towards his

5 mouth and due to the tension in the connecting pipe of the mask a signal is again sent electronically through the safety device to release the firing pin. Also, a signal is sent that audio-visual device is on and is showing that the oxygen is going to be generated. Upon receiving the above signal the firing pin is released and the igniter is thus ignited so as to decompose the chemical candle and the

10 oxygen generation is started. The oxygen so generated is then supplied to only those passengers who are using the oxygen mask to inhale the oxygen. Though, the oxygen mask is down but the supply of the oxygen is not started until the tactile sensor is not touched with the mouth of the user / passenger. As discussed herein above and to achieve the object of supplying oxygen as and

15 when need various electronic solenoid valves are provided with the safety device to provide various signals to start generation of the oxygen. Also, electronic solenoid valves are provided with the safety device to sense in advance about the collision air craft or altitude of the air craft in order to open and close the supply of the oxygen into the cabin of the air craft as and when required, for

20 example, the supply of the oxygen is stopped when the air craft is about the collide or when the air craft is at the altitude where natural oxygen supply is available. Similarly, when the air craft is at high altitude and the supply of oxygen is needed to maintain pressurization inside the cabin of the air craft the oxygen

generation is automatically started and is supplied into the cabin for its use by the passengers.

Although the foregoing description of the present invention has been described with reference to particular embodiments and applications thereof, it has been
5 presented for purposes of illustration and is not intended to be exhaustive or to limit the invention to the particular embodiments and applications disclosed herein. It will be apparent to those having ordinary skill in the art that a number of changes, modifications, variations, or alterations to the invention as described herein may be made, none of which depart from the spirit or scope of the present
10 invention. The particular embodiments and applications were chosen and described to provide the best illustration of the principles of the invention and its practical application to thereby enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated. All such changes, modifications, variations, and
15 alterations should therefore be seen as being within the scope of the present invention as determined by the appended claims when interpreted in accordance with the breadth to which they are fairly, legally, and equitably entitled.

I CLAIM:

1. Chemical oxygen generator comprising a container to accommodate a filter and a chemical candle therein and adapted to be disposed into an insulated casing, a reusable firing pin holding means being provided at one end of the container to hold the firing pin and release it upon getting signals about (i) required pressure failure in the cabin, (ii) switching on of an audio and visual warning display device and (iii) physical contact of an electronic tactile sensor with passenger so as to ignite a percussion cap provided with a solid disc to fire the chemical candle and to generate oxygen upon decomposition of the chemical candle, an insulating disc pad being provided between reusable holding means and solid disc to accommodate the firing pin and to protect reusable holding means from excessive heat regenerated during decomposition of the chemical candle, another solid disc having a chemical oxygen supply control device being provided at the other end of the container such that to OPEN and CLOSE supply of the chemical oxygen, a chemical oxygen supply means adapted to be secured with chemical oxygen supply control device being provided to supply oxygen as and when required by the user, sealing means being provided around the periphery of discs to facilitate securing of the discs with the container in an air tight manner.
2. The chemical oxygen generator as claimed in claim 1 wherein a cylindrical container made of a bad conducting material is provided inside the metallic container.

3. The chemical oxygen generator as claimed in claim 2 wherein the bad conducting material comprises ceramic material, glass wool pad, mica sheet, silica pad and / or asbestos pad etc.
4. The chemical oxygen generator as claimed in claim 1 wherein the insulated casing is made of composite material or metal.
5. The chemical oxygen generator as claimed in claim 1 wherein the filter element comprises wire mesh having a layer of porous material provided on either sides thereof.
6. The chemical oxygen generator as claimed in claim 5 wherein the porous material comprises ceramic fiber porous material, glass fiber porous material, ceramic porous material.
7. The chemical oxygen generator as claimed in claim 1 wherein the filter element comprises a pouch such that to accommodate the chemical candle therein.
8. The chemical oxygen generator as claimed in claim 1 wherein the chemical candle is kept in position by means of a holding pin secured with a perforated disc provided at the other end of the container.
9. The chemical oxygen generator as claimed in claim 8 wherein a filter is provided on either sides of the perforated disc.
10. The chemical oxygen generator as claimed in claim 1 wherein the firing pin holding means comprises a plurality of electronic solenoids such that to release the firing pin upon receiving electronic signals.
11. The chemical oxygen generator as claimed in claim 1 wherein chemical oxygen supply control device comprises a multifunctional solenoid such

that to OPEN supply of oxygen upon receiving signals about cabin pressurization failure, cabin decompression at a higher altitude.

