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[54] **RESUSCITATOR DEVICE**
15 Claims, 6 Drawing Figs.

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137/81.5

[51] Int. Cl. **A61m 16/00**

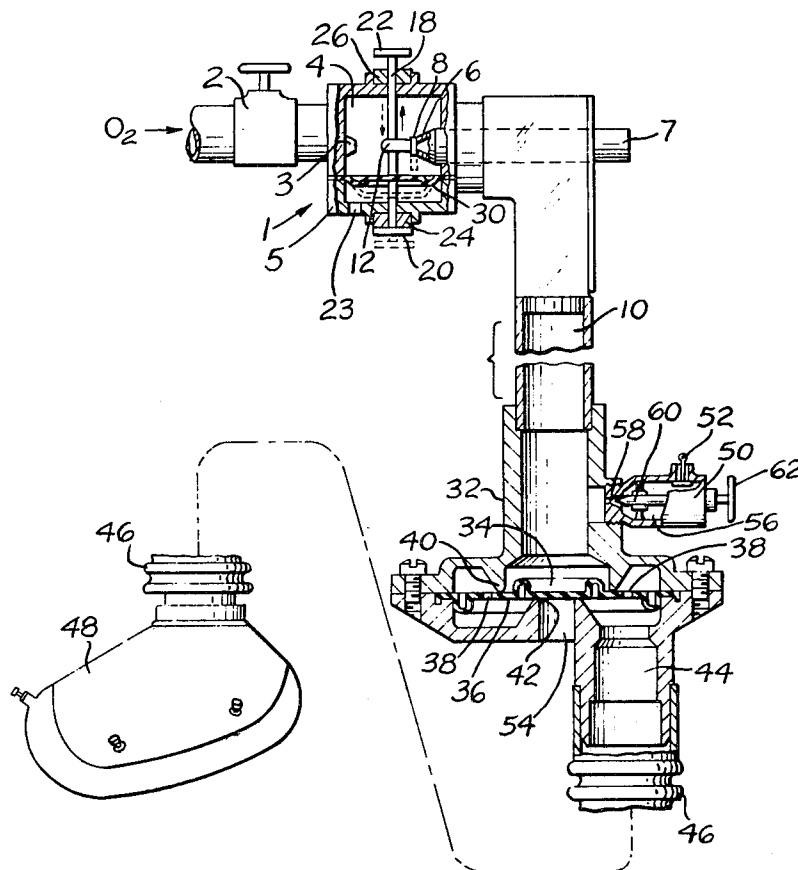
[50] Field of Search 128/145.5-145.8,
203, 207, 210, 211; 137/81.5

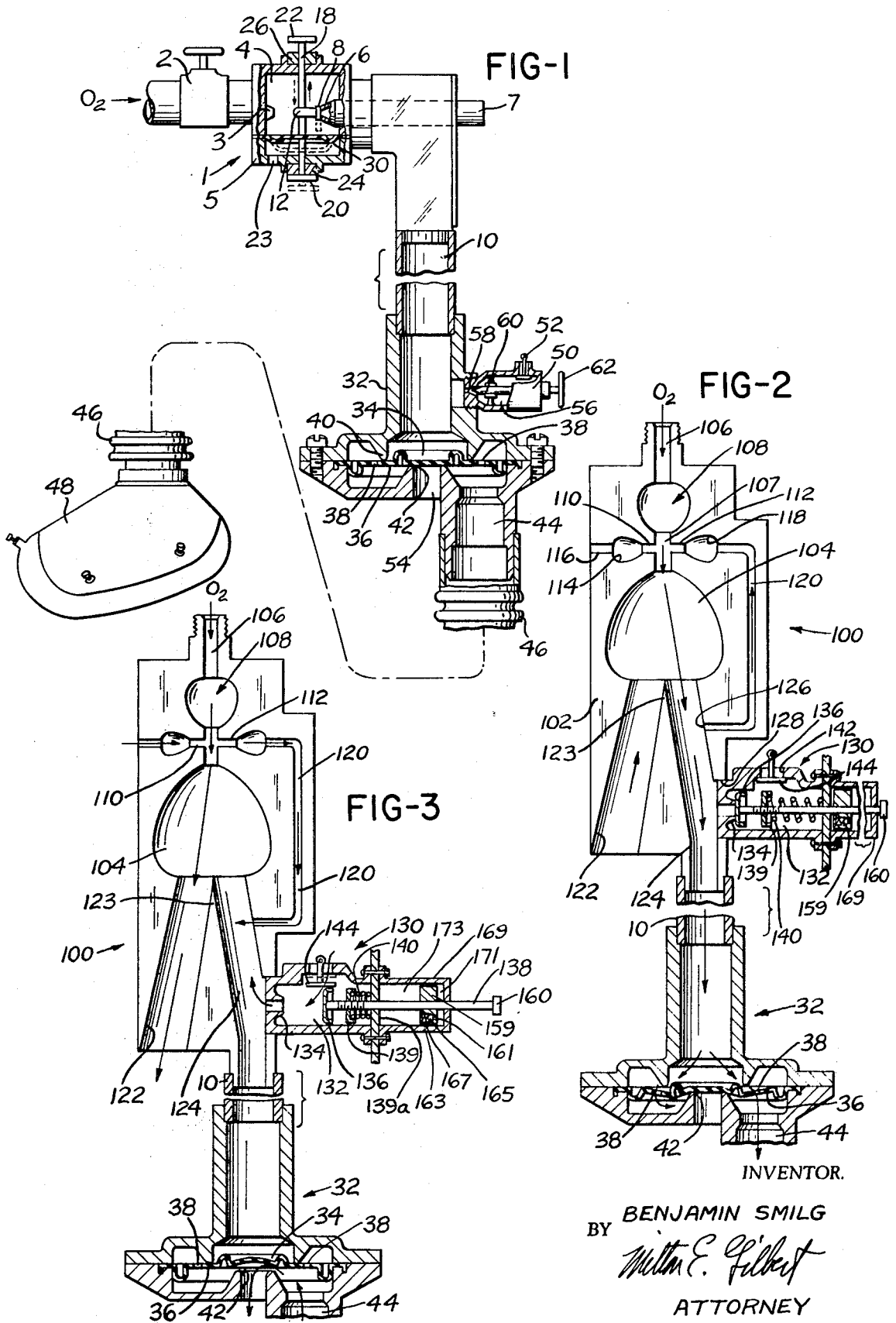
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ABSTRACT: A resuscitation valve connected to receive oxygen under pressure and alternately exhaust same to atmosphere or deliver same through a conduit to an exhalation valve; the latter having a valve member operating to interconnect the conduit to a passageway directed to the lungs of a patient to permit positive pressure thereof and alternately to permit interconnection of the last named passageway to ambient for exhalation of the patient. A time-delay valve means including a one-way valve and a throttling valve is connected to the conduit to permit transfer of ambient pressure to the resuscitation valve to delay its cycling on the exhausting cycle thereof, i.e. the exhalation cycle for the patient, thereby to maintain peak positive pressure in the patient's lungs for a period selected by the setting of the throttling device.





