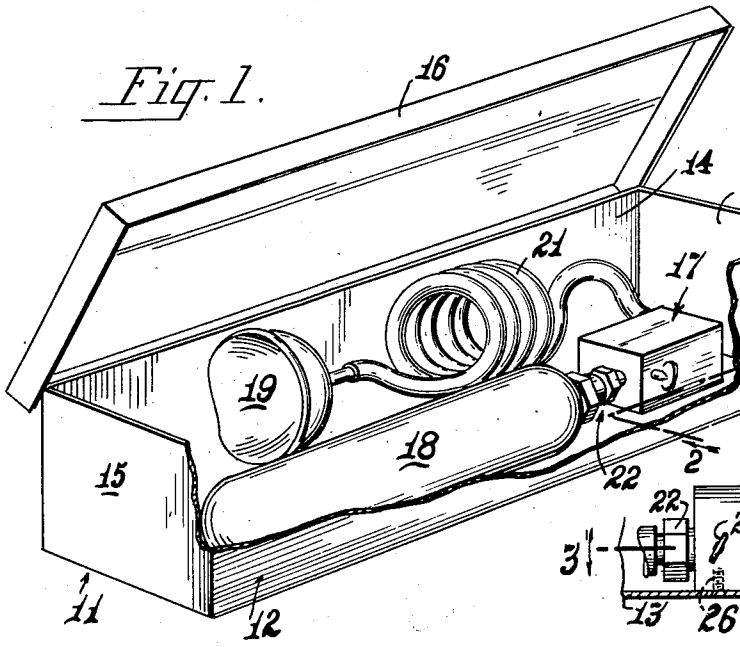
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PORTABLE INHALATOR

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Fig. 1.



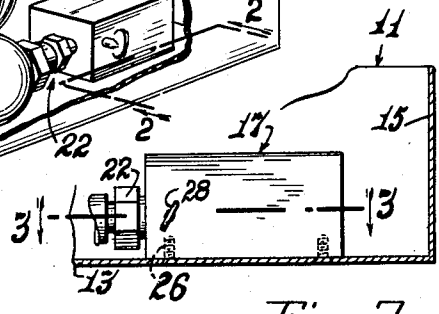
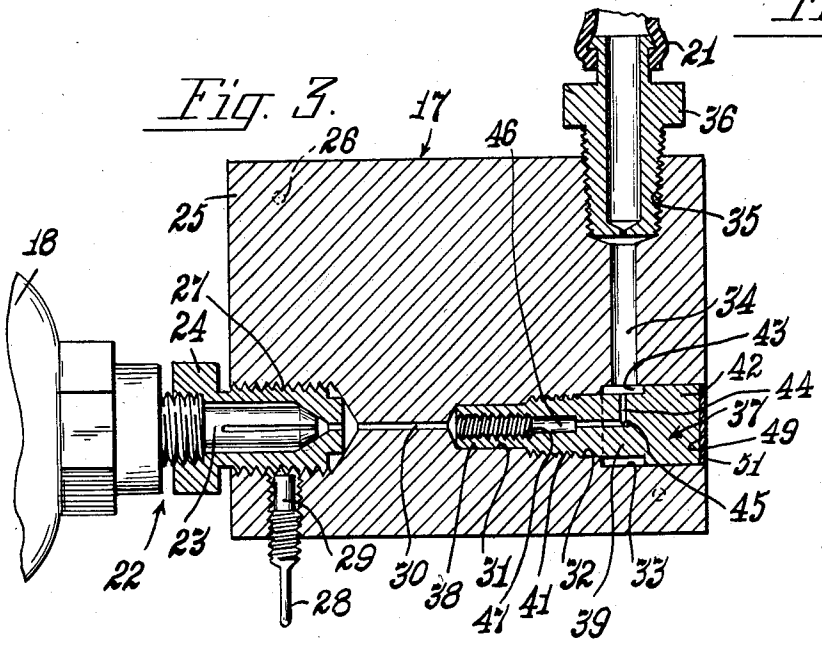


Fig. 2.

