April 15, 1969 B. R. SUGG ET AL 3,438,372

ANAESTHETICS ADMINISTERING APPARATUS

Filed Dec. 2, 1966 Sheet 1 of 3

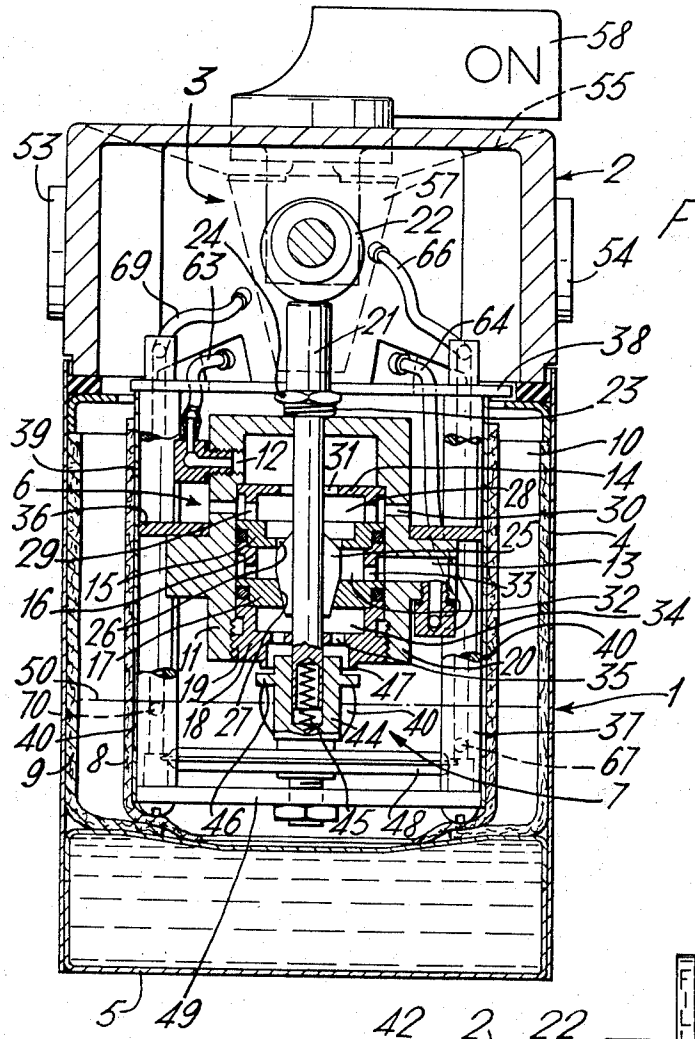


Fig. 1.

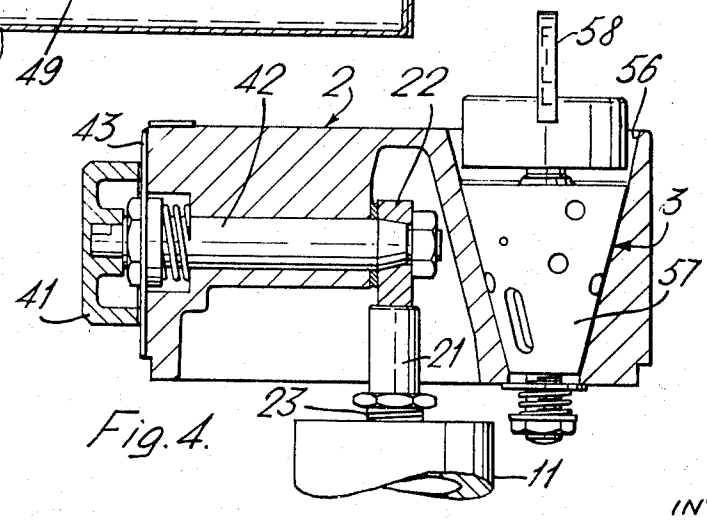


Fig. 4.

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ANAESTHETICS ADMINISTERING APPARATUS

Fig. 3.

