

April 10, 1962

B. A. KINDRED

3,028,873

NON-REBREATHING VALVE

Filed Nov. 19, 1956

2 Sheets-Sheet 1

FIG. 1.

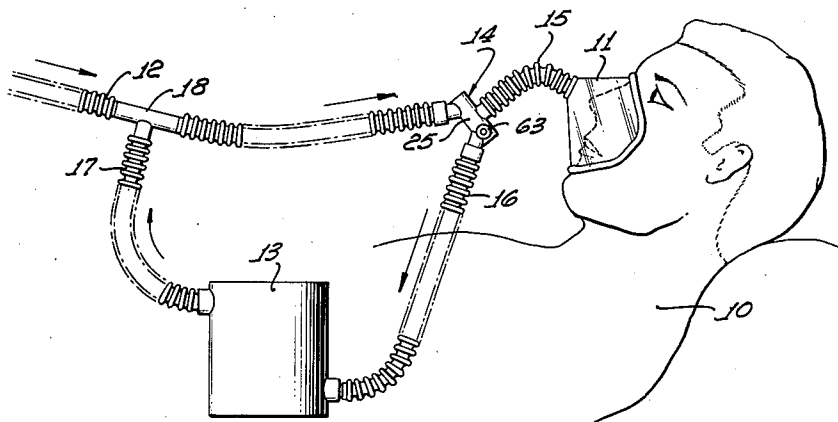


FIG. 2.

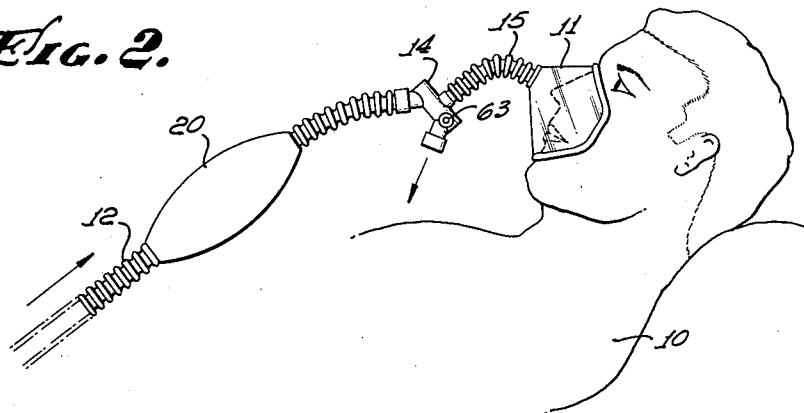
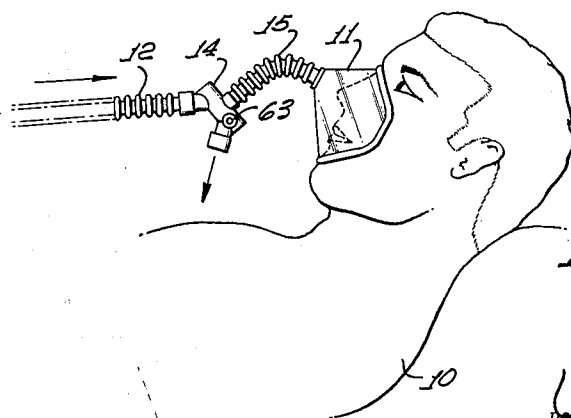


FIG. 3.



BOB A. KINDRED
INVENTOR.

HUEBNER, BEEHLER,
WORREL & HERZIG
ATTORNEYS

BY *Vernon D. Beehler*

April 10, 1962

B. A. KINDRED

3,028,873

NON-REBREATHING VALVE

Filed Nov. 19, 1956

2 Sheets-Sheet 2

FIG. 4.