Fig. 3.



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Fig. 4.

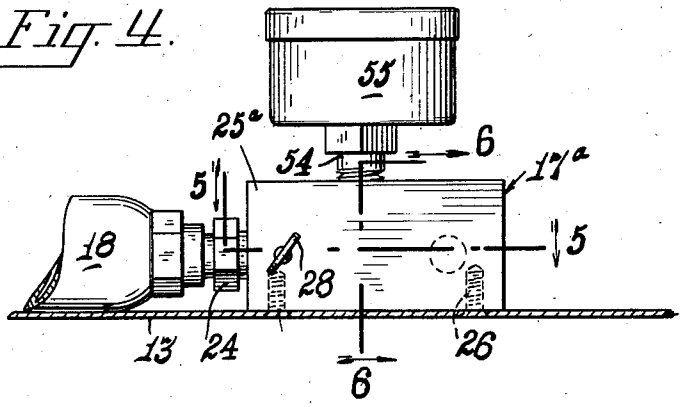


Fig. 5.

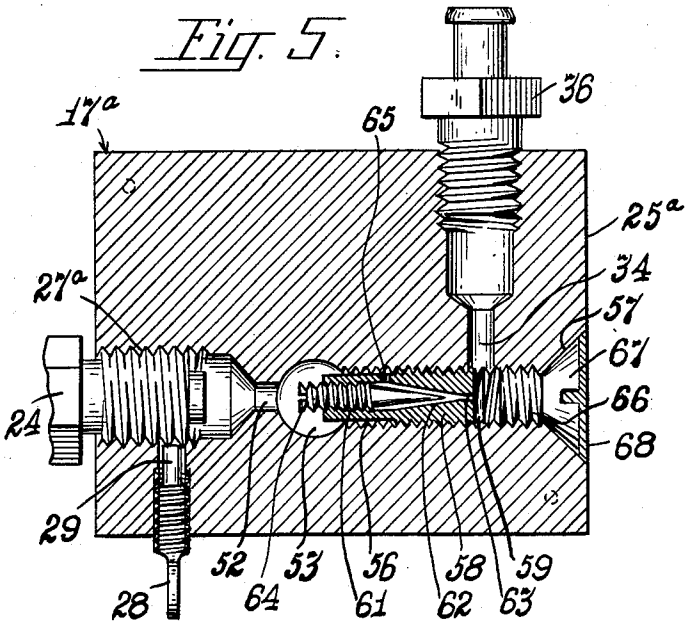
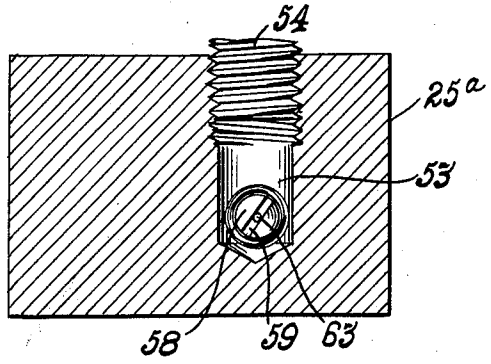


Fig. 6



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PORTABLE INHALATOR

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Application June 19, 1957, Serial No. 666,546

11 Claims. (Cl. 128—203)

This invention relates to improvements in inhalators and more particularly to the novel construction and assembly of a portable inhalator or respirator of a character adapted to accommodate a small-size standard type of pressurized oxygen cylinder.

The embodiment of the apparatus illustrated in the accompanying drawing is comprised of a shallow substantially rectangular carrying case in which is mounted firmly a novelly constructed turbulator and flow-control unit having a mounting opening in the body thereof to receive the usual valve control fitting, which may be externally threaded, mounted on the end of an oxygen cylinder which is also contained in the carrying case. The carrying case preferably is of sufficient size to permit the usual face mask and its flexible hose connection to be stored therein thus providing a compact assembly that may be transported easily and be set up for use quickly and with a minimum of effort. Furthermore, the flow control unit includes novel means to prevent unauthorized manipulation of or tampering with a turbulator or flow-control element mounted in the body thereof.