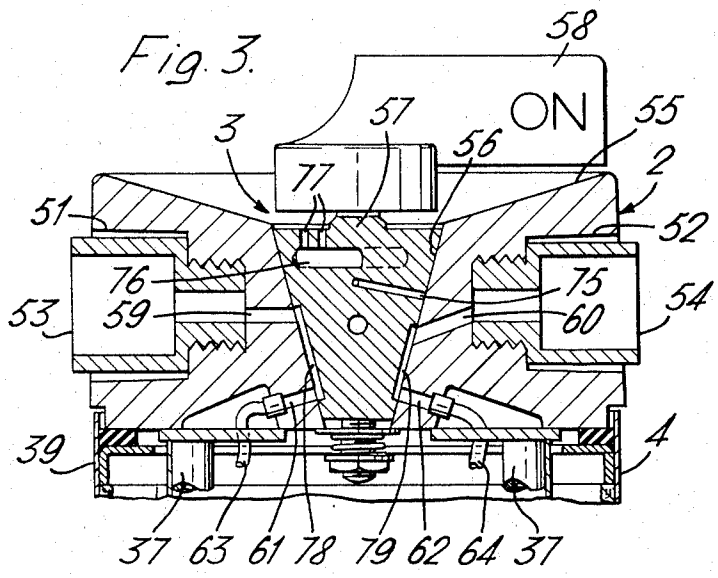
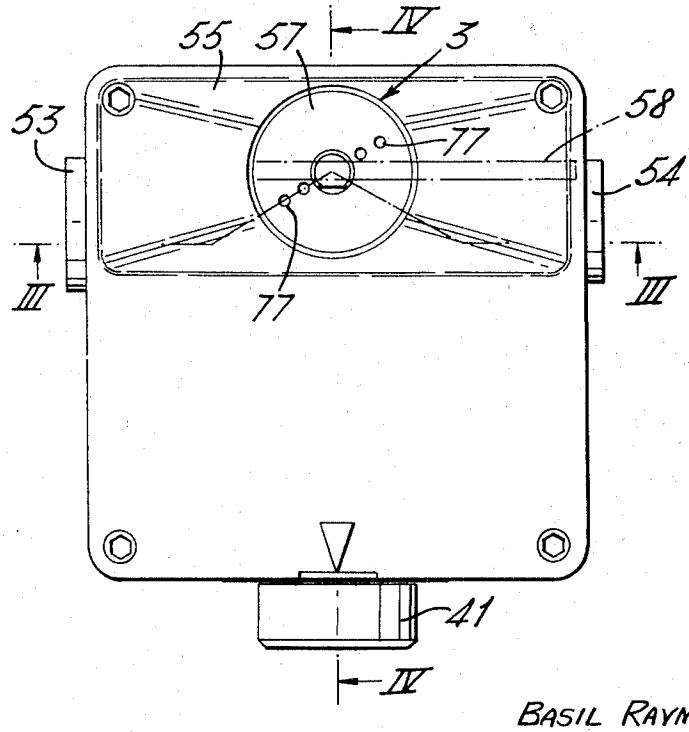


Fig. 2.



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ANAESTHETICS ADMINISTERING APPARATUS

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Fig. 5.

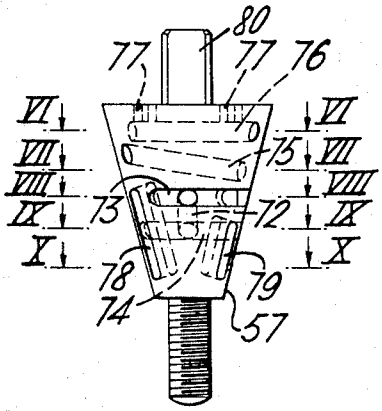


Fig. 6.

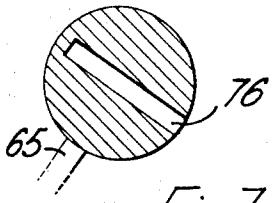


Fig. 7.

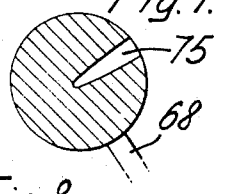


Fig. 8.

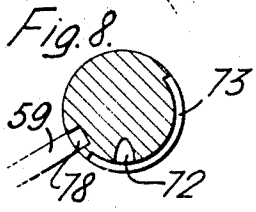


Fig. 9.

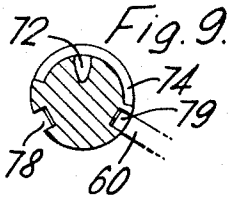


Fig. 10.

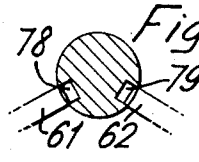


Fig. 11.

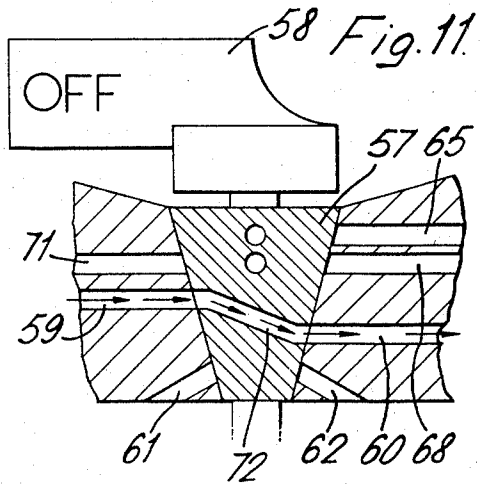


Fig. 12.

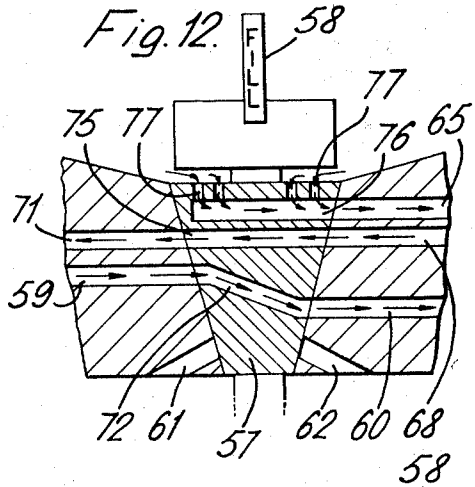
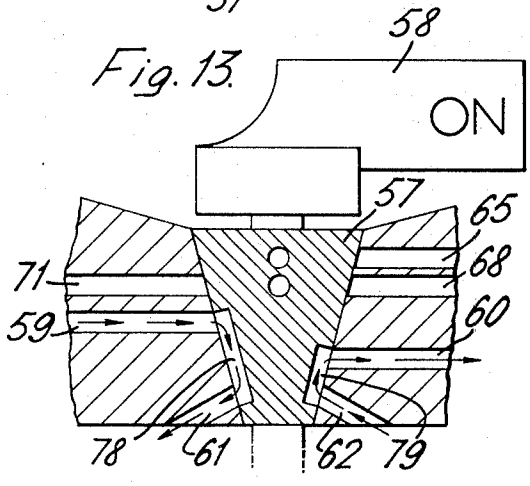