12. The chemical oxygen generator as claimed in claim 11 wherein chemical oxygen supply control device comprises a multifunctional solenoid such that to CLOSE supply of oxygen when cabin pressurization is restored, when aircraft cruise or descent 10000 ft. MSL and below.

13. The chemical oxygen generator as claimed in claim 12 wherein chemical oxygen supply control device comprises a multifunctional solenoid such that to CLOSE supply of oxygen upon receiving signals from enhanced ground proximity warning system (EGPWS) or ground proximity warning system (GPWS) at any altitude.

14. The chemical oxygen generator as claimed in claim 1 wherein the chemical oxygen supply means comprises an unidirectional oxygen flow valve secured with a chamber such that to prevent unwanted material to be injected, by the miscreants, into the chemical oxygen supply means, plurality of oxygen supply outlets with respective electronic solenoid being provided with the chamber such that to supply oxygen upon receiving signals about physical contact of the tactile sensor with the user.

15. The chemical oxygen generator as claimed in claim 13 wherein the chemical oxygen supply means provided with an electronic solenoid valve to stop the flow of oxygen upon receiving the signal about the tactile sensor not in use.

16. The chemical oxygen generator as claimed in claim 1 wherein the sealing means are made of ceramic fiber rope, glass fiber rope or asbestos rope.

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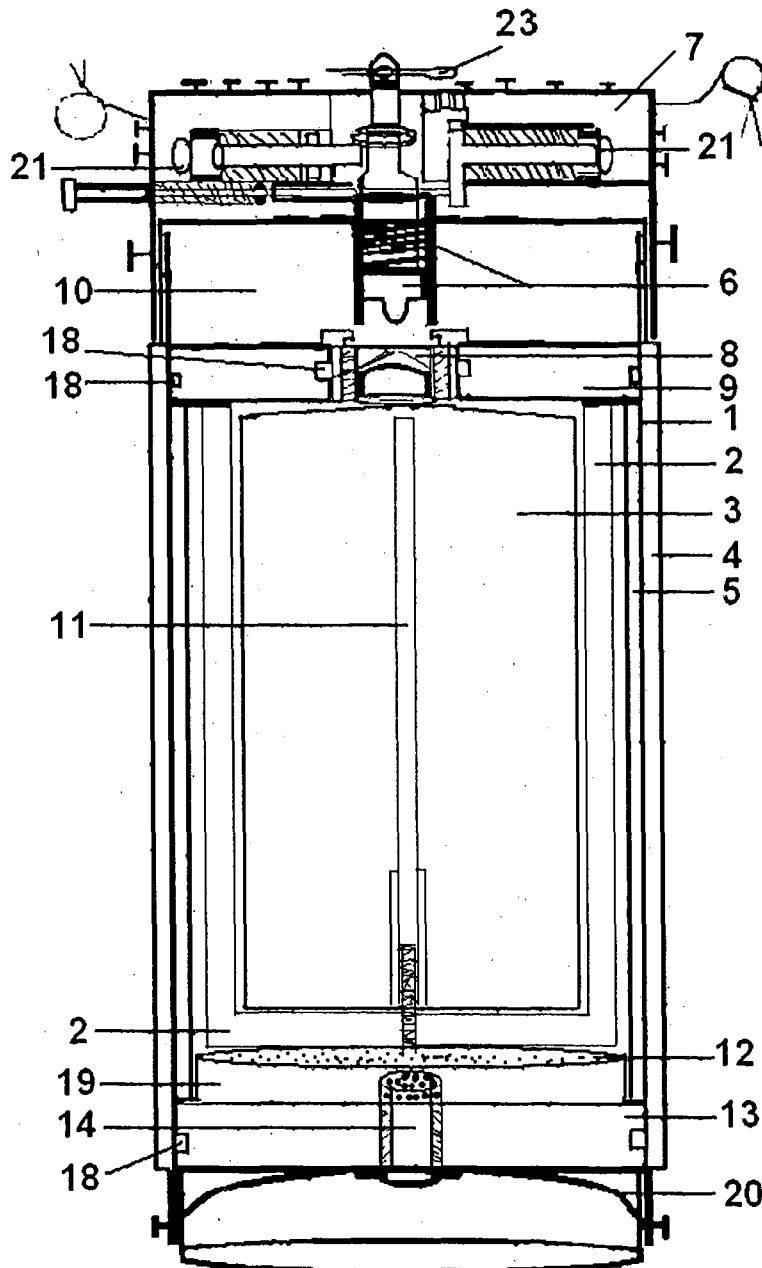


