

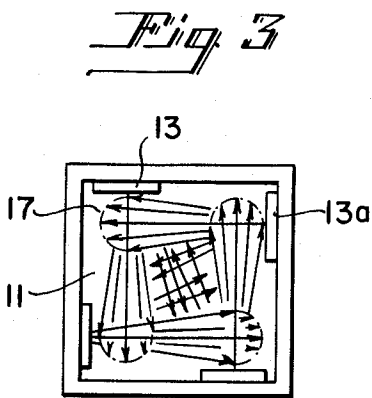
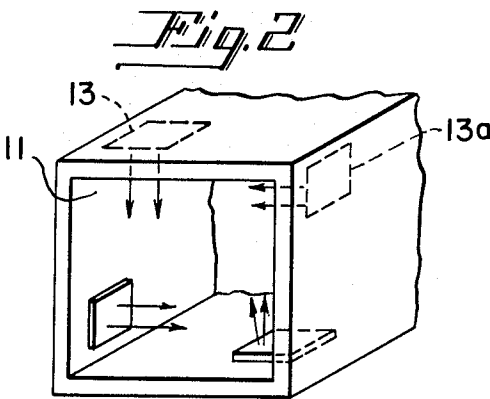
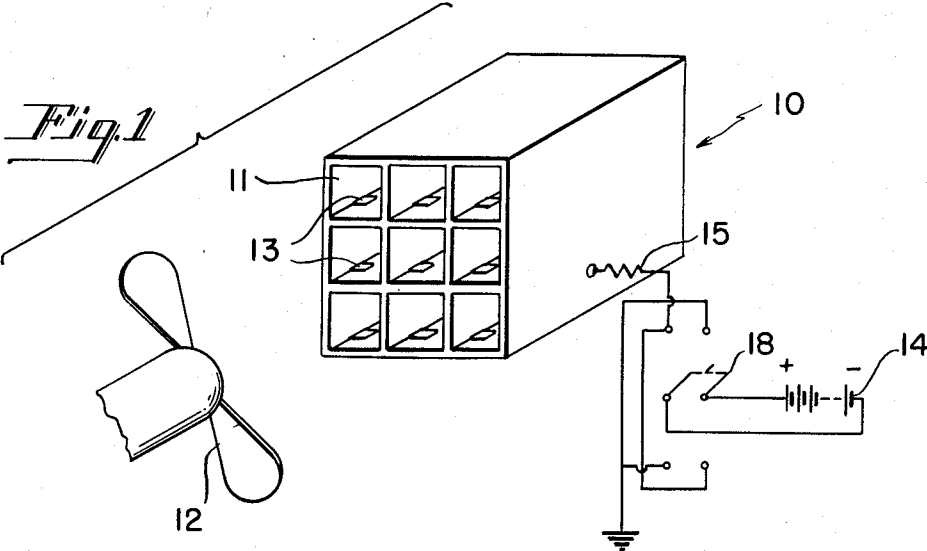
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APPARATUS FOR IONIZING AN AIR STREAM

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APPARATUS FOR IONIZING AN AIR STREAM

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5 Claims. (Cl. 250—44)

This invention relates to a method of and an apparatus for ionizing an air stream.

A primary object of this invention is to provide a method of, and a simple apparatus for, ionizing a stream of air that is to be provided for respiratory uses.

Many investigations have been made into the physiological effects of ionized air. The effects of positively charged ions and of negatively charged ions have been observed. The positive ions in the air appear to have undesirable results, whereas the presence of negative ions in the air appears to have a stimulating effect and to create a condition of general well-being in those who breathe that ionized atmosphere.

Another object of this invention therefore is to provide an apparatus for ionizing the atmosphere for therapeutic purposes.