Fig. 13.



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United States Patent Office

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ANAESTHETICS ADMINISTERING APPARATUS

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Claims priority, application Great Britain, Dec. 10, 1965, 52,580/65
Int. Cl. A61m *17/00, 15/00;* B01d *47/16*
U.S. Cl. 128—188 17 Claims

ABSTRACT OF THE DISCLOSURE

An anaesthetic administering apparatus having a vapourising chamber through which a carrier gas is passed to entrain anaesthetic vapour, the flow of the carrier gas being controlled by a single valve having three positions, these being an "off" position in which the carrier gas is passed directly to the patient without passing through the vapourising chamber and in which position anaesthetic cannot be introduced into the chamber, a "fill" position in which the carrier gas is again passed directly to the patient but in which anaesthetic can be introduced into the vapourising chamber, and an "on" position in which the carrier gas passes through the vapourising chamber before reaching the patient and in which, once again, anaesthetic cannot be introduced into the chamber.

This invention relates to apparatus for administering anaesthetics, and is particularly directed to the provision of an improved control valve for such apparatus.

The kind of apparatus with which the invention is concerned is that in which a carrier gas for anaesthetic vapour is led in operation to a breathing mask for a patient via a vapourising chamber charged with liquid anaesthetic whose vapour is entrained by the carrier gas in its passage through such chamber. The carrier gas may be air or oxygen, for example, and it may either be breathed in and out by the patient under his own volition or, alternatively, supplied under elevated pressure so that no assistance from the patient is required.

When it becomes necessary to recharge the vapourising chamber with anaesthetic liquid during the operation of such apparatus, as will sometimes occur, it is important the flow of carrier gas through the chamber should be cut off during such recharging as otherwise the patient may temporarily receive an undesirably high concentration of anaesthetic; also, when the carrier gas is pressurised, it may blow part of the new charge of liquid anaesthetic out of the vapourising chamber towards the patient if its flow through such chamber is not so arrested. Furthermore, the presence of pressurised carrier gas in the chamber may prevent the entry of a new liquid charge altogether.

In known apparatus such cutting off of the flow of carrier gas through the vapourising chamber can only be achieved either at the expense of also cutting off the flow of the gas direct to the patient (i.e. not via the vapourising chamber) which may be very undesirable or, in order to maintain the latter flow, by operating a number of separate controls in a correct manner and sequence. It is a primary object of the present invention to provide means whereby these difficulties may be overcome or considerably reduced.

Thus, according to the invention there is provided apparatus for administering anaesthetics, such apparatus including an inlet for an anaesthetic carrier gas such as air or oxygen, an outlet connectible to a breathing mask for a patient, a vapourising chamber adapted to hold a charge of a liquid anaesthetic, and a valve for controlling both the path of flow of said carrier gas through the apparatus and the entry of liquid anaesthetic into the vapourising chamber to charge the same, a control member of such valve being adjustable to any one of three positions these being a first position in which, in operation, the said carrier gas is directed to flow from said inlet to said outlet without passing through the vapourising chamber and charging passage to such chamber is closed, a second position in which, in operation, the said carrier gas is directed to flow from said inlet to said outlet without passing through the vapourising chamber and said charging passage is open, and a third position in which, in operation, the said carrier gas is directed to flow from said inlet to said outlet via the vapourising chamber and said charging passage is closed.

The said first position of the valve control member, hereinafter referred to as the "off" position, is thus one in which the vapourising chamber is sealed so that anaesthetic vapour cannot escape therefrom either to a patient or or atmosphere, but in which a passage for the flow of carrier gas from the inlet to the outlet is nevertheless provided so that a patient will still be able to breathe by way of such passage if a breathing mask connected to the outlet is applied to his face with the apparatus in its "off" condition.

With the valve control member in its said second position, hereinafter referred to as the "fill" position, the or each charging passage to the vapourising chamber is open to permit the chamber to be charged with liquid anaesthetic; means will of course be provided to permit the egress from the chamber of gas displaced by such liquid. As previously mentioned it is important that the carrier gas supplied to the patient should not be permitted to flow through the vapourising chamber during such filling step, and this desideratum is achieved in the apparatus according to the invention; nevertheless the flow of carrier gas directly to the patient without its passing through the vapourising chamber is still permitted so that the patient can continue to receive the full flow of carrier gas during a recharging operation.