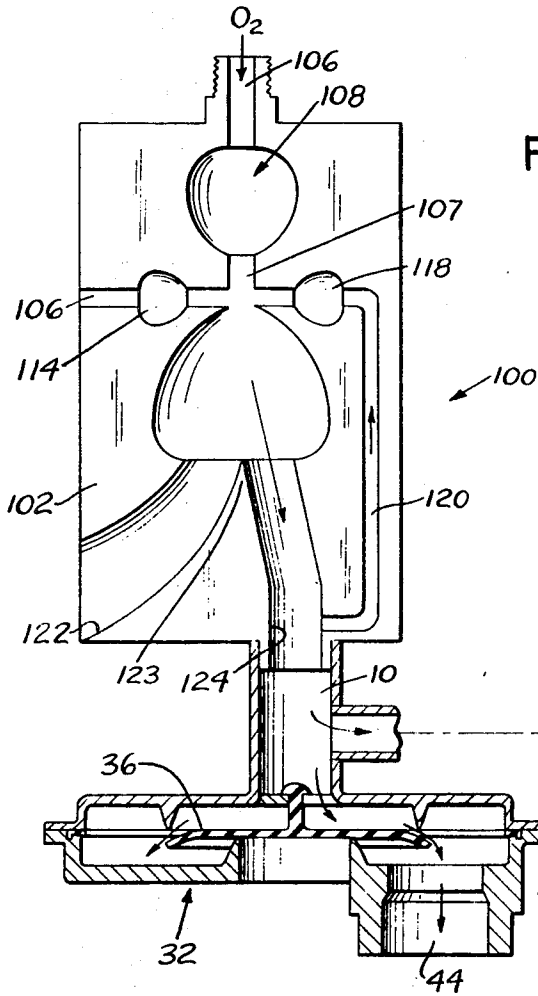


FIG-4

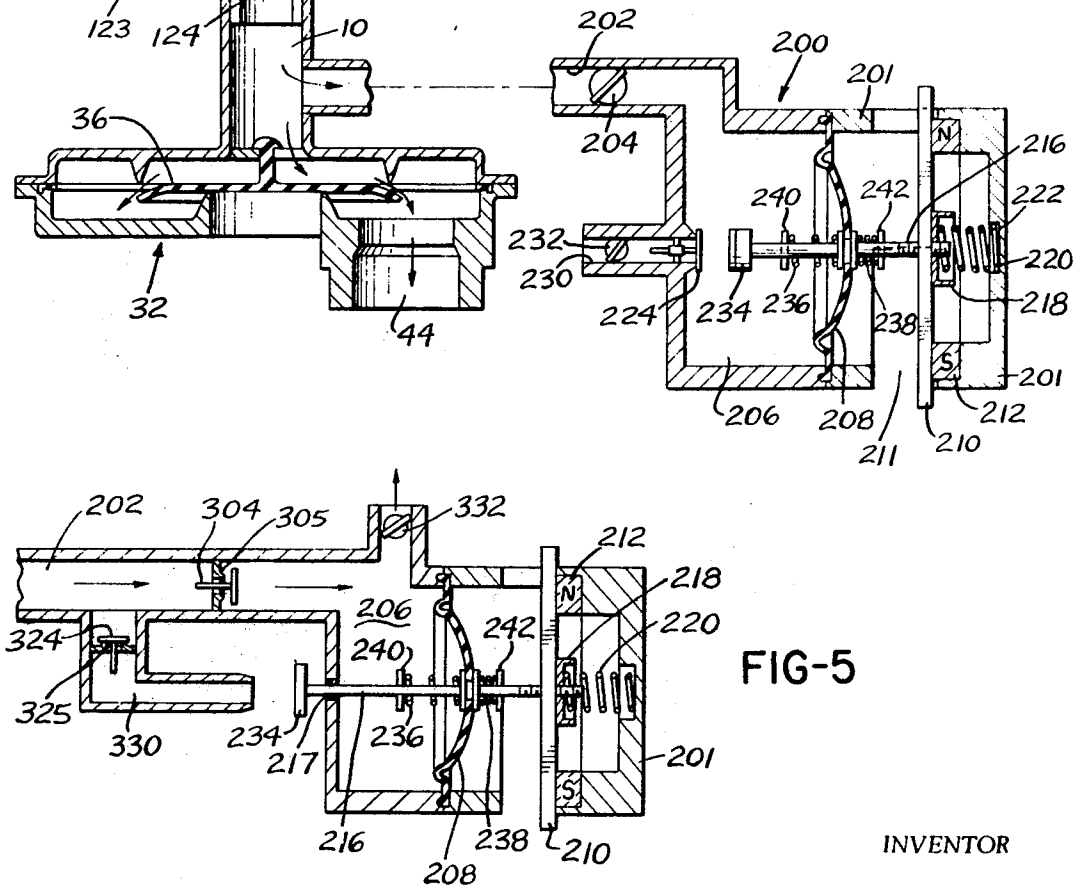


FIG-5