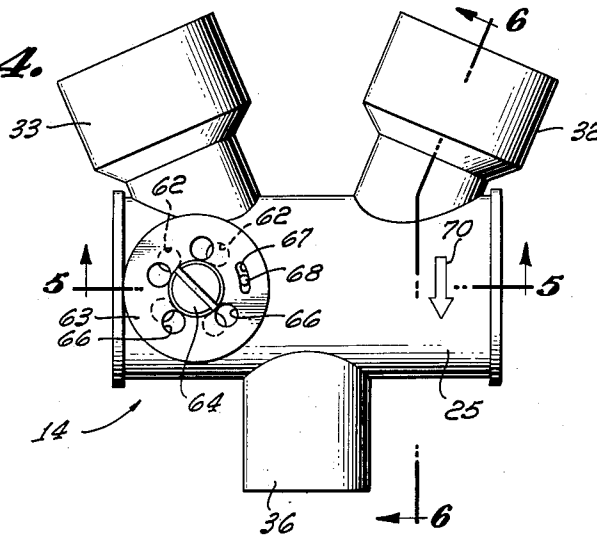


FIG. 5.

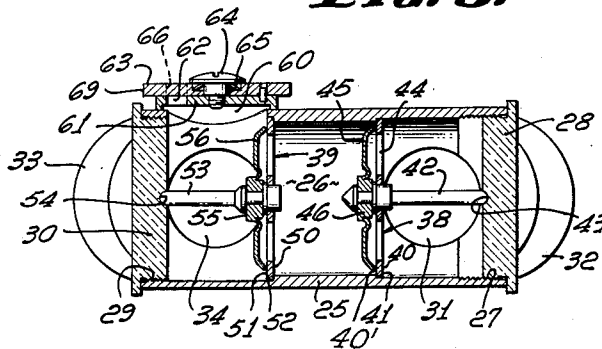
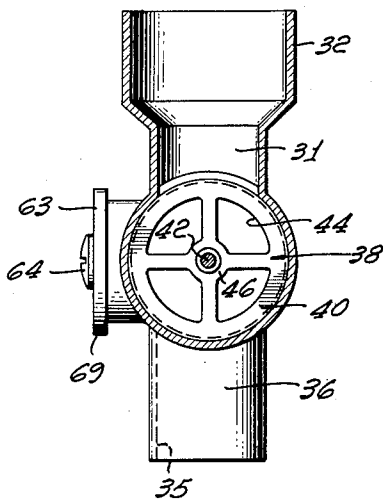


FIG. 6.



BOB A. KINDRED
INVENTOR.
HUEBNER, BEEHLER,
WORREL & HERZIG
ATTORNEYS

Vernon D. Beeher
BY

1

3,028,873

NON-REBREATHING VALVE

Bob A. Kindred, Duarte, Calif., assignor to Sierra Engineering Co., Sierra Madre, Calif., a corporation of California

Filed Nov. 19, 1956, Ser. No. 623,001
4 Claims. (Cl. 137-63)

The application relates to anesthesia equipment and has particular reference to a non-rebreathing anesthesia system and suitable valve means therefor acceptable for use with anesthesia gases of a commonly prevalent type which are apt to be combustible when mixed in certain proportions with the atmosphere.

Where a patient may require the administration of an anesthesia drug, either in an emergency situation attendant upon an operation or perhaps an accident or in the routine administration of anesthesia gases, administration of such gases is important and critical. Even though an accident may happen no more often than once in one thousand or even once in five thousand times, even that one accident need be avoided if at all possible. Requirements are such that to be sure the operator must be capable of handling the equipment with certainty under the urgency of possible serious consequences and if too much time is consumed in the selection and application of mechanical equipment, time valuable to the treatment and recovery of the patient may be lost.

Also during the progress of administration of an anesthesia gas, conditions may change which necessitate some alteration in the handling of the anesthesia gas or exhalation from the patient or a combination of the two.

It is therefore among the objects of the invention to provide a new and improved non-rebreathing anesthesia system and necessary valve equipment therefor which is simple and direct in application and manipulation and which is so arranged that the parts cannot be assembled in an inoperative manner.

Another object of the invention is to provide a new and improved non-rebreathing anesthesia system and necessary valve means therefor which is compact in structure, light in weight to improve the ease of handling, and so assembled that the valve means may be located as near as conveniently possible to the patient.

Still another object of the invention is to provide a new and improved valve group for a non-rebreathing anesthesia system so constructed that the interior of the valve device is visible to inspection from the exterior whereby the operator can be immediately satisfied as to whether or not the valve device is in operating order and which includes an auxiliary adjustment capable of modifying the quantity of partly consumed anesthesia gas which might be mixed with exhalant from the lungs, thereby to more carefully control the reintroduction into the inflow gas line of gaseous ingredients exhaled by the patient.