In the third position of the valve control member, hereinafter referred to as the "on" position, the carrier gas is led from the inlet through the vapourising chamber and thence to the outlet to the patient, the or each charging passage being closed. This is thus the operative condition of the apparatus.

In a preferred form of the invention the said valve control member includes a rotary cock formed to define the various passages for setting up the appropriate communications between the inlet and outlet and the vapourising chamber of the apparatus in the three conditions of the control valve referred to above. In such preferred

embodiment the said valve cock is rotatably mounted in a seating formed with a number of passages for the flow of carrier gas, liquid anaesthetic and a mixture of carrier gas and anaesthetic vapour as the case may be; all of these passages open into the heating surface for the valve and such passages are:

(a) One leading from the said inlet of the apparatus for the passage of pure carrier gas;

(b) One leading to the said outlet of the apparatus;

(c) One leading to the vapourising chamber for the flow of pure carrier gas thereinto;

(d) One leading from the vapourising chamber for the flow of carrier gas and entrained anaesthetic vapour therefrom;

(e) One leading from the vapourising chamber for the flow to the valve of air displaced from such chamber by a new charge of anaesthetic liquid;

(f) One leading to the outside atmosphere for the passage of such displaced air; and

(g) One leading to the vapourising chamber for the passage of anaesthetic liquid thereto during charging.

The valve cock itself is, in such preferred embodiment, formed with a passage (h) into which anaesthetic liquid may be introduced when the vapourising chamber is to be charged, such passage having an outlet into the seating surface of the cock.

The valve cock of such preferred embodiment is so formed that in its said off position it provides a communication only between passages (a) and (b); in its fill position it provides communications only between passages (a) and (b), between passages (e) and (f), and between passages (h) and (g); in its on position it provides communications only between passages (a) and (c) and between passages (d) and (b).

It will be understood from the above that the only communication which has to be effected in more than one position of the valve cock is that between passages (a) and (b) in both the off and fill positions. Clearly this effect may be achieved by providing two separate bores through the valve cock, for example, or in various other ways; in a preferred construction a communicating channel is formed in the valve cock between circumferential channels in its seating surface which circumferential channels communicate one with each of the passages (a) and (b) in both the off and fill positions of the valve cock. This preferred construction was the advantage that a connection between passages (a) and (b) is provided at all intermediate positions of the cock, so that the supply of carrier gas to the patient cannot be cut off by inadvertent movement of the cock during use.

Clearly the cock could be formed with various different arrangements of bores therethrough and channels in its seating surface to set up the desired communications in its respective positions of rotation. In a preferred form the communications between passages (a) and (c), and (d) and (b), respectively, in the on position of the valve cock are both provided by channels formed in the seating surface of the cock, whilst the communication between passages (e) and (f) in the fill position is formed by a bore.

In a preferred form of the invention, access to the passage (h) in the valve cock for the delivery of anaesthetic liquid thereinto when the vapourising chamber is to be charged is provided through one or more apertures leading into such passage from an exposed surface of the valve cock. In a particularly convenient arrangement such exposed surface of the cock is constituted by a top horizontal surface thereof in the normal position of use of the apparatus, which surface is arranged at the bottom of a dished top surface portion of the part of the apparatus defining the said seating, into which a dose of liquid anaesthetic can be poured so as to run into the passage (h) in the cock by way of such aperture or apertures. Such passage in the valve cock could, if desired, be replaced by a bore therethrough to provide, in the fill position of the cock, a communication to the passage (g) from a further passage in the seating into which latter passage a dose of liquid anaesthetic could be introduced in some other manner.

In a preferred form of the invention, in which the valve control member comprises a rotary cock, the three aforementioned positions of the latter are arranged at 90° to one another in the rotation of the cock about its axis. A manually operable handle will generally be provided for rotating the valve member between its said positions, together with means for clearly indicating the location of such positions.

The apparatus according to the invention preferably includes a proportioning valve for controlling the concentration of anaesthetic vapour in the gaseous mixture delivered to the patient in the on position of the apparatus and, in accordance with an important preferred feature of the invention, such proportioning valve is located within the vapourising chamber and close to but above what will be the maximum level of the anaesthetic liquid in operation. Such location of the proportioning valve helps to ensure that the concentration of anaesthetic vapour in the gaseous mixture delivered to a patient will be consistent for varying rates of flow of the carrier gas.

The proportioning valve may, as in a preferred form of the invention, include a double tapered valve member arranged to be infinitely adjustable between one extreme position in which, in operation, all of the carrier gas which it directs from the vapourising chamber to the said outlet has passed through the anaesthetic vapour in the vapourising chamber and another extreme position in which none of the carrier gas delivered to the outlet by way of such proportioning valve has entrained any anaesthetic vapour in the vapourising chamber and another extreme position in which none of the carrier gas delivered to the outlet by way of such proportioning valve has entrained any anaesthetic vapour. Clearly the concentration of anaesthetic vapour in the gaseous mixture delivered to a patient may be varied between these two extremes. Any convenient kind of proportioning valve may be employed in the apparatus, e.g. a rotary valve member could be used instead of the double tapered valve member referred to above.

