July 6, 1937. E. SILTEN 2,086,140

AUTOMATIC TEMPERATURE REGULATED NARCOSIS APPARATUS

Filed Sept. 1, 1934 2 Sheets-Sheet 1

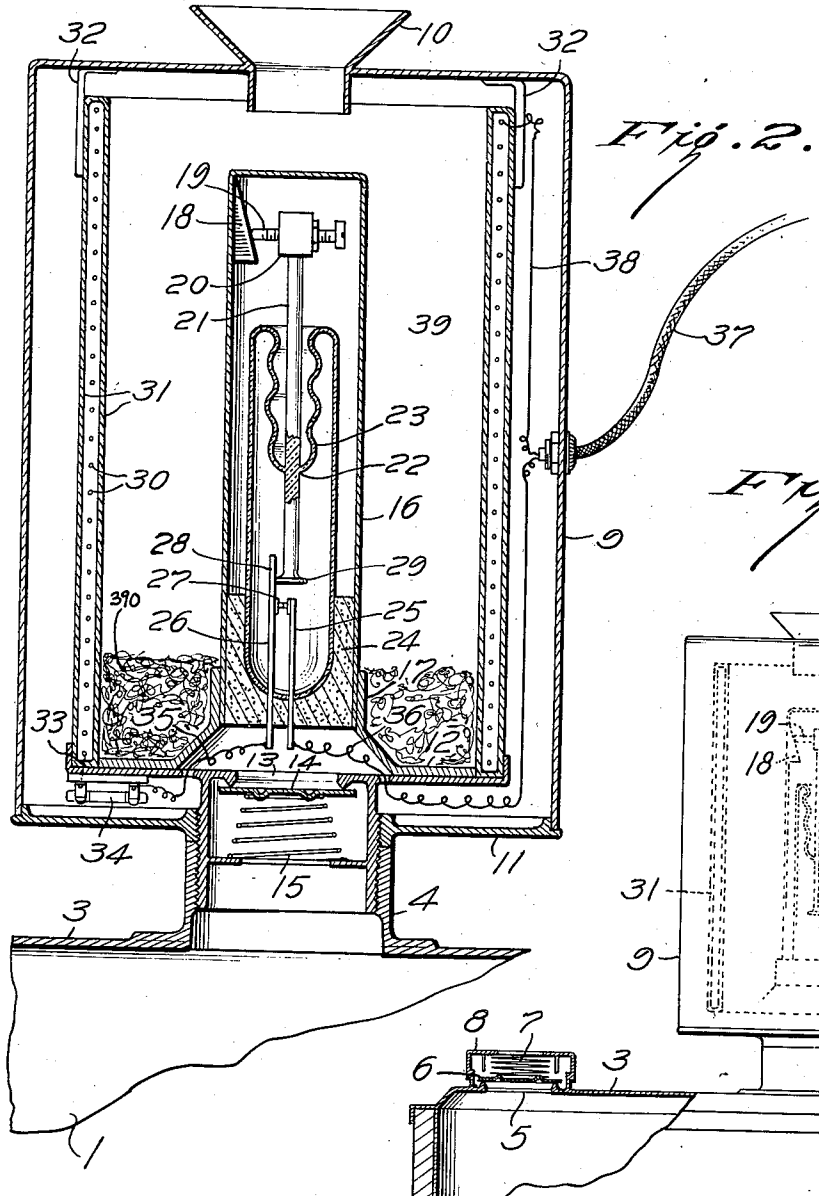


Fig. 2.

Fig. 1.

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Fig. 4.

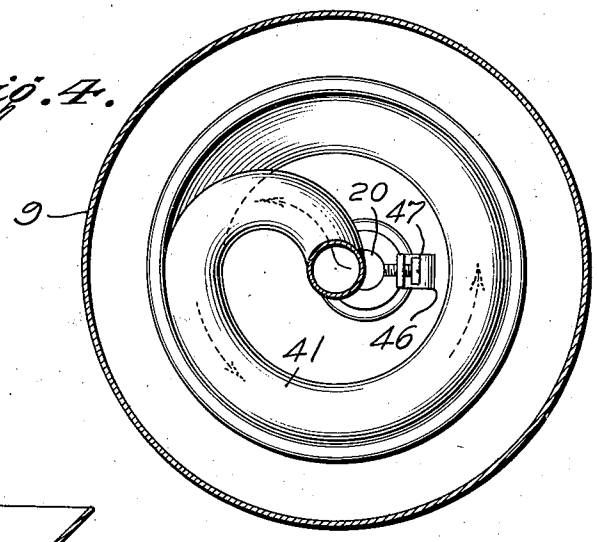


Fig. 3.