Fig.- 1

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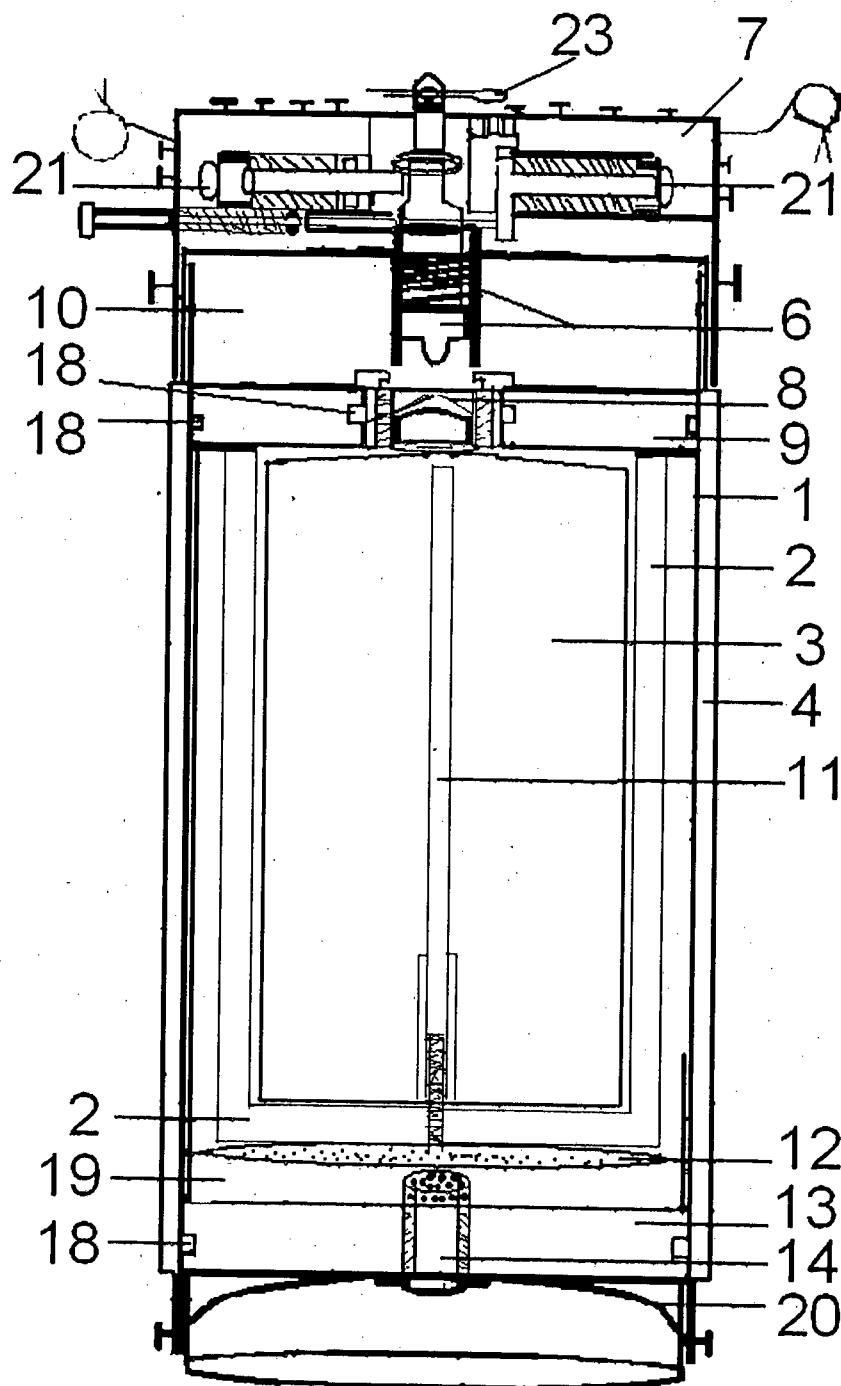