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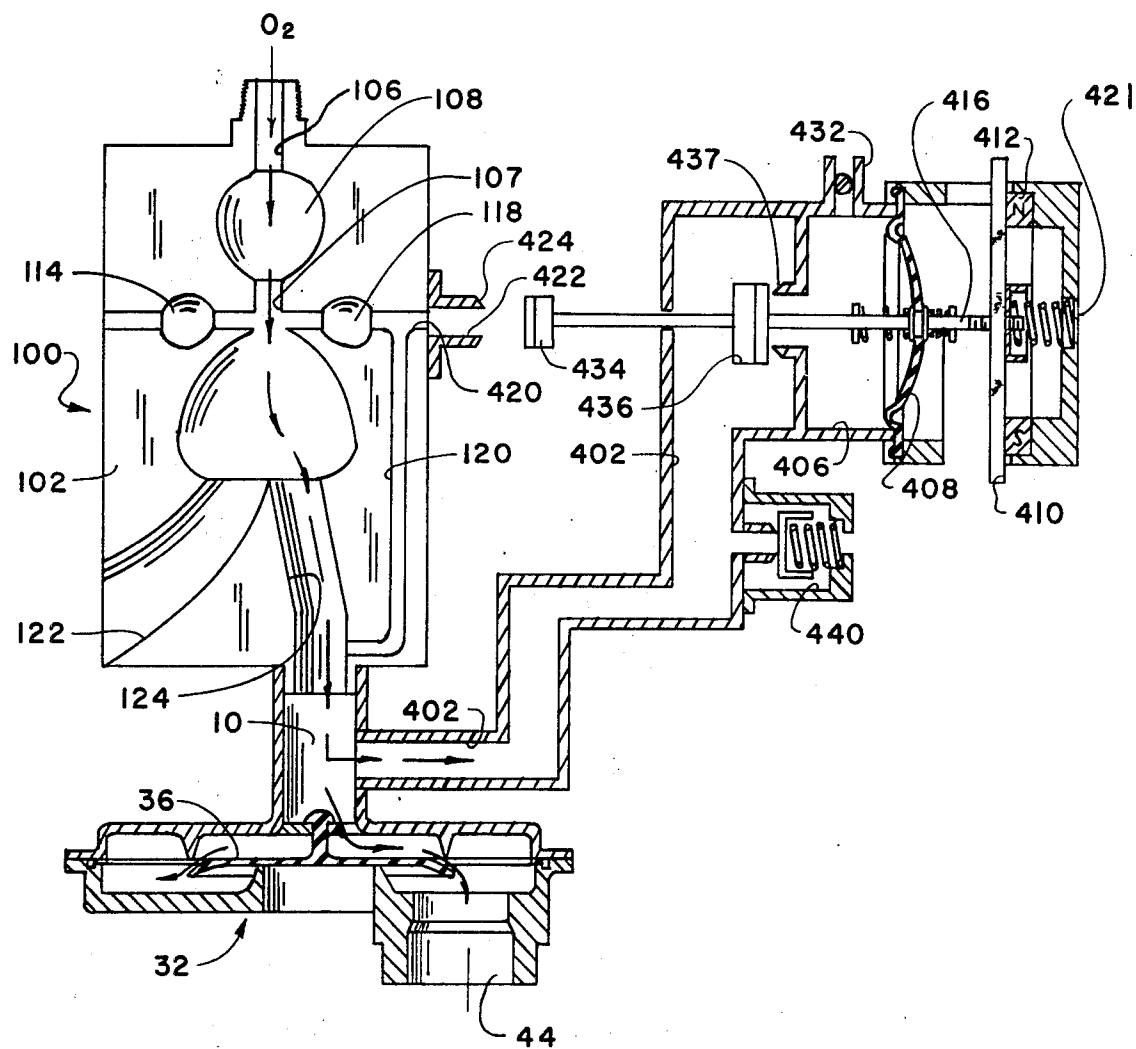