With these and other objects in view, the invention consists in the construction, arrangement and combination of the various parts of the device whereby the objects contemplated are attained, as hereinafter set forth, pointed out in the appended claims and illustrated in the accompanying drawings.

In the drawings:

FIGURE 1 is a side elevational view of one system for the administration of anesthesia gases to a patient.

FIGURE 2 is a side elevational view of a modified special form of system for introducing anesthesia gases to the lungs of a person.

FIGURE 3 is a side elevational view of the non-rebreathing valve introduced directly in an anesthesia gas supply line.

FIGURE 4 is a plan view of the valve device itself.

2

FIGURE 5 is a longitudinal sectional view on the line 5-5 of FIGURE 4.

FIGURE 6 is a cross-sectional view on the line 6-6 of FIGURE 4.

A typical system for the administration of anesthesia gases to a patient 10 comprises a mask 11 adapted to cover the nose and mouth of the patient, an anesthesia gas supply line 12 adapted to connect to a conventional source of anesthesia gas (not shown), and a canister 13 usually supplied with soda lime filter for eliminating carbon dioxide and moisture which might be exhaled.

A non-rebreathing valve group 15 has a central connection to a mask supply line 15. A return line 16 leads from one terminal of the valve group to the canister. A reconditioned gas line connects from the canister 13 to the gas supply line 12 at an intermediate point 18.

Under certain conditions particularly where the patient 10 may be unable to inhale effectively, it becomes advisable to assist the flow of anesthesia gas to the patient. To accomplish this the system may be so arranged that a pressure bag 20 is inserted into the gas supply line 12 so that upon manipulation by squeezing on the part of the technician, a slight pressure is created in the gas supply line to the valve group 14 and mask supply line 15, thereby to force the gas along with a slight additional pressure into the lungs of the patient.

On still other occasions where the patient may be permitted to exhale freely, the valve group 14 may be employed alone between the gas supply line 12 and the mask supply line 15 without auxiliary attachments or employment of a collector like the canister 13 of FIGURE 1.

The valve group identified generally by the reference character 14 comprises a valve body 25 having a substantially cylindrical shape and enclosing a substantially cylindrical chamber 26. The chamber 26 has a threaded end 27 closed by a transparent plug 28. At the opposite end of the chamber is a second threaded end 29 closed by a transparent plug 30. In the embodiment chosen for the purpose of illustration there are three passages communicating with the chamber. A supply passage 31 is formed in an obliquely extending projection 32. A similar projection 33 extending obliquely outwardly away from the projection 32 has a return passage 34 therein. Centrally disposed and on the opposite side of the valve body 25 is a mask supply line passage 35 contained within a central projection 36. As will be noted, the mask supply line passage communicates directly and unrestrictedly with the cylindrical chamber 26 whereas valve devices 38 and 39 respectively separate the chamber 26 from the supply passage 31 and the return passage 34.

The valve device 38 comprises a valve seat element 40 having a valve seat 40' thereon adapted to lodge upon a shoulder 41 and be confined thereon by action of a stem 42 centered by means of an aperture 43 in the plug 28. The valve seat element 40 is in the form of a disc having passages 44 therein. A resilient disc valve element 45 is mounted upon a bushing 46 which in return is anchored in the valve seat member. When the flow from passage 31 is toward the chamber 26, the valve element flexes and permits the gas to flow. Pressure in an opposite direction causes the valve element to close upon its seat.

Similarly a valve seat element 50 slightly larger in diameter than the valve seat element 40 provides a valve seat 51 and is adapted to seat upon a shoulder 52 similarly larger in diameter than the shoulder 41. The valve seat element is retained in position by a stem 53 lodged in an aperture 54 in the plug 30. A bushing 55 on the stem and in turn confined in the valve seat element mounts a resilient disc valve 56. The disc valve 56 flexes

to open upon flow from the chamber 26 toward the return passage 34.

By providing valve seat elements of different maximum outside diameter and by having corresponding shoulders of a diameter only to fit the appropriate valve seat element, it will not be possible to assemble both valve seat elements in the valve body in the wrong way for the reason that the valve seat element of larger diameter cannot be pushed into the end of the chamber of smaller diameter.

