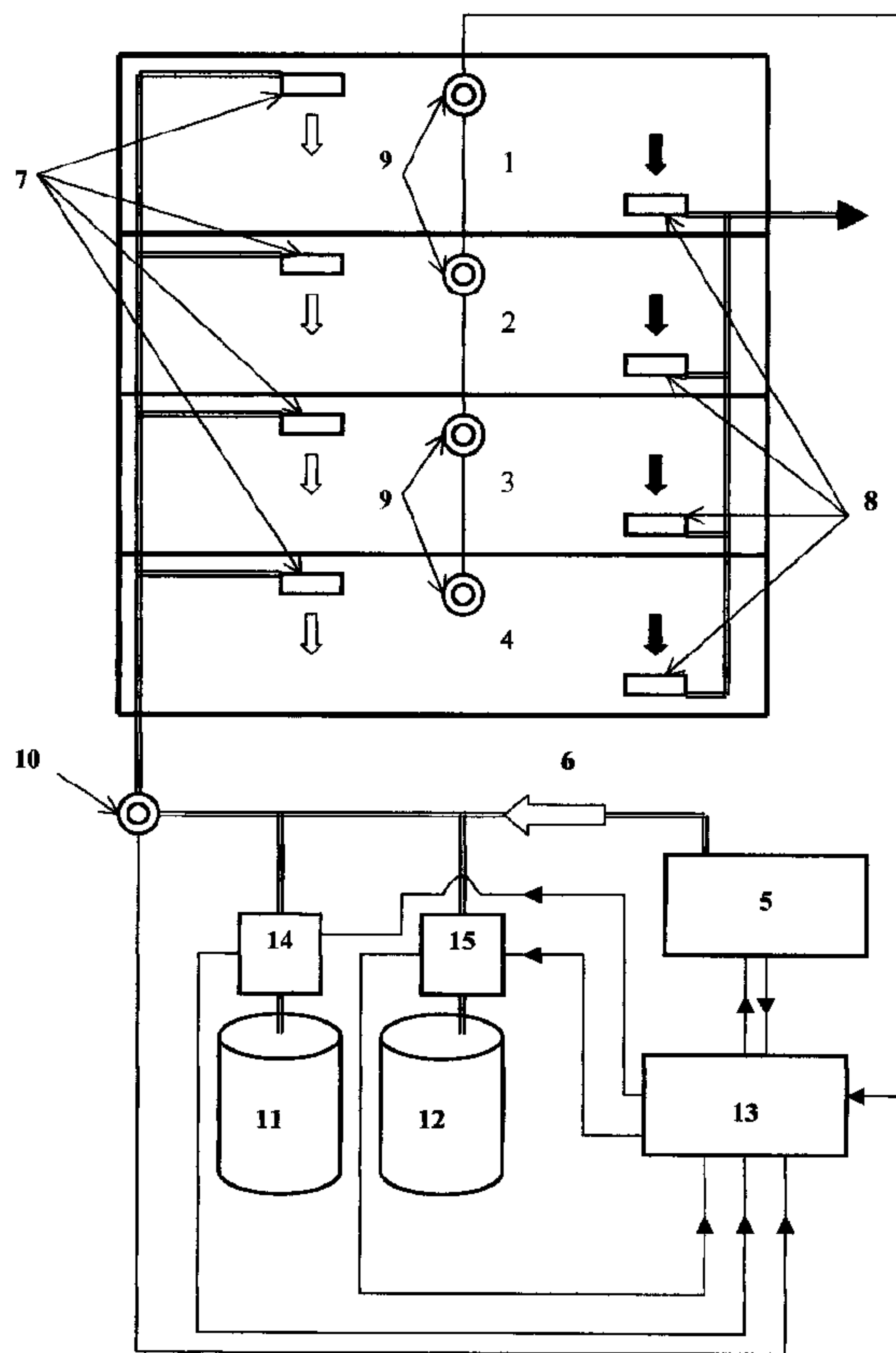




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(54) Titre : METHODE DE CONTROLE DE CONCENTRATION DE L'AZOTE ET DE L'OXYGENE PURIFIES D'UN MILIEU D'AIR CONDITIONNE
 (54) Title: A METHOD OF CONTROLLING THE CONCENTRATION OF PURIFIED NITROGEN AND OXYGEN IN AIR CONDITIONED SPACE



(57) Abrégé/Abstract:

A bed and enclosure for the same that comprises a frame to support a mattress, legs, headboard, footboard, connecting elements and one or more reflectors, wherein a location of a mattress is selected based on a shape of a reflector and direction of incoming radiations.