Means will, of course, be provided for adjusting such proportioning valve and may take any of a variety of forms; obviously a rotary valve could be adjusted by way of a rotary shaft accessible outside of the vapourisilng chamber. In a preferred embodiment in which the valve member is of the double tapered variety such member is mounted on an axially adjustable shaft movable by cam means.

As the volatility of the anaesthetic liquid in the vaporising chamber, and thus the concentration if its vapour, will vary with ambient temperature, means are preferably provided in association with the said proportioning valve for compensating for such variations. In a preferred embodiment such means comprises a subsidiary valve adapted, in operation, to control the flow of that proportion of the carrier gas which has been passed through the anaesthetic vapour, such subsidiary valve being itself controlled by a sealed temperature-responsive capsule.

The vapourising chamber of the apparatus will preferably house one or more wicks, formed for example of brushed nylon, for soaking up the anaesthetic liquid and thus causing its vapour to be distributed throughout the chamber in operation. Preferably two tubular wicks are provided and are arranged concentrically of one another to define a tubular passage for the flow of carrier gas through the anaesthetic vapour.

Means are preferably provided for reducing temperature fluctuations in the apparatus by increasing its thermal mass, and may conveniently take the form of a water jacket whose top wall forms the base of the vapourising chamber.

The seating for the control valve of the apparatus may conveniently take the form of a metal block forming the lid of the vapourising chamber; in a preferred form of the invention the passages for the flow of carrier gas between the aforementioned passages (c) and (d) in said seating member and the proportioning valve of the apparatus take the form of flexible tubes formed of a suitable synthetic plastics material.

In order that the invention may be more readily understood, one embodiment of the same will now be described by way of example and with reference to the drawings accompanying the provisional specification in which:

FIGURE 1 is a vertical medial cross-section through the apparatus;

FIGURE 2 is a top plan view of the apparatus with the adjusting handle of its control valve removed for the sake of clarity;

FIGURE 3 is a vertical cross-section of the top part of the apparatus, taken on the line III—III of FIG. 2 but with the control valve adjusting handle in position;

FIGURE 4 is a vertical cross-section of the top part of the apparatus, taken on the line IV—IV of FIG. 2, again with the control valve adjusting handle in position;

FIGURE 5 is a view in side elevation of the control member of the control valve of the apparatus;

FIGURES 6 to 10 are cross-sections on the lines VI to X respectively of FIG. 5; and

FIGURES 11 to 13 are diagrammatic illustrations of the various flows through the control valve in the said off, fill, and on positions thereof, respectively.

Referring first to FIGS. 1 to 4, the illustrated apparatus comprises two basic parts, i.e. a vapourising chamber **1** and a head **2** which head carries the control valve of the apparatus, such control valve being generally indicated at **3**.

The side wall of the vapourising chamber **1** is constituted by a metal tube **4** of square cross-section, whilst the bottom of such chamber is formed by the top wall of a water jacket **5** secured in the bottom of the tube **4**; the roof of the chamber is formed by the head **2**.

Housed within the vapourising chamber **1** is a proportioning valve assembly generally indicated by **6**, a temperature-responsive valve generally indicated by **7**, and a pair of brushed nylon wicks **8** and **9** of square cross-section which together define a tubular space **10** closed at its lower end by the inturned end of the outer wick **9**.

Referring now particularly to the proportioning valve assembly **6** (FIG. 1) this comprises an open-ended tubular housing **11** formed with an inlet opening **12** by way of which carrier gas such as air or oxygen is received from the control valve **3**, and an outlet opening **13** through which a gaseous mixture containing a concentration of anaesthetic vapour determined by the setting of the proportioning valve is transmitted back to the control valve for delivery to a patient.

The main tubular housing **11** of the proportioning valve contains five flow control members **14** to **18** which are maintained in position by the engagement of an externally screw-threaded flange **19** of the lowest member **18** with an internally screw-threaded sleeve **20** at the bottom of the housing **11**.

A control shaft **21** of the proportioning valve extends vertically and centrally thereof and is engaged at its top end by an eccentrically mounted circular cam member **22** controlled by means referred to hereinafter. The control shaft is biased upwardly by a compression spring **23** bearing between a nut **24** thereon and the closed top of the housing **11** and is thus movable up and down under the influence of the spring **23** and the cam **22**. The control shaft carries a double tapered valve member **25** cooperating with seatings defined by the bounding edges of central apertures **26** and **27** in the flow control members **15** and **17** respectively.

It will be observed that the flow control members **14** and **15** enclosed a space **28** which communicates, via openings **29** in the wall of the member **14** and passages **30** in the wall of the housing **11**, with the exterior of such housing; such space **28** is also in communication with the inlet **12** to the housing via circular opening **31** in flow control member **14**. Also the space **32** defined within the flow control members **15, 16** and **17** communicates with the outlet **13** from the housing via openings **33** in the wall of the member **16**, whilst the space **34** between the flow control members **17** and **18** communicates with the exterior of the housing **11** via bores **35** in the member **18**.

The space within the inner wick **8** is divided into upper and lower parts by a square plate **36** which supports the proportioning valve assembly and is itself supported at its corners by four pillars **37** secured to a top mounting plate **38** beneath the head **2**.