When air is ionized, ions of both polarities are formed, that, ions of positive sign or positive polarity and ions of negative sign or negative polarity are formed. For therapeutic purposes, for which the present invention is primarily proposed, the presence of the negative ions alone is generally desired. It is therefore necessary when ionizing the atmosphere in the region that is to be conditioned, that the positively charged ions be removed from the atmosphere in order that the negatively charged ions may be fully effective. The construction and operation of the system and apparatus provided herein are such as to permit removal of ions of either charge. Normally, however, the apparatus will be operated to remove the positively charged ions from the treated atmosphere at the time that the atmosphere is ionized, so that only the negatively charged ions are free to distribute themselves in the region where the air is to be conditioned.

There are four main presently known methods of producing ionization of the air, namely, (1) by electric spark or brush discharge; (2) by ultraviolet rays; (3) by X-rays; and (4) by radium emanations.

The first three methods are not so well suited, or are not so practicable, where the ionization is desired for therapeutic purposes. The first method, by electric spark or brush discharge, also produces oxidation of the nitrogen of the air and combines that with the moisture in the air to form nitrous acid vapors (HNO_2). Those vapors are unstable, and in moist air, further oxydation takes place to form nitric acid (HNO_3). The original vapors of nitrous acid, however, produce bad effects on the lungs, causing irritation of the mucous tissues and resulting in coughing.

The second and the third methods involve and require costly apparatus and a special knowledge of handling such apparatus. Moreover, the consumption of energy by the apparatus of those two methods is considerable.

The fourth method, involving ionization of the air by radium emanations, is very practical and is the basis of the method and of the apparatus disclosed herein.

In brief, the method and the apparatus of this invention comprise means for driving a continuous stream of air through a confined passage, within which a trans-

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verse region is filled with alpha radiations from suitable radiating material. The entire section of the air stream that is forced through that region will be subjected to, and affected by, the ionizing action of the alpha radiations in that region. In the apparatus to be described herein, the sources of the alpha radiation consist of thin radioactive metal sheets or strips. Because of the manner in which the radiations from such a flat sheet source distribute themselves to establish a radiation field, the strips are arranged to establish progressively overlapping fields in order to assure a radiation field that is homogeneously effective over the entire sectional area of passage within which the radiation region is to be confined. By means of that construction, the size of the apparatus may be kept relatively small, and optimum ionizing action achieved.

The construction of the ionizing apparatus of this invention, and the manner in which it functions, may be readily understood upon reference to the accompanying drawings, in which:

Figure 1 is a schematic perspective view of the arrangement showing a fan forcing a stream of air through a chamber, shown here, by way of example, as a multi-cell ionizing structure, provided with sources of alpha radiations disposed on the inner side walls of the respective cells, and having a suitable source of polarizing potential connected thereto for polarizing the cell structure, to attract and carry away the positive ions generated in the cell during the ionizing action;

Figure 2 is a perspective view of one cell portion showing the spaced disposition and arrangement of four sheets or leaves of radio-active material on the side walls of the cell in order to establish a homogeneous ionizing field; and

Figure 3 is an end view of the cell of Fig. 2, and illustrates how the radiations from the respective sources overlap and fill the section to establish a homogeneous ionizing sectional zone in the cell.

As shown in Fig. 1, an ionizing structure 10 is shaped as a metal box with one or more passages, or cells there-through, that are open at the front and back to permit a stream of air to be driven through them by a suitable motive device, such as a fan 12 disposed to direct the stream of air into the openings of the passages 11. Near the entrance of each passage 11, a radio-active substance 13 is fixed to the surface of the wall enclosing the passage 11, to serve as a source of high alpha radiation output, and to ionize the air that is driven into and through the passage.

Upon ionization of the air stream through each passage, ions of positive sign and ions of negative sign will be formed. Since ions of only one sign are desired in the treated air stream, in this case the ions of the negative sign, it is desirable to remove the ions that carry the positive charge. For that purpose a source of high D. C. potential is provided, shown here as a battery 14, but which may be any suitable source of direct current voltage, of the order of 500 to 1000 volts. The voltage is applied to the ionizing structure 10 in such polarity direction as to make the ionizing structure of negative potential. Thus the positive ions are attracted to the wall of the ionizing structure and are neutralized and drawn off, while the negatively charged ions are repelled from the wall surfaces and permitted to pass on freely through the passages of the ionizer into the atmosphere of a room or other region where the treated ionized air is desired for therapeutic purposes.