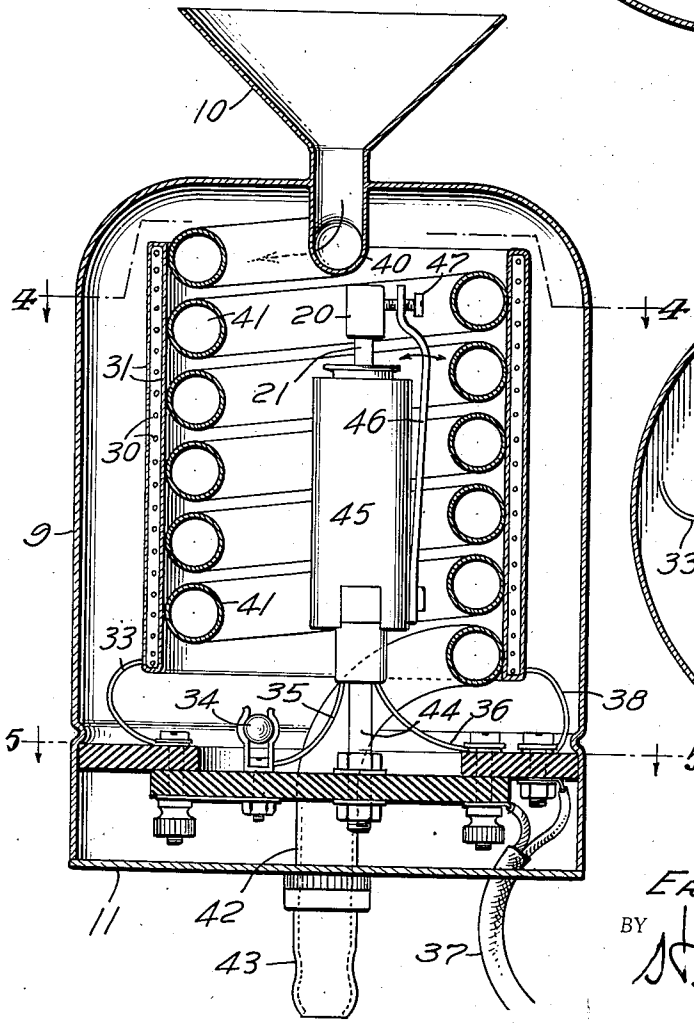
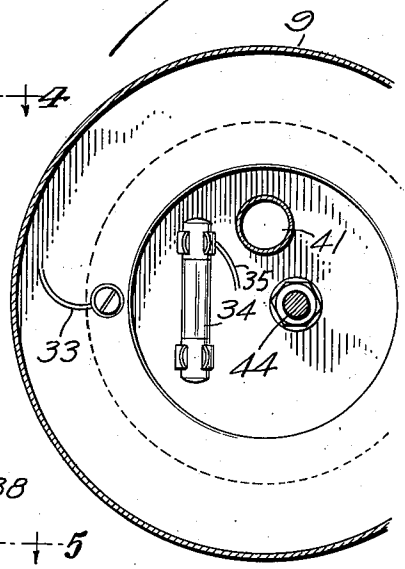


Fig. 5.



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UNITED STATES PATENT OFFICE

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AUTOMATIC TEMPERATURE REGULATED NARCOSIS APPARATUS

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Application September 1, 1934, Serial No. 742,433
In Germany September 8, 1933

18 Claims. (Cl. 128—192)

This invention relates to inhalation devices, more particularly to an apparatus for the inhalation of medicinals, anesthetics and the like, and for the treatment of diseases of the respiratory tract.

Various devices for the inhalation of preheated air or other gases and vapors have been known. Such devices include a chamber with electrical heating means. In the chamber the gases or vapors to be heated are brought to the desired temperature, or liquids, such as ether may be vaporized or gasified therein. However, such prior art devices have the difficulty that the temperature cannot be regulated, resulting in large temperature changes. This is very disadvantageous in anesthetic devices in which ether or other anesthetics are vaporized. The anesthetic is thereby supplied in greatly varying amounts, requiring varying amounts of heat for vaporization. As a result, by the application of large amounts of anesthetic, the desired temperature is not obtained, and when small amounts are applied there is the danger of overheating.

The present invention is directed to an apparatus of this type in which the temperature is self-regulated and which is adjustable to the desired point. The regulation may take place in any suitable manner, as by an expansion or a bimetallic regulator device in combination with a spark-free switch member for controlling the heating current to cut it off when the desired, adjusted temperature is reached, and to close the circuit as soon as the temperature has dropped slightly.