FIG. - 6

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RESUSCITATOR DEVICE

This application is a continuation-in-part of my prior U.S. Pat. application Ser. No. 518,365, filed Jan. 3, 1966, entitled "RESUSCITATOR DEVICE," now abandoned.

This invention relates generally to a resuscitator device incorporating a plurality of valves and more particularly to a device including a bistable cycling valve and an exhalation valve.

It is deemed to be highly desirable from medical considerations to permit a patient who is being treated with a resuscitation apparatus to exhale rapidly and completely. On the other hand, it may be desired with some patients to maintain a desired peak positive pressure in the patients' lungs for a specified period. Such a desired result is presently brought about by the employment of valves having many moving parts which are subject to wear, dirt accumulation, etc. In the case of resuscitation valves operating with a positive-negative or intermittent positive cycling action, the rate of cycling and the residual pressure at the patient's facepiece may be such that the patient is not caused to exhale completely before his lungs are subjected once again to the positive pressure phase of the cycle.

It is therefore one object of the invention to combine a bistable resuscitator valve with an exhalation valve, in order to permit complete and rapid exhalation of a patient. It is another object of the invention to provide a resuscitation apparatus in which a resuscitation valve is employed having no moving parts and in which the time period of the exhalation phase of the cycling valve can be adjustably determined. A still further object is to provide a resuscitation apparatus in which the patient's exhalation is directed out to atmosphere without impinging upon delicate cycling mechanisms or small passageways in the resuscitation valve. A further object of the invention is to provide a time delay means on the positive pressure phase of a bistable resuscitator device.

These and other objects of the invention will become more readily apparent upon a reading of the description following hereinafter, and upon an examination of the drawings, in which:

FIG. 1 is a side view, partially in cross section of one preferred embodiment of the resuscitation apparatus of the invention;

FIG. 2 is a view similar to that of FIG. 1, but showing a further embodiment of the invention;

FIG. 3 is a view similar to that of FIG. 1, but showing the device of FIG. 2 in its alternate phase of operation;

FIG. 4 is a view similar to that of FIG. 1, but showing the device of FIGS. 2 and 3 combined with a modified time-delay means;

FIG. 5 is a view of still another modified time-delay means; and

FIG. 6 is a view similar to that of FIG. 4, of a modified time-delay means on the inhalation cycle.

In its broadest concept, the invention combines a resuscitator automatic cycling valve with an exhalation means to produce a rapid and complete exhalation by the patient, said means including a timing device to maintain exhalation for a desired length of time. The invention also contemplates the employment of a fluid amplifier device as the automatic cycling valve in the above combination. The invention further contemplates the provision of a time delay on the inhalation phase of the cycling valve.

Fluid amplifiers or fluid control devices employing no moving parts have been known previously but their specific application to resuscitation devices has not been previously accomplished. In its basic construction a fluid amplifier employs a high-energy or power stream flowing into a housing through an inlet channel. The stream flows past a widened chamber and arrives at a pair of divergent outgoing channels separated by a pointed structure called the splitter. The device employs two control jets located one on each side of the inlet channel. If one of the control jets is turned on, the jetstream emerging from this jet will add its momentum to that of the main stream,

and additionally will contribute a directional effect. The entire main stream will then be bent in the direction of one of the outlet channels and will pass out through that outlet. Rather than employing the momentum effect, if the control jet is properly placed with respect to the power stream, the main factor deflecting the stream will be pressure rather than momentum. It is thus seen that by connecting various pressure levels to the control jets, the main stream can be made bistable; i.e., it will swing over from one stable situation where it locks onto one wall of the channel in which it is flowing and exits on that side, to an alternate stable situation where the stream locks onto the opposite channel and flows out of the other outlet.

In the present invention or aspirator fluid amplifier device is coupled to an exhalation valve and one of the control jets is open to ambient while the other control jet is subject to the pressure present in the inlet conduit to the exhalation valve.

Referring now to FIG. 1, there is shown a bistable cycling valve 1. A source of oxygen is led into a conduit past a flow adjustment valve 2 and out of a jet inlet 3 into a chamber 4 formed within a housing 5. Opposed to the inlet 3 is a venturi or aspirator passage 6 which leads to an exhaust opening 7 leading from the valve housing communicating with ambient. The aspirator passage 6 acts as a valve seat in cooperating with a movable valve member 8. The chamber 4 is enclosed on one side by a diaphragm 30. The opposite side of the diaphragm 30 is exposed to ambient via the port 23. Mounted in the valve housing 5 is a shaft 18 which is affixed to the diaphragm 30. The shaft is so mounted that as the diaphragm 30 moves the shaft will move vertically up and down as viewed in FIG. 1.