Portable inhalators are old in the art; however inhalators of known types require the high degree of skill of persons trained in the use of medical oxygen equipment for their operation. The portable inhalator described and claimed herein is suitable for use by non-technical personnel, such as athletes, operators of small gymnasiums and the like, motorists and truck drivers, operators of small aircraft, and others without technical training in the use and operation of medical oxygen equipment. The invention is light enough in weight and small enough in size to be conveniently and easily transported and stored; it is inexpensive in manufacture; it is pre-set in oxygen flow, and free from sensitive manipulation in operation.

The object of this invention is to provide a portable inhalator which is light in weight, compact and is easily set up for use or stored.

Another object is to provide a novel carrying case and a novel flow-control unit mounted firmly therein and arranged to receive and mount an oxygen cylinder in communication therewith.

Still another object is to provide a flow-control unit with novel means to prevent tampering with a novel flow-control element therein.

A further object is to provide a portable inhalator of the character described which is compactly arranged, light in weight, inexpensive to construct and assemble, safe in operation, and very efficient in use.

With the foregoing and such other objects in view, which will appear as the description proceeds, the invention consists of certain novel features of construction, arrangement and combination of parts hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in form, proportion, size and minor details of the structure may be made without departing from the spirit of the invention.

Referring to the drawings in which the same characters of reference are employed to identify corresponding parts:

Figure 1 is a perspective view of a portable inhalator embodying the present invention, showing a portion of its carrying case broken away.

Figure 2 is a vertical sectional view taken substantially along line 2—2 of Figure 1.

Figure 3 is an enlarged horizontal detail sectional view through the flow-control unit and showing a portion of the attached cylinder valve control fitting in section, taken substantially along line 3—3 of Figure 2.

Figure 4 is a view similar to Figure 2, showing a modified form of construction.

Figure 5 is an enlarged horizontal sectional view taken substantially on line 5—5 of Figure 4.

Figure 6 is an enlarged vertical sectional view taken substantially on line 6—6 of Figure 4.

Referring to the accompanying drawings, the inhalator is mounted within a suitable carrying case 11, which, in the present disclosure, comprises a shallow substantially rectangular main body portion 12 including a bottom wall 13, side walls 14 and end walls 15. A cover 16 having a perimeter flange thereon may be hinged or otherwise connected to the body portion 12, or it may be entirely removable therefrom.

Mounted within the carrying case is a mounting or flow-control assembly 17, a fluid cylinder 18, a mask 19 and its connecting hose 21. The mask, hose and fluid cylinder are of types commercially available, and, as best shown in Figure 2, the cylinder, which in this instance may contain liquified oxygen at an initial pressure of about 1800 pounds, has a normally closed valved outlet fixture 22 which includes a valve element 23 and a relatively movable closure fitting 24 which also serves as means to mount the cylinder on the flow-control assembly in a manner to be described presently.

The flow-control assembly includes a body 25 which is firmly secured to the inside face of the bottom wall 13 and adjacent to one end in any suitable manner such as, for example, by means of screws 26. In the embodiment of the flow-control assembly shown in detail in Figures 2 and 3, the body 25 has flow passageways therein (described in detail hereinafter) formed at their ends to receive fixtures or fittings for connecting the fluid cylinder 18 and the hose 21 thereto and in communication with each other through the flow passageways.

Referring to Figure 3, one end of the body 25 has a tapped opening 27, opening onto one end face thereof and adapted to receive, threaded therein, the externally threaded end of the closure fitting 24 so as to mount the cylinder 18 on the body in the position best shown in Figure 1. The fitting 24 is secured against unintended displacement by a thumb screw 28 threaded into the body 25 from one side face thereof. Preferably, the thumb screw 28 cooperates with a plug 29 which may be comprised of nylon plastic and which bears on the threads of the fitting 24 so as not to cause damage thereto. To open and close the valved outlet 22 of the cylinder 18, the cylinder is rotated relative to the held fitting 24, as is well known in the art.