In the accompanying drawings, constituting a part hereof, and in which like reference characters indicate like parts,

Figure 1 is a front elevational view of an apparatus made in accordance with this invention, some parts being shown in section.

Figure 2 is an enlarged cross-sectional view of a device made in accordance with this invention.

Figure 3 is a similar view of a modified form of apparatus.

Figure 4 is a horizontal cross-sectional view taken along the line 4—4 of Figure 3, and,

Figure 5 is a similar view taken along the line 5—5 of Figure 3.

I provide a mask 1, the edge 2 of which is provided with a roll or the like, to cause the mask to conform with the contour of the face. The opposite side 3 of the mask is provided with an inlet 4 and outlet opening 5 which is provided with a valve 6, normally held in place by a spring 7, and a cover 8. Secured to the inlet opening 4 is a casing 9, provided with a funnel 10 for the introduction of suitable substances into the apparatus.

The casing 9 is held in position on the plate 11 which constitutes the bottom thereof. Within the casing is a plate 12 having an opening 13 communicating with opening 4, and provided with a valve 14 normally held in position by a spring 15. A metal tube 16, having a relatively high coefficient of expansion, is secured to a support 17 attached to the plate 12. An inclined surface or plane 18, is provided at the inner upper edge of the tube 16, making contact with the end of a screw 19, held in block 20 to which is attached a depending stem 21, usually made of glass. The stem is fused at point 22 into the sealed glass tube 23 from which the air has been exhausted and which is preferably under a vacuum. The lower end of tube 23 is held by suitable material 24 rigidly secured to the base. In the bottom of said tube are electrodes 25 and 26, having contact members 27 for closing the circuit. Electrode 26 has an extension 28 against which the head 29 of stem 21 normally rests. An electrical heating arrangement is provided and consists of a coil 30 of suitable wire or the like, held between insulating plates 31, the whole being in proximity to the casing 9. Supports 32 hold the coil 30 in proper position. The lead wire 33 from one end of the coil is attached to fuse 34 from which a wire 35 connects to electrode 26. The wire 36 attached to electrode 25 passes through cable 37 and a wire 38 attached to the opposite end of coil 30 also is inserted into the cable which is connected to a suitable source of electricity.

In the operation of the device, the mask is placed in position, the wires 36 and 38 are connected to a source of energy causing the coil 30 to become heated. A suitable substance, such as ether, is dropped into the funnel 10 and by the breathing of the patient and the heat of the coil, is vaporized and mixed with air passing through the space 39 through valve 14 and into the mask. If desired, suitable filling material 390 may be placed in passage 39 to cause more uniform mixing and more uniform heating of the gaseous mixture. When the temperature of the mixture has reached the proper point, the expansion of tube 16 causes a movement of block 20 to the right, as shown by the arrow, which causes a simultaneous movement of the head 29 in the opposite direction, moving electrode 26 away from electrode 25. This breaks the contact 27 and cuts off the current. Upon cooling, the reverse action

takes place whereby the current is again caused to flow through the coil. The temperature at which the gaseous mixture is to be maintained may be adjusted by turning the screw **19** in one direction or the other.

In the modified form, shown in Figures 3, 4, and 5, the funnel **10** has its lower end **40** connected to a coil of pipe **41**, the lower end **42** of which is secured to a rubber tube **43**, which may be secured to or in place of the opening **4** of the mask **1**. A rod **44**, the lower end of which is secured to a suitable base, is provided with a device **45** similar to the arrangement of the vacuum tube **23** containing a switching device. The temperature sensitive element in this embodiment is somewhat different and consists essentially of a bar **46** similar to the ordinary bi-metallic strips, the free end of which carries a screw **47** which is attached to the block **20**.

The operation of the device is similar to that shown in the Figures 1 and 2, with the difference that the mixture of air and ether or the like instead of travelling in the open space **39** is confined within the pipe **41**. The regulation of the temperature is obtained by the movement of the bar **46** to the right or left as shown by the arrow, thus controlling the contacts **27**.

The heated inhalation apparatus of the present invention containing temperature regulation is superior to prior devices because of its definitely greater safety and the simplicity of manipulation or handling. The temperature need not be watched and the danger of overheating is entirely eliminated. By such regulation, the temperature becomes independent of the current in the heating means, which can be made of greater capacity than heretofore. This has the considerable advantage that in the use of ether as an anesthetic, for example, the large amounts of ether in the initial stages of anesthetization may be as readily vaporized and brought to the desired temperature as the smaller amounts which are required to maintain the anesthetization in the later stages. The temperature sensitive element is connected directly to the switch avoiding the use of relays and the like.