As an auxiliary control there is provided a relief passage 60 in the valve body at a location between the valve device 39 and the return passage 34. In the embodiment shown a disc 61 is fixed over the relief passage and is provided with a series of relief apertures 62. In the example four such apertures are shown. A closure disc 63 is rotatably mounted upon the disc 61 and there held by a bolt 64 which compresses a spring element 65. Holes 66 in the closure disc match the apertures 62 of the disc 61 and are the means of adjusting the relief passage to all positions between full closed and full open position. So that the maximum positions may be definitely determined, the closure disc is provided with a slot 67 within which is a pin 68, the slot being of such length that when the pin is at one end of the slot the vent passages are at full open position and when the pin is at the opposite end of the slot the vent passages are in closed position. A protruding rim 69 improves the ease with which the closure disc can be rotated. An arrow 70 is shown for convenience on the valve body to indicate the proper direction of flow from the projection 32 and supply passage 31 therein into the valve body to the chamber 26.

When the valve group 14 is employed in a system like that shown in FIGURE 2 or like that shown in FIGURE 3, the disc valve 56 will open to pass exhalation gases directly to atmosphere. When the valve group is employed in a closed system like that illustrated in FIGURE 1, exhalation gases passing the disc valve 56 of the valve device 39 will pass outwardly through the return passage 34 to the return line 16. Meanwhile, during alternate breathing cycles anesthesia gas from the supply line 12 will pass into the chamber 26 from the supply passage 31 past the disc valve element 45 and thence through the mask supply line passage to the mask 11.

Exhalation gases after passing into the canister 13 may by use of some characteristic chemical ingredient such as soda lime have carbon dioxide and moisture absorbed therefrom so that unspent anesthesia gas coming from the lungs of the patient may pass through the reconditioned gas line 17 into the supply line 12 and then be used again.

In order to regulate the amount of exhalant introduced into the canister and hence reintroduced into the supply line the closure disc 63 may be opened slightly or to full open position by rotation of the closure disc, thereby to bleed off a lesser or greater percentage of exhalant gases to the atmosphere instead of permitting part or all of such exhalant gases to find their way through the canister to the supply line. This bleeding off adjustment can be carefully manipulated during all stages of the administration of anesthesia to the patient. Moreover, by having the system such that the valve group of the design proposed can be located close to the mask, the mask supply line 15 is thereby kept as short as possible and the system in consequence more effectively controlled by use of the valve group described. The valve group in turn constructed as shown can be readily made of conducting material such as any one of a number of acceptable metallic alloys which when inserted in a gas line system is self-conductive will assure an electrically conductive system throughout.

There has accordingly been described herein a compact, simple, and direct operating valve group, operating parts of which are readily visible from the exterior

and which is so arranged that the form of the valve group itself suggests proper connections and location in the system. The parts moreover are such as to be readily removable for servicing, readily checked before and during use, and so constructed that the valve group and system as a whole can be carefully and accurately regulated at all times.

While I have herein shown and described my invention in what I have conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of my invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A respiration valve comprising a substantially cylindrical thin walled body having a substantially cylindrical central chamber therein, said body having substantially cylindrical interiorly threaded end chambers on opposite ends of the central chamber in axial alignment therewith, a removable transparent closure at the outer end of each end chamber, each closure comprising an exteriorly threaded relatively thick portion threadedly mounted within the respective chamber and an annular flange overlying the edge of the respective end chamber, each said closure having smooth outside and inside faces in parallel relationship, a laterally extending breathing passage in direct communication with said central chamber and the exterior, a gas supply passageway in direct communication with one of said end chambers and extending laterally from last end chamber to the exterior and a transverse gas exhaust passageway in direct communication with the other of said end chambers and extending laterally from said last end chamber to the exterior, a valve unit retainer at the junction of the central chamber and the end chamber which is in communication with said gas supply passage and a check valve unit on said retainer having a central fixed stem in engagement with the respective transparent closure and removable upon removal of the respective transparent closure, a second valve unit retainer at the junction of the central chamber and the end chamber which is in communication with said exhaust passageway and a removable check valve unit on said second valve unit retainer having a central fixed stem engageable with the respective transparent closure and removable upon removal of said last transparent closure, each said valve unit comprising a valve disc on the respective valve unit retainer and engageable therewith, each said disc having a valve seat thereon and a valve opening there-through, and a valve element having a central portion fixed to the disc and having a movable portion operably mounted on the seat, the valve element in the first identified valve unit being adapted to open toward said central chamber and the valve element in the second identified valve unit being adapted to open toward said exhaust passageway.