The valve member 8 is connected to a support member 12 which may be fixedly connected to and actuated by the shaft 18. If desired, an articulated linkage to operate the valve member 8 from the diaphragm 30 or shaft 18 may be provided.

On each end of the shaft 18 mounted the ferromagnetic armatures 20 and 22, which cooperate respectively with the magnets 24 and 26, affixed to the housing 5.

FIG. 1 illustrates the positive pressure phase of operation of valve 1. Flow of oxygen is coming into chamber 4 through the jet inlet 3, and because valve 8 is seated upon the aspirator opening 6, pressure will build up in chamber 4. The diaphragm 30 will slowly be pushed downwardly, as viewed in FIG. 1, into the dotted line position. At the same time oxygen is flowing through conduit 10 to the second valve assembly 32. When sufficient loading force has been built up against the diaphragm 30, the attractive force between armature 20 and magnet 24 will be overcome, at which time the shaft 18 will move abruptly downwardly carrying the valve 8 off the valve seat formed by aspirator 6. The armature 22 will be rapidly drawn to magnet 26 at this time. Oxygen will then pass directly through aspirator 6 to the atmosphere through outlet 7. This will create a suction in the conduit 10, which will cause the patient to exhale as will be explained hereinafter.

When the valve 1 is operated in the positive phase shown in FIG. 1, positive pressure will be transmitted through conduit 10, and oxygen will flow into chamber 34 of valve 32. Pressure will then build up on the diaphragm 36 which is fixedly held within the valve 32. In the embodiment shown, the diaphragm 36 is provided with the holes or ports 38; however, an impermeable diaphragm of smaller diameter could be alternatively employed, which could be fixedly held at its center within the valve housing (see FIG. 4). The diaphragm 36 alternately seats upon the valve seat 40 or the valve seat 42. When seated upon the valve seat 42, egress from passageway 54 is prevented while at the same time the diaphragm is lifted off the valve seat 40 to permit oxygen to pass from chamber 34 to the outlet passageway 44 through a conduit 46 to a facemask 48 and hence to the lungs of a patient. During the negative cycle of valve 1, suction is produced in conduit 10, as indicated above. This suction causes the valve diaphragm 36 to move to seat upon the valve seat 40, and causes the patient to exhale back through conduit 46, passageway 44 and out through port 54 to atmosphere.

A time delay means to maintain the exhalation cycle is provided in the form of a valve assembly 50. This assembly 50 contains a one-way valve 52, and a throttling or orifice device 62 which may take the form of a needle valve 60 operating within a complementary-shaped orifice 58. When the exhalation phase of the device commences, there will be a suction created in the conduit 10, as above explained. This suction will be admitted to the chamber 56 in the valve housing 50, and serves to cause the valve 52 (preferably being flexible) to unseat to admit ambient atmosphere. (At this time the valve 8 has been removed from the aspirator conduit 6, which causes the suction by the outflow through port 7.) Ambient atmosphere flowing through check valve 52 will pass through chamber 56 and port 58 into the conduit 10, and thence to chamber 4 and out to atmosphere through aspirator 6 and port 7. The amount of ambient atmosphere that will flow in is determined by the setting of the needle valve 60 which is positioned by the device 62. This serves to adjust the duration of the negative cycle of the device. As indicated above, as soon as the suction reaches a predetermined valve in the chamber 4, as determined by the armature and magnet settings, the valve 1 will cycle and return to the positive phase. If the rate of inflow through valve 52 is set too slow, then the valve 1 will cycle into the positive phase almost instantaneously, thus preventing complete exhalation of the patient. If the rate of inflow is too great then the valve 1 may take too long a time to cycle into the positive phase. However, by the proper adjustment, the valve 1 will be permitted to remain in the exhalation phase for about 2 seconds, thus attaining a total cycling rate of 4 seconds or about 15 times per minute, which is the normal breathing rate.

In the embodiment of FIGS. 2 and 3, the exhalation valve 32 is employed as in the case of the embodiment of FIG. 1. However, the valve 1 is replaced by the fluid control device described previously. The fluid amplifier device 100 comprises a body 102 which has a specially shaped chamber 104 internally thereof. Leading into the chamber is an inlet passageway 106 which is in communication with the valve 2. The passageway 106 may be provided with a small chamber or reservoir 108 leading from the inlet through a central passage 107 to the chamber 104. Also leading into the passage 107 are the control passages 110 and 112, each provided with similar reservoirs 114 and 118, respectively. The chamber 114 communicates with the ambient atmosphere through an inlet passage 116; whereas the chamber 118 communicates with a feedback passage 120 which leads to the channel 124 for reasons as explained hereinafter.