The whole proportioning valve assembly is enclosed by a square-sectioned tubular casing **39** which makes a sliding fit thereon and is formed with an opening **40** in each side wall thereof near to its lower end; the inner wick **8** is a close fit over such casing **39**.

The path of carrier gas through the vapourising chamber and the proportioning valve is as follows. Gas entering the proportioning valve assembly at **12** from the control valve **3** passes through opening **31** into the space **28** from whence it can pass through openings **29** and apertures **30** and then over the top of the inner wick **8** into the space **10** between the two wicks. The carrier gas can then flow through the inner wick **8** and the openings **40** in the casing **39**, through the bores **35** in the flow control member **18**, and thus into the space **34**. In the course of its flow between the apertures **30** and the space **34** the carrier gas will entrain anaesthetic vapour.

It will thus be seen that, in operation, there will always be a supply of pure carrier gas to the space **28** immediately above the double tapered valve member **25** and a supply of carrier gas carrying anaesthetic vapour to the space **34** immediately below the valve member. The proportions of anaesthetic-free carrier gas and anaesthetic-impregnated carrier gas in the gaseous mixture supplied to the outlet **13** from the proportioning valve will thus clearly depend on the position of the valve member **25** relative to its upper and lower seating surfaces. In the illustrated condition of the apparatus the valve member is in its fully depressed position in which the opening **27** in the flow control member **17** is completely sealed thereby, so that no anaesthetic-impregnated carrier gas can flow into the space **32** and thence to the outlet **13**; only anaesthetic-free carrier gas can thus flow to the outlet by way of opening **26** in flow control member **15**. Obviously in the other extreme position of the valve member **25** only anaesthetic-impregnated carrier gas will flow to the outlet, the opening **26** being completely sealed. Infinite adjustment of the valve member between these two extremes is clearly possible.

Rotation of the cam **22** to adjust the position of shaft **21** and thus valve member **25** is effected by means of knob **41** (FIG. 4) via shaft **42** on which the circular cam is eccentrically mounted. The knob **41** carries a pointer and is surrounded by a scale **43** for indicating the concentration of anaesthetic which will be delivered in the various positions of the valve member **25**.

The temperature-responsive valve **7** already referred to comprises a valve member **44** slidably mounted on the bottom of the shaft **21** and biased downwardly by a compression spring **45** mounted in an axial bore in such shaft. An annular shoulder **46** on the valve member **44** is movable relatively to a seating surface defined by an annular ridge **47** on the flow control member **18** so as to control the flow of anaesthetic-impregnated carrier gas into the space **34** via the bores **35** in such flow control member.

The valve member 44 is secured to a sealed temperature-sensitive capsule 48 fixedly mounted above a bottom plate 49 suspended from the pillars 37, the capsule 48 being immersed in the anaesthetic liquid in operation. The maximum level of such liquid is indicated at 50.

It will be clear that an increase or decrease in the temperature of the anaesthetic liquid, and a consequent rise or fall in its volatility and the concentration of its vapour, will bring about a corresponding expansion or contraction of the capsule 48 to raise or lower the valve member 44 and thus enlarge or restrict the annular flow space for the anaesthetic-impregnated carrier gas defined between the shoulder 46 of the valve member and its seating surface 47.

Referring now to the construction of the head 2 of the apparatus, housing the control valve 3, such head is a heavy metal casting formed at its rear part with bores 51 and 52 in which are screw-threadedly mounted the main inlet and outlet members 53 and 54 of the apparatus. The inlet member 53 will be connected in operation to a source of carrier gas whilst the outlet member 54 will be connected to a breathing mask for a patient. The head is also formed with a dished portion 55 in its top surface, and a conical bore 56 which forms a seating for a conical control cock 57 of the control valve 3. The control cock is furnished with a handle 58 by means of which it may be rotated in its seating 56.

The head is formed with a bore 59 (FIG. 3) leading from the inlet 53 and opening into the conical seating 56 of the control cock, and a bore 60 opening from such seating and leading to the outlet 54. Further bores 61 and 62 lead from such seating to the underside of the head and are connected via flexible pipes 63 and 64 respectively to the inlet 12 and outlet 13 of the proportioning valve.

A further bore 65, not visible in FIG. 3 but illustrated diagrammatically in FIGS. 11 to 13, leads from the seating 56 and is connected by a flexible pipe 66 to the upper end of one of the pillars 37 which is of hollow construction and has an outlet 67 therefrom near to the bottom of the vapourising chamber. A bore 68, again not visible in FIG. 3 but illustrated diagrammatically in FIGS. 11 to 13, leads from the seating 56 and is connected by a flexible pipe 69 to another one of the pillars 37 which is also of hollow construction and has an inlet 70 thereto.

One further bore 71, narrower than those already mentioned, is provided in the head 2 and connects the conical seating 56 with the outside atmosphere via an opening in the side of the head casting. Such bore is again indicated diagrammatically in FIGS. 11 to 13.

The conical control cock is formed to provide the appropriate interconnections between the above-described bores in the head 2 in the off, fill, and on positions of the control valve, and its construction is illustrated in FIG. 3 and FIGS. 5 to 10.