The inner end of the tapped opening 27 communicates with one end of a small bore 30 in the body 25. The other end of the bore 30 opens into a bore of progressively increasing diameters, as at 31, 32 and 33, the latter opening directly onto the other end face of the body 25. A discharge passageway 34, also provided in the body 25, extends perpendicular to and is in direct communication at its inner end with the larger bore 33. Its other end opens into an axially aligned tapped opening 35 adapted to receive a fitting 36 carried on the end of the mask hose 21.

Mounted within the multiple diameter bore **31, 32,** and **33** of the body **25** is a turbulator and flow-control element or plug **37**. This element is shown in Figure 3 and it has an end portion **38** of a diameter to fit snugly in the bore portion **31**. The bore portion **32** and the medial portion **39** of the element **37** have complemental threads **41** for mounting the element **37** in place. The other end portion **42** of said element **37** has a snug fit in the larger bore portion **33**. As shown, said end portion **42** is considerably shorter than the length of the complemental bore portion **33** so as to provide an annular space **43** in direct communication with the perpendicular discharge passageway **34**.

The flow-control element **37** has a radial port **44** of small diameter opening onto the circumferential surface of the element in the area of the annular space **43**. Its other, or inner, end is in direct communication with the axial passageway **45**, of the same or substantially the same diameter, provided in the element **37**. A second axial passageway **46**, of a diameter larger than the diameter of the passageway **45**, is formed in the element **37** in communication at one end with the passageway **45** and at its other end with the axially aligned passageway **30** in the body **25**. A portion at least of the circumferential wall of the axial passageway **46** is formed with an uneven surface preferably in the form of circular undulations or ridges which may be provided by internals threads **47**.

The turbulator and flow-control structure is such that fluid flowing under pressure into the bore **30**, when the valve element **22** is open, is restricted during such passage. However, upon reaching the passageway **46** the fluid expands and at the same time it is turbulated by reason of the undulations or ridges **47** and this turbulated fluid then flows through the restricted passageway **45** and **44** and then into the enlarged discharge passage **34**. As it leaves the enlarged discharge passage **34**, through a restricted port **48** in the fitting **36**, it is again reduced in volumetric flow but its pressure is considerably increased, thus projecting into the large passageway defined by the hose **21**, a fluid flow which has been turbulated or otherwise disturbed sufficiently to insure that it is rendered entirely gaseous and that no liquid particles remain.

In order to prevent tampering with the flow-control element **37** its outermost face **49** is set inwardly of the plane of the corresponding face of the body **25** and a layer of cold solder **51** or the like is then placed in the circular well or recess defined by the insetting of said element. This comprises adequate means to prevent unauthorized manipulation of the flow-control element **37** in an attempt to regulate the fluid flow which is regulated entirely by manipulation of the conventional valve means **22** on the pressurized cylinder **18**. This means that, therefore, there is no danger of a person receiving too much or too little fluid or of the flow-control element **37** being blown out of the flow-control block **17** and thus rendering the entire apparatus useless.

In the embodiment of the flow control assembly **17***a* shown in Figures 4, 5, and 6, the body **25***a* has a tapped opening **27***a* opening onto one end face thereof to mount the externally threaded closure fitting **24** of the oxygen cylinder **18**. This tapped opening terminates at its inner end in a small orifice **52** which opens into a vertical well **53**, the upper end of which is tapped to receive the threaded mounting stem **54** of a pressure gauge **55**. A tapped bore **56** also opens at one end into the well **53** and terminates at its other end in a countersink **57** on the other end face of the body **25***a*. This tapped bore has threaded therein a flow control element or valve fixture including a nipple **58** which is externally threaded at one end portion only, as shown. The nipple **58** preferably has a screw driver slot **59** in one end and its other end has an internally threaded bore **61** which terminates in a valve seat **62** having a small diameter passageway **63**

leading from it to the slotted end of the nipple. A needle valve stem **64** is threaded into the tapped bore **61** and is pre-adjusted to provide the desired flow passage through the passageway **63** for oxygen or other fluid admitted thereinto through a radial port **65** which is in flow communication with the well **53** by reason of the absence of external threads on the one end portion of the nipple **58**. The fluid flowing toward the radial port **65** is turbulated as it advances across the internal threads of the bore **56** toward the port **65**.