Abstract

A bed and enclosure for the same that comprises a frame to support a mattress, legs, headboard, footboard, connecting elements and one or more reflectors, wherein a location of a mattress is selected based on a shape of a reflector and direction of incoming radiations.

A METHOD OF CONTROLLING THE CONCENTRATION OF PURIFIED NITROGEN AND OXYGEN IN AIR CONDITIONED SPACE

This invention is related to the air conditioning and can be used in residential or commercial buildings having air conditioned spaces.

Various air conditioning systems have been widely used to regulate the temperature and create comfortable conditions inside homes and buildings. However, air conditioning systems have caused so called "Sick Building Syndrome" which has resulted due to the accumulation of harmful impurities in indoor air. The symptoms attributed to this syndrome include headache, nausea, and shortness of breath, sinus congestion, and eye-nose-throat irritation.

Filters and dehumidifiers have been used to remove airborne dust particles and moisture in order to clean the air in individual systems, refer the USA Patent 5,749,359 and stationary systems, refer to the USA Patents 5,502,975 and 6,589,323. However, the cleaning of indoor air does not result in the same quality, as it would be by replacing it with the outdoor one. The refreshment of indoor air can be done by employing the ventilation system to bring outdoor air inside. However, this method can further deteriorate the quality of indoor air in the case of heavy smog. Doctors often advise people with heart and breathing problems, who live in large cities, that are affected by smog, such as Toronto and Hamilton in Canada, New York and Buffalo in the USA, Mexico City, Delhi in India and Rome in Italy to stay indoors during hot summer days.

To prevent the contamination of indoor air with polluted outdoor one, the latter one is used mostly for the heat exchange, as per inventions described by the Canadian Patents 2321243 and 1248807. An atmosphere control apparatus, as per Canadian Patent 1281795, employs two separate chambers with a large storage capacity. Cool and warm air, supplied by an air conditioner, is stored in the first and second chambers respectively. In order to create the required temperature, cool or warm air is selectively blown outward into the compartment. This method has limited applications and also does not have provision to refresh indoor air because the air conditioner produces warm and cold air for these compartments.

A significant health improvement was obtained through the enrichment of air with purified oxygen, which is delivered through the hoses and masks to the head – facial area of hospital patients or other recipients; refer to the USA Patents 4,991,616 and 4,681,099. The USA Patent 5,460,175 describes the distribution method of the mixture of air with up to 95% oxygen to the aircraft crewmembers. The most advanced air-oxygen breathing mixtures and method of their optimization and delivery are described in the USA Patent 6,131,569 and PCT/DE97/00324. The above-mentioned invention is based on the regulation of oxygen content in the air depending on the recipient's measured physical condition and performance. However, most of these methods and systems were created to deliver the oxygen - air respiratory mixtures through the head – facial area, directly to the face or mouth of the recipients. They can't be used for the air refreshment inside the buildings and homes and to deliver fresh or enriched with oxygen air simultaneously to all the recipients, such as employees or family members.

The invention per the USA patent 6,726,558 provides systems and methods of supplying oxygen-enriched air to an enclosed space or compartment. The systems and methods may distill

oxygen from ambient air by a molecular sieve pressure cycle mechanism, such as pressure swing absorption, may generate oxygen from water using electricity or may use oxygen enriched air produced by membrane filtration. The invention helps people improve their wellness, productivity and comfort, improve performance of mental and / or physical tasks, increase their alertness, quality of life and pleasure, reduce their drowsiness, and aid in curing and preventing disease by increasing the percentage of oxygen in the enclosed space to a beneficial and safe level. However, this method does not fully refresh the indoor air. Air is a mixture of 21% oxygen (O₂) and 78% nitrogen (N₂). Only oxygen is consumed during breathing by individuals. However, the nitrogen content in the air is 3.7 times greater than oxygen. Therefore, nitrogen accumulates 3.7 times more airborne contaminants in indoor air.

We have found that most disadvantages of all known methods and air conditioning systems may be overcome by injecting of a mixture of purified nitrogen and oxygen into a stream of supplied air flowing in an air passage distributing conditioned air from an air conditioning unit to the spaces, wherein the mixture being regulated in the range from 2% to 100% by volume of the supply air flow in response to a signal sent by a control board.