Thus the control cock is formed with a bore 72 extending completely therethrough and arranged at an obtuse angle to the axis of rotation of the cock, and with two horizontal circumferential channels 73 and 74 into which the ends of the bore 72 opens; alternatively, if desired, the channels 73 and 74 could be interconnected by a further channel extending at right angles to them in the cock surface, and the bore 72 omitted. In the aforementioned off position of the control valve, illustrated diagrammatically in FIG. 11, the bore 59 in the head is connected to the bore 60 therein by way of channel 73, bore 72 and channel 74 in the control cock. All of the other bores in the head are blocked by the control cock. Thus, in the off position of the control valve, carrier gas entering the apparatus at inlet 53 simply passes straight through the control valve to outlet 54; such flow is indicated in FIG. 11.

The control cock is also formed with a narrow diameter bore 75 extending completely therethrough and with a blind bore 76 which is aligned with the top horizontal surface of the cock and connected with such surface by apertures 77. When the control cock is rotated through 90° in the anticlockwise sense as seen from above, its off position illustrated in FIG. 11 to its fill position illustrated in FIG. 12, the narrow bore 75 will come into such a position as to connect bore 68 in the head with bore 71 therein, whilst the open end of blind bore 76 will be brought into alignment with bore 65 in the head. The channels 73 and 74 in the cock ensure that the bores 59 and 60 in the head are still interconnected by way of the bore 72 in the cock.

Thus, in such fill position of the control valve, communication is provided firstly between the apertures 77 in the top surface of the control cock and the inlet 67 at the bottom of the vapourising chamber so that a dose of anaesthetic liquid poured into the dished portion 55 of the head will run down into the vapourising chamber by way of apertures 77, blind bore 76, bore 65, flexible pipe 66, pillar 37 and inlet 67; secondly between outlets 70 from the vapourising chamber and bore 71 in the head so that air can be displaced from the vapourising chamber via outlet 70, pillar 37, flexible pipe 69, and bores 68, 75 and 71; and thirdly between the bores 59 and 60 in the head so that carrier gas can still pass directly to a patient as in the off position of the apparatus. Thus, when the control cock is in its fill position the vapoursizing chamber can be re-charged with anesthetic liquid without the flow of carrier gas to the patient being cut off, although such carrier gas will not have passed through the vapourising chamber for reasons explained hereinbefore. The flows in this position of the cock are indicated in FIG. 12.

The position of air outlet 70 from the vapourising chamber defines the maximum liquid level 50 as no more liquid can enter the chamber once such air outlet has been covered thereby.

Further rotation of the control cock through 90° will bring it into its on position illustrated in FIG. 13. In this position the bore 59 in the head is put in communication with the bore 61 therein by way of a vertical channel 78 in the surface of the control cock, whilst the bores 62 and 60 are similarly interconnected by a channel 79. The bore 59 is thus connected to the inlet 12 of the proportioning valve via channel 78, bore 61 and flexible pipe 63, whilst the outlet 13 from the proportioning valve is connected to bore 60 via flexible pipe 64, bore 62 and channel 79. Carrier gas delivered to the inlet 53 of the apparatus will therefore pass to the proportioning valve and some or all of such gas will be passed through the vapourising chamber in the manner already described, and thereafter delivered to a patient via outlet 54. This is, of course, the normal operational condition of the apparatus. The flow in this position of the cock is indicated in FIG. 13.

The channels 73 and 74 extend round the circumference of the valve cock to an extent such that at any position thereof from the off position to a point close to the on position there is always free passage for carrier gas from the bore 59 to the bore 60. The widths of the webs between the adjacent ends of channels 73 and 78 and the adjacent ends of channels 74 and 79 are less than the width of bores 59 and 60, so that a passage for the flow of carrier gas through the vapourising chamber via channels 78 and 79 is opened before the communication between bores 59 and 60 is closed. Thus there is no position of the cock in which the supply of carrier gas to the patient is obstructed.

The position of the control cock at any particular time is indicated by lettering on its handle 58 illustrated in the drawings and always visible from the front of the apparatus. The mode of engagement between the handle 58 and a mounting stub 80 therefor on the top of the con-

trol cock is such that the handle cannot be placed on the cock in any but the position in which it correctly indicates the position of the cock.

It will thus be seen that the invention provides apparatus for delivering anaesthetic which whilst being highly versatile is nevertheless extremely simple to operate. Control of the flow through the apparatus by means of a single operating handle has the important advantage that it is impossible to carry out two or more control operations in the wrong sequence or to omit to perform one of them at all, as may well occur with known apparatus in which the flow of carrier gas and anaesthetic liquid is controlled by more than one valve or other control element.

We claim:

1. Apparatus for administering anaesthetics, such apparatus including an inlet for an anaesthetic carrier gas such as air or oxygen, an outlet connectible to a breathing mask for a patient, a vapourising chamber adapted to hold a charge of a liquid anaesthetic, at least one charging passage to said chamber, a valve for controlling both the path of flow of said carrier gas through the apparatus and the entry of liquid anaesthetic into the vapourising chamber to charge the same, and a control member for said valve, said control member being adjustable to any one of three positions these being a first position in which, in operation, the said carrier gas is directed to flow from said inlet to said outlet without passing through the vapourising chamber and said charging passage to said chamber is closed, a second position in which, in operation, the said carrier gas is directed to flow from said inlet to said outlet without passing through the vapourising chamber and said charging passage is open, and a third position in which, in operation, the said carrier gas is directed to flow from said inlet to said outlet via the vapourising chamber and said charging passage is closed.