Access to the pre-adjusted valve fixture **58—64** and manipulation thereof is normally prevented by the presence of a screw plug **66** having a tapered slotted head **67** which is seated in the countersink **57**. If desired, a covering layer of soft material such as cold solder **68** is arranged over the head **67** to prevent tampering. The spaced relationship between the slotted end of the valve fixture nipple **58** and the opposed inner end of the screw plug **66** may be fixed at the time of assembly so as to increase or decrease the volumetric capacity of the intervening space and thereby regulate the pressure under which the liquid flows into the hose fitting **36**.

As many posisble embodiments may be made in the invention, and as many changes may be made in the embodiments above set forth, it is to be understood that all matters hereinbefore set forth or shown in the accompanying drawings are to be interpreted as illustrative and not in a limiting sense.

Having thus described the invention, what is claimed as new and desired to be secured by United States Letters Patent is the following:

1. A portable inhalator comprising a flow-control unit, a pressurized fluid cylinder having a valved outlet mounted on and in communication with the flow-control unit, said valved outlet having a portion locked firmly in the flow-control unit so as to open and close the valved outlet by manipulation of the cylinder, a hose and mask assembly in flow communication with the flow-control unit, a flow-control turbulator plug mounted in the flow-control unit having passageways through which fluid flowing through the unit passes, and means sealing said turbulator plug in place.

2. A portable inhalator comprising a case, a flow-control unit mounted within and adjacent to one end of the case, a pressurized fluid cylinder having a valved outlet mounted within the case and in communication with the flow-control unit, a portion of the valved outlet on the cylinder being locked firmly in the flow-control unit so that opening and closing of the valved outlet is effected by manipulation of the cylinder only, a hose and mask assembly in flow communication with the flow-control unit, a flow-control turbulator plug mounted in the flow-control unit having passageways through which the fluid flowing through the unit passes, and means sealing said turbulator plug in place.

3. A portable inhalator comprising a carrying case, a flow-control unit mounted within the case, means securing it in place thereon, a pressurized fluid cylinder having a valved outlet mounted within the case on and in communication with the flow-control unit, means to lock the valved outlet firmly in the flow-control unit so that opening and closing of the valved outlet is effected by manipulation of the cylinder, hose and mask assembly in said case mounted on and in flow communication with the flow-control unit, a flow-control element removably mounted in the flow-control unit and through which fluid flowing through the unit passes, and means sealing said flow-control element in place.

4. A portable inhalator of the kind adapted to have mounted in association therewith a pressurized fluid cylinder having a valved outlet including an externally threaded valve control element, a flow-control unit, a case mounting the flow-control unit, said case being of sufficient dimensions to accommodate the cylinder therein, a tapped opening in said unit into which the externally

threaded valve control element is threaded, means to secure said control element against displacement when the cylinder is rotated relative thereto to open and close the valve, said means including a nylon element arranged for direct engagement with the threads on the valve control element, a flow-control member in the flow-control unit, a passageway in the flow-control unit communicating at one end with the tapped opening and at its other end with the flow-control member, said member having a passageway therethrough in communication with the passageway in the flow-control unit and with a discharge passageway, means in the flow-control member passageway to turbulate fluids flowing therethrough and to restrict the rate of flow therethrough, and means sealing said flow-control member within the unit to prevent tampering therewith.

5. A portable inhalator of the kind adapted to have mounted in association therewith a pressurized fluid cylinder having a valved outlet including an externally threaded valve control element, a flow-control unit, a case mounting the flow-control unit, said case being of sufficient dimensions to accommodate the cylinder therein, a tapped opening in said unit into which the externally threaded valve control element is threaded, means to secure said control element against displacement when the cylinder is moved relative thereto to open and close the valve, a flow-control member in the flow control unit, a passageway in the flow-control unit communicating at one end with the tapped opening and at its other end with the flow-control member, said member having a passageway therethrough in communication with the passageway in the flow-control unit and with a discharge passageway, means in the flow-control member passageway to turbulate fluids flowing therethrough, and means sealing said flow-control member within the element to prevent tampering therewith.