In other embodiment of the proposed method the concentration of purified nitrogen in the injected purified oxygen-nitrogen mixture is regulated from 1% to 100% based on the required needs.

An air conditioning system to carry out the invented method includes an air conditioner, a conditioned air supply duct, a purified oxygen storage unit connected to the air supply duct through an oxygen regulating valve, a purified nitrogen storage unit connected to the air supply duct via a nitrogen regulating valve, an oxygen analyzer being connected to a control board which regulates the valves thereby can vary the flow of purified nitrogen and oxygen into the supply duct.

The following Figure illustrates an example of the air conditioning system for the building with four floors.

In the Figure, that illustrates the air conditioning system, each floor is marked (1) through (4); and the air conditioner (5) is connected to each floor by the air supply duct (6). Each floor is equipped with the air inlet (7) for the fresh air. Also each floor, as well as individual compartments on the floor, can be equipped with the exhaust ventilation (8) that is placed in the area that generates most significant amount of contaminants such as kitchen in the house, printing area in the office or welding or painting area in the production shop. The air supply duct (6) is connected to the compressed or liquid oxygen (11) and nitrogen (12) storage units through the regulating valves (14) and (15) respectively. The injection of liquid nitrogen and oxygen would reduce also the consumption of electric energy by the air conditioning system as they have low temperature. The oxygen analyzer (10) is placed in the main air supply duct (6) and is electronically connected to the control board (13). The control board (13) is connected electronically to the regulating valves (14) and (15), air conditioner (5), oxygen analyzers (9) and (10).

The purified oxygen and nitrogen in the ratio 1:3.7 are injected into the air supply duct (6) in the range from 2% to 100% by volume of the supply air flow to maintain the normal concentration of oxygen (21%) and nitrogen (78%) in the indoor air. As a result, the injection of purified nitrogen in combination with oxygen is 3.7 times more effective to obtain refreshing effect than the injection of just oxygen because the purified oxygen and nitrogen dilute contaminants inside the building and purge them away through the exhaust ventilation (8) and natural imperfections such as leakage through windows and doors. Purified mixture of oxygen and nitrogen create the effect of fresh outdoor air inside the building and eliminate the root cause of the "Sick Building Syndrome".

The proportional changing of injected oxygen and nitrogen, or only one of these gases can be used to regulate the nitrogen and oxygen contents in the air. The concentration of oxygen is controlled by the oxygen analyzer (10) and is regulated automatically by the control board (13) through valves (14) and (15).

The proposed air conditioning system can be used to regulate the concentration of nitrogen in air by injecting of the purified oxygen-nitrogen mixture with the content of nitrogen from 1% to 100% into the air supply duct. The elevated content of nitrogen can be used for training purpose to adapt people to a lack of oxygen, different medical reasons, research, and other required needs including preventing of spreading of fire. The low content of nitrogen and elevated content of oxygen can be used to increase the energy level of people by the end of business day or in hospitals in case of medical needs.

Any amount of purified oxygen and nitrogen will improve the quality of the indoor air. However, the most economical amount is 2 - 25%.

For example, if the recommended productivity of the air-conditioning system is 15 to 20 cubic feet per minute (cfm.) per person, oxygen or oxygen-nitrogen mixture should be 0.3 to 5 cfm per person.

Claims

The invented method and its embodiments in which an exclusive property or privilege is claimed are defined as follows:

1. A method of controlling the concentration of oxygen and nitrogen in residential or commercial buildings having air conditioned spaces comprising the step of injecting a mixture of purified nitrogen and oxygen into a stream of supplied air flowing in an air passage distributing conditioned air from an air conditioning unit to the spaces, the mixture being regulated in the range from 2% to 100% by volume of the supply air flow in response to a signal sent by a control board.
2. A method of controlling the concentration of oxygen and nitrogen in residential or commercial buildings as claimed in claim 1, wherein the concentration of purified nitrogen in the injected purified oxygen-nitrogen mixture is regulated from 1% to 100% based on the required needs.
3. An air conditioning system that includes an air conditioner, a conditioned air supply duct, a purified oxygen storage unit connected to the air supply duct through an oxygen regulating valve, a purified nitrogen storage unit connected to the air supply duct via a nitrogen regulating valve, an oxygen analyzer being connected to a control board which regulates the valves thereby can vary the flow of purified nitrogen and oxygen into the supply duct.