As a safety measure, a resistor 15 of relatively large resistance value is provided in the circuit between the polarizing voltage 14 and the ionizing structure 10, to limit the current that might flow in that circuit and through the ionizing structure to ground, in case the structure should become accidentally grounded. Thus

even if someone were to accidentally touch the ionizer structure, the energy that could be released to it from the source 14 of D. C. voltage would be too small to do any harm.

The alpha radiations that leave the radiating sources 13 start with a fairly high velocity, and have a projection range that is relatively short, being of the order of about 5 centimeters or two inches for air. The ionizing action, by the radiations from that source, is relatively small on a stream of air very close to the source of radiation. The radiation in that part of the passage near the radiating source would thus ordinarily be ineffective to ionize the air passing through that part of the passage. In order that an ionizing passage may be made effective to ionize an air stream across the entire section of the passage, the flat sheet sources 13 of the alpha radiations may be disposed on each surface of the walls of the passage, as shown in Figs. 2 and 3, so the radiation fields will overlap and fill the entire cross-sectional region defined by the passage walls and the axial dimension of the radiating leaves or strips.

As indicated schematically in Fig. 3, the high speed region of the field 13-a, immediately adjacent the source leaf 13, contains very little of the effective alpha radiation from leaf 13. However, that space is filled by the low-speed radiations from leaf 17 during the relatively low speed movement of those radiations, near the ends of their paths of projection, into the region 13-a.

Thus by means of the arrangement of the radiating leaves, as in Figs. 2 and 3, the entire transverse sectional area of a passage of each cell is substantially completely filled with alpha radiations, of proper speed to make the entire cross-sectional area of each passage effective to ionize the air stream passing therethrough. Consequently, the dimensions of the ionizing structure may be reduced to a definite minimum with optimum operating conditions and maximum ionizing efficiency assured.

Although the device as described herein is primarily intended for use as a therapeutic ionizing apparatus, from which the ions of negative charge are desired, it should be obvious that by reversing the connection of the polarizing potential source 14 to the ionizing structure 10, the shell may be made positive in order to attract and neutralize the negative ions and permit the positive ions in the air stream to continue and be delivered for any desired purpose. Also by appropriate adjustment of the polariz-

ing voltage applied to the ionizing structure, a desired proportion of the ions may be established in the air stream through the ionizer, or, by removing the polarizing voltage, the air stream may be ionized to contain ions of both signs.

What is claimed is:

1. An air stream ionizer comprising a metallic shell shaped to define a passage with an inlet and an outlet, means for driving an air stream into the inlet and through said shell, a source of alpha radiation supported on the shell adjacent the inlet of the passage to ionize the air stream moving through the passage, and means external of the passage and shell for electrostatically polarizing the metallic shell to withdraw ions of undesired polarity from the ionized air stream while the stream traverses the passage in the metallic shell.

2. An ionizer as in claim 1, in which the source of alpha radiation is disposed peripherally around a sectional region of the shell passage, to establish an effective ionizing action over the entire volume of the region through which the air stream must flow.

3. An ionizer as in claim 1, in which the metallic shell is shaped with its walls disposed to define a rectangular section, and a source of alpha radiation is disposed in each inner wall surface with the radiations directed into a predetermined transverse sectional region.

4. An ionizer as in claim 1, in which an air passage is defined by a metallic tube of rectangular section with side walls having a width dimension about equal to alpha partical range, and a radiating strip source supported on the inner surface of each wall so the strips are in spaced relation around the periphery of the transverse zone defined by the radiating strips.

5. An ionizer as in claim 4, in which each radiating strip is disposed to project its slow-speed radiation field into the high-speed region of the field of the next adjacent strip.

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