6. A portable inhalator of the kind adapted to have mounted in association therewith a fluid pressure cylinder having a valved outlet including a valve control element, a flow-control unit, a case mounting the flow-control unit, said case being of sufficient dimensions to accommodate the cylinder therein, an opening in said unit in which the valve control element is mounted, means to secure said control element against displacement when the cylinder is turned relative thereto to open and close the valve, a flow-control plug in the flow-control unit, a passageway in the flow-control unit communicating at one end with the said opening and at its other end with the flow-control plug, said plug having a passageway therethrough in communication with the passageway in the flow-control unit and with a discharge passageway, means in the flow-control plug passageway to turbulate fluid flowing therethrough, and means sealing said flow-control plug within the element to prevent tampering therewith.

7. A portable inhalator comprising a pressurized fluid cylinder having a valved outlet including a valve control element, a flow-control unit, an opening in said unit in which the valve control element is secured, a flow-control member mounted in the flow-control unit, a passageway in the flow-control unit communicating at one end with the said opening and at its other end with the flow-control member, said member having a passageway therethrough in communication with the passageway in the flow-control unit and with a discharge passageway, means in the flow-control member passageway to turbulate fluids flowing therethrough, said member having a surface located inwardly from the related surface of the element to define a well, and a layer of material formed in the well to prevent tampering with the flow-control member.

8. A portable inhalator of the kind adapted to have mounted in association therewith a pressurized fluid cylinder having a valved outlet including an externally threaded valve control element, a flow-control unit, a case mounting the flow-control unit, said case being of sufficient dimensions to accommodate the cylinder therein, a tapped opening in said unit into which the externally threaded valve control element is threaded, means to secure said control element against displacement when the cylinder is rotated relative thereto to open and close the valve, said means including a nylon element arranged for direct engagement with the valve control element, a flow-control member in the flow-control unit, a passageway in the flow-control unit communicating at one end with the tapped opening and at its other end with the flow-control member, said member having a passageway therethrough in communication with the passageway in the flow-control unit and with a discharge passageway, means in the flow-control member passageway to turbulate fluid flowing therethrough and to restrict the rate of flow therethrough, said member having a surface located inwardly from the related surface of the unit to define a well, and means filling said well to prevent tampering with the member.

9. A portable inhalator comprising a pressurized fluid cylinder having a valved outlet including a valve control element, a flow-control unit, an opening in said unit in which the valve control element is secured, means to secure said control element against displacement when the cylinder is rotated relative thereto to open and close the valve, a flow-control member in the flow-control unit, a passageway in the flow-control unit communicating at one end with the said opening and at its other end with the flow-control member, said member having a passageway therethrough in communication with the passageway in the flow-control unit and with a discharge passageway, annular undulations in the flow-control member passageway to turbulate fluids flowing therethrough, said member having a surface located inwardly from the related surface of the element to define a well, and a layer of cold solder in the well to conceal and prevent tampering with the member.

10. A portable innhalator comprising a flow-control unit, a pressurized fluid cylinder having a valved outlet mounted on and in communication with the flow-control unit, said valved outlet having a portion locked firmly in the flow-control unit so as to open and close the valved outlet by manipulation of the cylinder, a hose and mask assembly in flow communication with the flow-control unit, a flow-control plug mounted in the flow-control unit having passageways through which fluid flowing through the unit passes, and means sealing said plug in place.

11. A portable inhalator comprising a flow-control unit, a pressurized fluid cylinder having a valved outlet mounted on and in communication with the flow-control unit, said valved outlet having a portion locked firmly in the flow-control unit so as to open and close the valved outlet by manipulation of the cylinder, a hose and mask assembly in flow communication with the flow-control unit, and a flow-control plug mounted in the flow-control unit having passageways through which fluid flowing through the unit passes.

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