Leading from the chamber 104 are the two exit channels 122 and 124, separated by a pointed wall or splitter head 123. The feedback passage 120 communicates with the channel 124 at the location 126. The channel 124 leads to the conduit 10, all the other parts of the valve 32 being numbered as indicated previously in connection with FIG. 1. The fluid amplifier device 100 operates in a bistable manner. Thus, if the pressure in control passage 112 is less than atmospheric, i.e., the pressure in passage 110, then the incoming oxygen stream will flow into chamber 104 and out through channel 124. If the pressure in control passage 112 increases above atmospheric then the valve 100 will cycle over and the oxygen stream will exit through channel 122 to atmosphere. The device will remain in either one or the other of the stable states until cycled over by the change in pressure described.

A time delay means 130 is provided which includes a check valve 144 operating to alternately seal or open the port 142. The means 130 has an internal chamber 132, one end of which is formed into a valve seat 134, against which the valve plate 136 seats. The valve plate 136 is affixed to a rod 138 and is spring loaded by a spring 140 captured between a plate 139a and a cup member 139, which is internally threaded. The loading on the spring 140 may be fixed or may be adjusted by axially moving the internally threaded cup member 139. This is done by rotating the rod 138 which is appropriately threaded in this area. Rotation of the rod 138 may be accomplished by turning a knob 160 affixed to the rod.

FIG. 2 shows the device in the positive phase of the cycle. Flow of oxygen enters into passage 106 and flows out through the channel 124, as explained above and as shown by the arrows. The positive pressure in the channel 124 serves to force the valve 136 to the right or to unseat it from the valve seat 134. When this occurs then positive pressure will fill the chamber 132 and seat the check valve 144 to prevent any ingress of ambient atmosphere. As the pressure builds up in the channel 124, then it will flow through the feedback passage 120 to increase the pressure in the passage 112. When the pressure in the control passage 112 exceeds atmospheric pressure, i.e., the pressure in passage 110, then the device 100 will cycle over to the condition shown in FIG. 3. The oxygen jet will now flow out of the channel 122 and a suction will be created in the chamber 132 and will be building up in the feedback passage 120. The length of time necessary to build up sufficient suction in the feedback passage 120 and hence in the control passage 112 will be determined by the time-delay means 130. The valve plate 136 will now begin moving to the left, as viewed in FIG. 3, and the check valve 144 will unseat to permit inflow of ambient atmosphere. The length of time necessary to attain sufficient inflow to bring about the desired time delay is determined by the spring force of return spring 140 and by a damping mechanism contained in housing 169 affixed to the time-delay means 130. This damping mechanism comprises a plate 159 affixed to the shaft 138 moving axially within the housing 169. The plate 159 is provided on one side with a small bore 161 communicating with the chamber 171; and on the other side with a coaxially arranged larger bore 163 communicating with a chamber 173. A ball valve member 165 is spring loaded by a spring 167 captured within the bore 163. Motion of the plate 159 to the right, as viewed in FIG. 3, is relatively unimpeded since fluid will transfer from chamber 171 to chamber 173 by flowing through bores 161 and 163. However, motion of the plate 159 is retarded by the ball valve 165 seating on the bore 161 to meter flow of fluid from chamber 173 to chamber 171, when the plate 159 moves to the left, as viewed in FIG. 3.

When the spring 140 seats the valve 136 on the seat 134, then the inflow will cease and almost immediately the valve 100 will be permitted to cycle to the positive phase, as shown in FIG. 2, due to the sudden increase in suction in the passage 120. Up to this time the patient has been exhaling as indicated in FIG. 3, and the exhalation phase will be concluded when the valve cycles back to the positive phase shown in FIG. 2.

A further modified device is shown in FIG. 4, wherein the same valves 100 and 32 are used as previously described, and the parts are numbered identically. However, a different time-delay means is employed. Communicating with the passage 10 is a conduit 202 provided with a throttling valve 204. The conduit 202 leads to a chamber 206 formed within the housing 201 of the time-delay means 200. Also mounted in the housing 201 is a diaphragm 208 slidably mounted on a shaft 216. The diaphragm operates against two springs 236 and 238 located one on each side thereof, and the springs in turn are retained at their other ends by the pins 240 and 242, respectively. The pins 240 and 242 pass through the shaft 216. Also formed in the housing 201 is a passage 230 provided with a check valve 224 and a throttling valve 232. When the positive pressure comes into the chamber 206 it seats the check valve 224 to close off the inlet passage 230 and also serves to exert pressure against diaphragm 208 to move it to the right as viewed in FIG. 4. This causes the spring 238 to become compressed and the spring 236 to become unloaded. As the pressure against the diaphragm builds up it will load the shaft 216 with a force tending to urge it to the right.

Mounted on one end of the shaft 216 is a pad 234, and on the other end is a bar armature 210. The armature 210 is axially translated within the slot 211 which preferably is extended on each side for an angle of 90° to permit angularly adjusting the armature 210 within the magnetic field of a magnet 212 embedded in the right end of the housing 210. The movement of the armature 210 to the right is resisted also by a spring 220

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resting at one end in a bore 222, and at its other end in a cup 218 affixed to the armature 210.