Fig.- 2

1/3

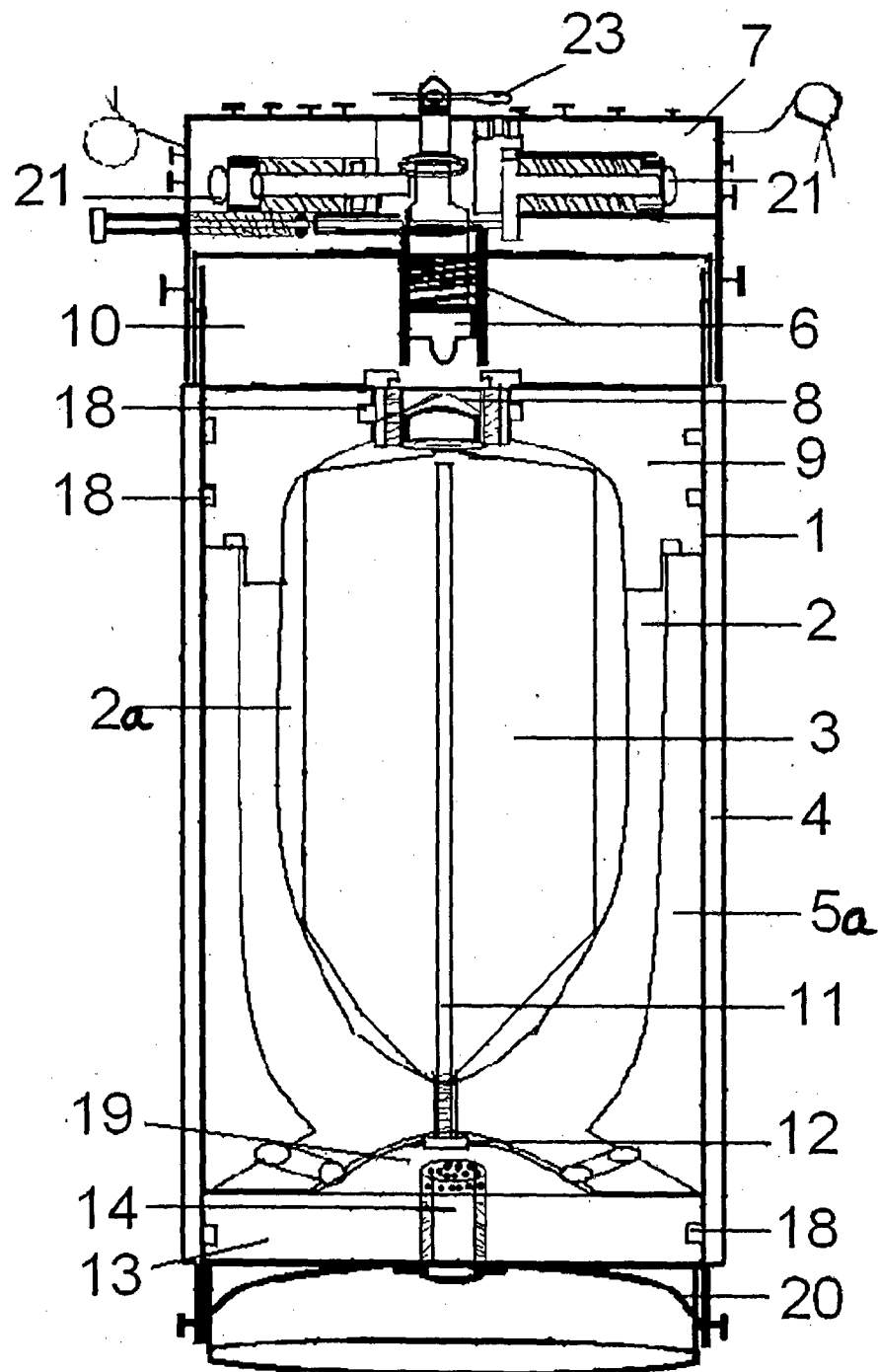


Fig.-3

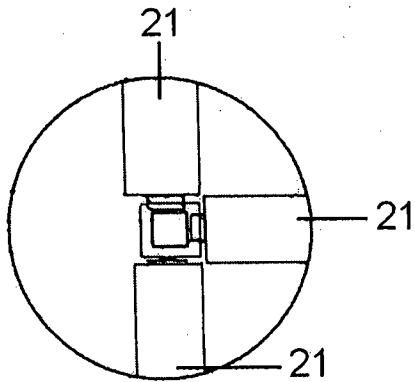


Fig. - 4

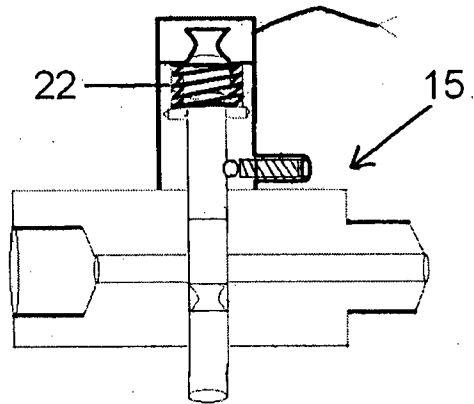


Fig. - 5A

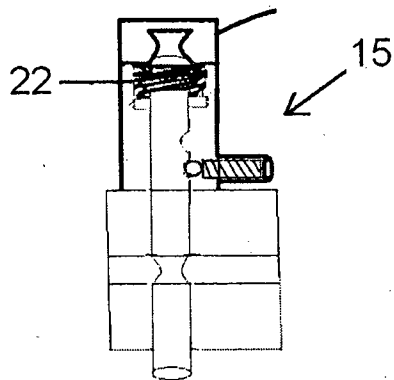


Fig. - 5B

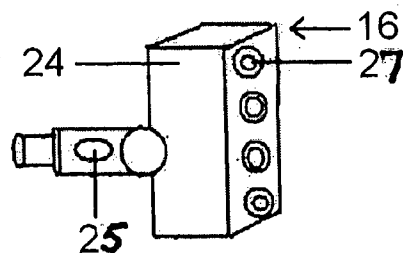


Fig. - 6

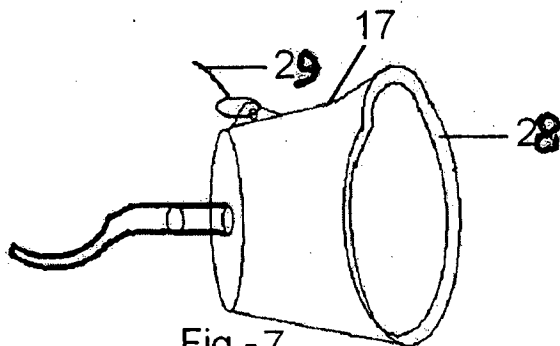


Fig. - 7

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IN2012/000628

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC: B01J7/-, A62B7/-

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)

WPI,EPODOC,CNPAT,CNKI: oxygen, generator, filter, candle, chemical, solid, disc

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	CN2236331Y (PENG Zexiang) 02 Oct. 1996 (02.10.1996) Claim 1, Figure 1	1-16
A	US4536370A (DRAEGERWERK AG.) 20 Aug. 1985 (20.08.1985) Column 3 Lines 25-66, Figure 1	1-16

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

☒ See patent family annex.

* Special categories of cited documents:	“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
“A” document defining the general state of the art which is not considered to be of particular relevance	“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
“E” earlier application or patent but published on or after the international filing date	“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
“L” document which may throw doubts on priority claim (S) or which is cited to establish the publication date of another citation or other special reason (as specified)	“&” document member of the same patent family
“O” document referring to an oral disclosure, use, exhibition or other means	
“P” document published prior to the international filing date but later than the priority date claimed	

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Date of mailing of the international search report
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Name and mailing address of the ISA/CN
The State Intellectual Property Office, the P.R.China
6 Xitucheng Rd., Jimen Bridge, Haidian District, Beijing, China
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Authorized officer
REN, Weihua
Telephone No. (86-10)82246917

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/IN2012/000628

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
CN2236331Y	02.10.1996	None	
US4536370A	20.08.1985	GB2117251A	12.10.1983
		DE3210959A	13.10.1983
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		JP2054281B	21.11.1990
		GB2117251B	12.03.1986

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IN2012/000628

Continuation of:

CLASSIFICATION OF SUBJECT MATTER

B01J7/00 (2006.01)i

A62B7/08 (2006.01)i