2. Apparatus as claimed in claim **1**, wherein the said valve control member comprises a rotary cock formed to define passages for setting up the appropriate communications between the inlet and outlet and the vapourising chamber of the apparatus in the three said positions of said control member.

3. Apparatus as claimed in claim **2**, wherein the arrangement is such that a passage for the flow of carrier gas from the said inlet to the said outlet is also provided when the said valve cock is in any position of adjustment other than the said first, second and third positions thereof.

4. Apparatus as claimed in claim **2**, including a seating in said valve, said valve cock being rotatably mounted in said seating, passages formed in said seating which passages open into the seat surface thereof and which passages comprise:

(a) one leading from the said inlet of the apparatus for the passage of pure carrier gas;

(b) one leading to the said outlet of the apparatus;

(c) one leading to the said vapourising chamber for the flow of pure carrier gas thereinto;

(d) one leading from the vapourising chamber for the flow of carrier gas and entrained anaesthetic vapour therefrom;

(e) one leading from the vapourising chamber for the flow to the valve of air displaced from such chamber by a new charge of anaesthetic liquid;

(f) one leading to the outside atmosphere for the passage of such displaced air; and

(g) one constituting a charging passage and leading to the vapourising chamber for the passage of anaesthetic liquid thereto during charging; the said valve cock being formed with a passage (h) into which anaesthetic liquid may be introduced when the vapourising chamber is to be charged, such passage having an outlet into the said seating surface for the cock; and the valve cock being so formed that when in its said first position it provides a communication only between passages (a) and (b), when in its said second position it provides communications only between passages (a) and (b) between passages (e) and (f) and between passages (h) and (g), and when in its said third position it provides communications only between passages (a) and (c) and between passages (d) and (b).

5. Apparatus as claimed in claim **4**, including two circumferential channels formed in the seating surface of said valve cock, which circumferential channels communicate one with each of the passages (a) and (b) in both the first and second positions of the cock, such circumferential channels being interconnected by a further channel or bore to provide the communication between passages (a) and (b) in the said first and second positions of the cock.

6. Apparatus as claimed in claim **5**, including respective channels formed in the seating surface of the valve cock to provide the communications between passages (a) and (c) and between passages (d) and (b) in the said third position of the cock.

7. Apparatus as claimed in claim **4**, including a bore formed in the said valve cock to provide the communication between passages (e) and (f) in the said second position of the cock.

8. Apparatus as claimed in claim **4**, including one or more apertures leading into the passage (h) in the valve cock from an exposed surface of the said cock to provide access to said passage (h) for the delivery of anaesthetic liquid thereinto when the vapourising chamber is to be charged.

9. Apparatus as claimed in claim **8**, wherein the part of the apparatus which defines the said seating for the valve cock is formed with a dished top surface portion into which a dose of liquid anaesthetic can be poured, and the said exposed surface of the valve cock is a top horizontal surface thereof which is arranged at the bottom of said dished surface so that a dose of liquid anaesthetic poured into said dished surface may run into the passage (h) in the valve cock by way of said aperture or apertures.

10. Apparatus as claimed in claim **4**, including a metal block forming the lid of the said vapourising chamber, the seat seating for the valve cock being formed in said metal block.

11. Apparatus as claimed in claim **4**, wherein the three said positions of the rotary valve cock are arranged at 90° to one another in the rotation of the cock about its axis.

12. Apparatus as claimed in claim **1**, including a proportioning valve for controlling the concentration of anaesthetic vapour in the gaseous mixture delivered by the apparatus when the said control member thereof is in its said third position, such proportioning valve being located within the vapourising chamber and close to but above what will be the maximum level of the anaesthetic liquid in operation.

13. Apparatus as claimed in claim **12**, wherein the said proportioning valve includes a double tapered valve member arranged to be infinitely adjustable between one extreme position in which, in operation, all of the carrier gas which it directs from the vapourising chamber to the said outlet has passed through the anaesthetic vapour in the vapourising chamber and another extreme position in which none of the carrier gas delivered to the outlet by way of such proportioning valve has entrained any anaesthetic vapour.

14. Apparatus as claimed in claim **13**, including an axially adjustable shaft mounting the said valve member of the proportioning valve, and cam means for adjusting said shaft.

perature responsive means associated with the said pro-

15. Apparatus as claimed in claim **12**, including tem-

portioning valve and adapted, in use of the apparatus, to influence the operation of the latter in such manner as to compensate for the effect of ambient temperature variations on the volatility of anaesthetic liquid in the vapourising chamber.

16. Apparatus as claimed in claim **15**, wherein the said temperature responsive means comprises a subsidiary valve adapted, in operation, to control the flow of that proportion of the carrier gas which has been passed through the anaesthetic vapour, and a sealed temperature-responsive capsule controlling such subsidiary valve.

17. Apparatus as claimed in claim **1**, including a water jacket whose top wall forms the base of the said vapourising chamber.

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