While I have described my invention setting forth two specific embodiments thereof, it will be apparent to those skilled in the art that various changes in the construction and operation of my device may be made. For instance, the materials may be different from those described, the arrangement of the parts may be varied, the type and location of the heating element may be changed, the vacuum switch may be replaced by another type of switch to accomplish the same purpose, the flow of the gases thru the device may be changed, and the connection to the mask may be different. These and other changes in the details of my invention may be introduced within the scope thereof, the invention being defined in the claims appended hereto.

What I claim is:

1. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in said casing, an enclosed switch in the circuit of said element, and means in proximity to the path of flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing.

2. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in said casing, an enclosed switch in the circuit of said element, and means in proximity to the path of flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing and means for regulating said temperature.

3. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in said casing, an enclosed switch in the circuit of said element, and means in proximity to the path of flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing comprising a temperature sensitive device directly connected to said switch.

4. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in said casing, a switch enclosed in an evacuated chamber placed in the circuit of said element, and means in proximity to the path of flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing.

5. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in said casing, a spark-free switch, in the circuit of said element, and means in proximity to the path of flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing.

6. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in said casing, an enclosed switch in the circuit of said element, and means in proximity to the path of the flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing and an outlet for gases and vapors secured to a mask.

7. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in proximity to and within said casing, an enclosed switch in the circuit of said element and located within said element, and means in proximity to the path of the flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing.

8. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in proximity to and within said casing, an enclosed switch in the circuit of said element and located within said element, and means in proximity to the path of the flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing comprising a temperature expansible member, an inclined

plane and a contact member touching said plane and adapted to operate said switch.

9. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in proximity to and within said casing, an enclosed switch in the circuit of said element and located within said element, and means in proximity to the path of the flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing comprising a bi-metallic strip and a contact member touching said strip and adapted to operate said switch.

10. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, means for mixing said gases and substances to provide a homogeneous gaseous mixture, an electrical heating element in proximity to and within said casing, an enclosed switch in the circuit of said element and located within said element, a passage for gases between said element and said switch, and means in proximity to the path of flow of said mixture for automatically operating said switch to maintain a desired temperature in said casing.

11. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, an electrical heating element in proximity to and within said casing, an enclosed switch in the circuit of said element and located within said element, a pipe for gases between said element and said switch and means for automatically operating said switch to maintain a desired temperature in said casing.

12. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, an electrical heating element in proximity to and within said casing, an enclosed switch in the circuit of said element and located within said element, a coiled pipe for gases between said element and said switch and means for automatically operating said switch to maintain a desired temperature in said casing.

13. An inhalation apparatus comprising a casing, means for introducing gases and vaporizable substances into the same, an electrical heating element in proximity to and within said casing, an enclosed switch in the circuit of said element and located within said element, a passage for gases between said element and said switch, and means for automatically operating said switch to maintain a desired temperature in said casing, said passage having means for impeding the flow of gases.

14. An inhalation apparatus comprising a casing, means for passing a mixture of gases and vapors into the same, an electrical heating element in said casing, an enclosed switch in the circuit of said element, and means within said casing including a thermostat in the path of said mixture for automatically operating said switch to maintain a constant temperature of the gaseous mixture flowing through said casing.

15. An inhalation apparatus comprising a casing, means for passing a mixture of gases and vapors into the same, an electrical heating element in said casing and extending substantially the entire length thereof, an enclosed switch in the circuit of said element, and means within said casing including a thermostat in the path of said mixture for automatically operating said switch to maintain a constant temperature of the gaseous mixture flowing through said casing.

16. An inhalation apparatus comprising a casing, means for passing a mixture of gases and vapors into the same, an electrical heating element in said casing, an enclosed switch in the circuit of said element, a valve at the gas outlet end of said casing, and means within said casing including a thermostat in the path of said mixture for automatically operating said switch to maintain a constant temperature of the gaseous mixture flowing through said casing.

17. An inhalation apparatus comprising a casing, means for passing a mixture of gases and vapors into the same, an electrical heating element in said casing, an enclosed switch in the circuit of said element, and means substantially centrally located within said casing including a thermostat in the path of said mixture for automatically operating said switch to maintain a constant temperature of the gaseous mixture flowing through said casing.

18. An inhalation apparatus comprising a casing, means for passing a mixture of gases and vapors into the same, an electrical heating element in said casing, an enclosed switch in the circuit of said element, and means substantially centrally located within said casing including a thermostat in the path of said mixture for automatically operating said switch to maintain a constant temperature of the gaseous mixture flowing through said casing and in contact with said switch operating means.

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