In the positive phase of the device the parts are as shown in FIG. 4, with the armature 210 held by the magnet 212 and the spring 220 compressed. Pressure builds up in the feedback passage 120 as described before and the valve 100 will be cycled into the negative phase. Conduit 10 will then have suction present and the chamber pressure 206 will drop. When this occurs the valve 224 will unseat to admit an amount of ambient atmosphere as determined by the setting of the needle or throttle valve 232 to the chamber 206 and also to the conduit 202 as determined by the setting of the valve 204. At this time with the drop in pressure in the chamber 206, the diaphragm 208 will be urged to move to the left, as viewed in FIG. 4, at a rate controlled by the rate of drop in pressure as determined by the valve settings 232 and 204. However, the diaphragm is prevented from moving to the left by the attraction of the armature 210 to the magnet 212. When the suction pressure is great enough to draw the diaphragm 208 with a sufficient force to overcome the magnetic force, the armature will then snap away from the magnet and the pad 234 will contact the valve 224 to seal off the inlet passage 230. At this time, suction will rise rapidly in the passageway 120 which will cause the valve 100 to cycle back to the positive phase shown in FIG. 4. The time delay is readily adjustable by positioning of the armature within the magnet field angularly through the slots mentioned. The armature is formed as a bar 210 and the magnet is a circular magnet 212 to enable this ready adjustment.

A further modification of the time-delay means is shown in FIG. 5. In this modification similar parts are numbered similarly to that of FIG. 4. The throttle valve 204 is replaced by a one-way check valve 304 working against a valve seat 305 within the conduit 202. Also, the throttle valve 232 is replaced by a bleed valve 332 located in one side of the housing 201. The inlet valve 224 is replaced by a one-way check valve 324 operating against a valve seat 325 fixed within the conduit 330 leading to atmosphere. The shaft 216 passes through a sealed opening 217 in the housing 201 and the pad 234 operates in the open to alternately seal or open the conduit 330.

The operation of the device in FIG. 5 is similar to that of FIG. 4. On the positive phase of valve 100, pressured fluid enters the chamber 206 from passageway 10 via the one-way valve 304, and acts against diaphragm 208. The diaphragm slips on the shaft 216 to compress the spring 238. As the pressure in the chamber 206 increases it urges shaft 216 carrying the armature 210 towards the magnet 212 and is opposed by the spring 220. Eventually the pressure becomes large enough to drive the armature 210 against the magnet 212. This lifts the pad 234 off of the conduit 330 to permit ambient atmosphere to enter conduit 330 to open the one-way check valve 324 and enter the conduit 202. At this time the valve 100 receives the direct effect of the incoming ambient through the valve 324, without having to go through the chamber 206. When valve 304 closes the pressure will bleed out of the chamber 206 past the adjustable bleed valve 332.

In the modification of FIG. 5 the spring 220 is made of such sufficient strength that when the pressure in chamber 206 becomes sufficiently low to overcome the force between the armature 210 and magnet 212, then the diaphragm 208 and armature 210 will move to the left as viewed in FIG. 5. The pad 234 will then snap over to seat on the inlet conduit 330 to shut off inflow of ambient to the valve 100 and to trip it back to the positive phase as indicated previously.

In the modification of FIG. 6, the feedback passage 120 is provided with an alternate passage 420 which is normally closed to atmosphere but can be opened to atmosphere by the displacement of valve plate 434. During the initiation of the positive flow (i.e., inflation phase) and as the flow enters passageway 10 on its way to the patient's lungs, a portion of this flow is diverted through passage 402, through the open valve 436, and into chamber 406, where the pressure acts against diaphragm 408. This pressure increases as the flow

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into passageway 10 continues and eventually becomes sufficiently large to overcome the restraint due to spring 421. Shaft 416 is forced to move to the right (as viewed in FIG. 6) which in turn causes armature 410 to snap to the right and to contact magnet 412. Valve plate 436 is simultaneously caused to move against valve seat 437, and thus to seal camber 406. Valve plate 434 is simultaneously caused to move away from valve seat 424, thus opening the feedback passages 120-420 to atmosphere. The feedback flow through passage 120 will then exhaust to atmosphere through passage 422 rather than flow toward central passage 107. Cycling of the fluid amplifier 100 to direct flow from passage 124 to passage 122 will be delayed and consequently, the resuscitator valve will not cycle from the positive or inflation phase to the negative or deflation phase as long as feedback passage 120 is open to atmosphere.

In the meantime, the pressure entrapped in chamber 406 due to the closing of valve 437 by valve plate 436 is permitted to leak out to atmosphere through the adjustable bleed 432. When the pressure in chamber 406 is reduced to a sufficiently low value, spring 421 will overcome the magnetic force-holding armature 410 against magnet 412, and shaft 416 will snap to the left (as viewed in FIG. 6) to cause valve plate 434 to again seat against valve seat 424, thus forcing the feedback flow through passage 120 to flow toward central passage 107. There the feedback flow will cause the fluid flow entering the right-hand channel 124 to be diverted to the left-hand channel 122 to initiate the negative or suction phase of the resuscitator. The device shown in FIG. 6 constitutes a time delay which can be adjusted by adjusting bleed 432 to maintain the positive cycle for a desired length of time.

The relief valve 440 is normally adjusted to correspond to the peak positive pressure to which the patient is to be treated. The relief valve insures that this desired peak pressure will not be exceeded while the positive or inflation phase exists and is normally set at a value just above the pressure at which the shaft 416 is caused to snap to the right to seal the chamber 406.