2. A non-rebreathing anesthesia valve comprising a body having a chamber therein having opposite openings, a removable transparent closure at each opening, a breathing passageway communicating between said chamber and the exterior, a gas supply passageway between the chamber and the exterior, a gas exhaust passageway between the chamber and the exterior, a first valve shoulder of one size in the chamber in communication with said gas supply passage and a check valve unit of size corresponding to the size of the first valve shoulder on said first valve shoulder removable upon removal of one said transparent closure and adapted to open toward the chamber, a second valve shoulder of another size in the chamber in communication with said exhaust passageway and a removable check valve unit of size corresponding to the size of the second valve shoulder on said second valve shoulder removable upon

5

removal of the other transparent closure and adapted to open toward said exhaust passageway, a relief port in said body in communication with the exhaust passageway on the downstream side of the check valve unit therein, and a relief port closure having a manually engageable element thereon, a stop at open position and a stop at closed position of said closure, said closure being movable to infinitely variable adjustments between full open and full closed positions.

3. A non-rebreathing anesthesia valve comprising a cylindrical body having a cylindrical chamber therein open at opposite ends, a removable transparent closure at each end of the chamber, a transverse breathing passageway communicating between an intermediate portion of said chamber and the exterior, a transverse gas supply passageway between the chamber at one end thereof and the exterior and a transverse gas exhaust passageway between the chamber at the other end thereof and the exterior, a valve shoulder of one size in the chamber in communication with said gas supply passage and a check valve unit of size corresponding to the size of said valve shoulder on said shoulder removable upon removal of one said transparent closure and adapted to open toward the chamber, a second valve shoulder of another size in the chamber in communication with said exhaust passageway and a removable check valve unit of size corresponding to the size of the second valve shoulder on said second valve shoulder removable upon removal of the other transparent closure and adapted to open toward said exhaust passageway, means forming a mounting on said body adjacent the exhaust passageway, a relief port in said mounting, a relief port closure rotatably secured on said mounting and having a manually engageable overhanging annular flange, a stop at open position and a stop at closed position of said closure, said closure being movable to infinitely variable adjustments between full open and full closed positions.

4. A non-rebreathing anesthesia valve comprising a body having a chamber therein having opposite openings, removable transparent closure means for said openings, a breathing passageway communicating between said

6

chamber and the exterior, a gas supply passageway between the chamber and the exterior, a first valve shoulder in the chamber in communication with said gas supply passage and a check valve unit on said first shoulder removable upon removal of one said transparent closure and adapted to open toward the chamber, a second valve shoulder in the chamber in communication with said exhaust passageway and a removable check valve unit on said shoulder removable upon removal of the other transparent closure and adapted to open toward said exhaust passageway, a relief port in said body in communication with the exhaust passageway on the downstream side of the check valve unit therein, and a relief port closure having a manually engageable element thereon, a stop at open position and a stop at closed position of said closure, said closure being movable to infinitely variable adjustments between full open and full closed positions, said first identified check valve unit and the respective passageway having complementary engaging elements of one category and said second identified check valve unit having complementary engaging elements of another category which do not fit the first identified engaging elements whereby said check valve units are not inter-changeable.

References Cited in the file of this patent

UNITED STATES PATENTS

46,902	Hawkins	Mar. 21, 1865
804,272	Schwarz	Nov. 14, 1905
1,625,419	McCaa	Apr. 19, 1927
2,295,774	Corydon	Sept. 15, 1942
2,388,533	Edmondson	Nov. 6, 1945
2,823,670	Page	Feb. 18, 1958

FOREIGN PATENTS

604,558	Great Britain	July 6, 1948
766,487	France	Aug. 16, 1934
661,034	Germany	Oct. 30, 1934
1,127,006	France	Aug. 6, 1956
910,738	France	Feb. 11, 1946