Although what I have described are various preferred embodiments of the invention it is to be understood that various changes in dimensions, rearrangements of parts, etc., may be accomplished while still remaining within the scope and spirit of the invention.

What I claim is:

1. A resuscitator device comprising, in combination:

a bistable resuscitator valve means connected to a source of positive pressure, and having a positive pressure outlet conduit;

a second valve means comprising a housing having an inner chamber; first, second and third passageways within said housing leading from said chamber; said first passageway communicating with said positive pressure outlet conduit and leading to a first valve seat fixedly formed within said housing; said third passageway being alternately placed in communication with said first and second passageways; a discrete continuous flexible valve member of substantially planar configuration mounted within said housing juxtaposed to said passageways, said first valve seat being located on one side of said valve member and said second and third passageways cooperating with a second valve seat fixedly formed within said housing and being located on the opposite side of said valve member, said flexible valve member operating to alternately seat upon said first and second valve seats as determined by the position of said bistable valve means,

and time-delay means operatively connected to said valves for controlling the duration of the exhalation cycle.

2. The resuscitator device of claim 1 wherein said bistable valve means comprises a valve body having a chamber partially closed by a diaphragm, a positive pressure inlet means and an aspirator outlet means, a shutoff means for said aspirator outlet means, and linkage means connected to the operated by said diaphragm to position said shutoff means alternately to shutoff egress from said chamber to said aspirator

outlet or to permit such egress, said chamber being in constant communication with said positive pressure outlet conduit.

3. The resuscitator device of claim 1 wherein said bistable valve means comprises a pressure cycling fluid amplifier device including pressure feedback means.

4. The resuscitator device of claim 3 wherein said fluid amplifier device comprises a body member having a pressure inlet passage leading to a chamber, a pair of control jet passages one on each side of said pressure inlet jet passage and impinging thereon, a pair of outlet channels leading from said chamber and being separated by a portion of the wall of said chamber formed into a splitter head, one of said channels leading to the ambient, and the other of said channels leading to said positive pressure outlet conduit.

5. The resuscitator device of claim 4 wherein said fluid amplifier device includes a feedback passageway interconnecting said other channel to one of said control jet passages.

6. The resuscitator of claim 1 wherein said time-delay means includes a check valve in communication with said positive pressure outlet conduit and leading to ambient, said check valve operating to admit ambient atmosphere to said conduit during the exhalation phase to thereby delay the cycling of the bistable valve means for a period determined by said time-delay means.

7. The resuscitator device of claim 6 wherein said time-delay means includes means for presetting the rate of flow-in of ambient atmosphere past said check valve to said conduit.

8. The resuscitator device of claim 7 wherein said means for presetting the rate of flow-in is adjustable.

9. The resuscitator device of claim 8 wherein a further adjustable means is provided to determine the length of the time delay including a magnet element and an armature positionable relative to the field of said magnet.

10. A resuscitator device comprising, in combination:

a bistable resuscitator valve means connected to a source of positive pressure, and having a positive pressure outlet conduit and an outlet conduit to ambient, said valve means operating in one phase to emit positive pressure from said positive pressure outlet conduit and operating in a second phase to emit positive pressure from said ambient outlet conduit,

a second valve means comprising a housing having an inner chamber; first, second and third passageways within said housing leading from said chamber; said first passageway

communicating with said positive pressure outlet conduit and leading to a first valve seat fixedly formed within said housing; said third passageway being alternately placed in communication with said first and second passageways; a discrete continuous flexible valve member of substantially planar configuration mounted within said housing juxtaposed to said passageways, said first valve seat being located on one side of said valve member and said second and third passageways cooperating with a second valve seat fixedly formed within said housing and being located on the opposite side of said valve member, said flexible valve member operating to alternately seat upon said first and second valve seats as determined by the position of said bistable valve means, said valves cooperating in a predetermined manner to selectively provide an inhalation and exhalation cycle of pressure to a patient's lungs; and time-delay means operatively connected to said valves for controlling the characteristics of one of said cycles.

11. The device of claim 10 wherein said bistable valve means comprises a pressure-cycling fluid amplifier device including pressure feedback means.

12. The resuscitator device of claim 11 wherein said fluid amplifier device comprises a body member having a pressure inlet passage leading to a chamber, a pair of control jet passages one on each side of said pressure inlet jet passage and impinging thereon, a pair of outlet channels leading from said chamber and being separated by a portion of the wall of said chamber formed into a splitter head, one of said channels leading to the ambient, and the other of said channels leading to said positive pressure outlet conduit.

13. The resuscitator device of claim 11 wherein said fluid amplifier device includes a feedback passageway interconnecting said other channel to one of said control jet passages.

14. The resuscitator device of claim 13 wherein said time-delay means includes a second bistable valve means interconnected to said feedback passageway to control the cycling of said fluid amplifier device.

15. The resuscitator device of claim 14 wherein said second bistable valve means is arranged to open said feedback passageway to ambient during the inhalation phase to thereby maintain positive pressure in the lungs of a patient, and means for adjustably presetting the rate at which said second bistable valve means will cycle.