May 8, 1945. H. G. DAVIS 2,375,215

ATOMIZER

Filed July 29, 1941

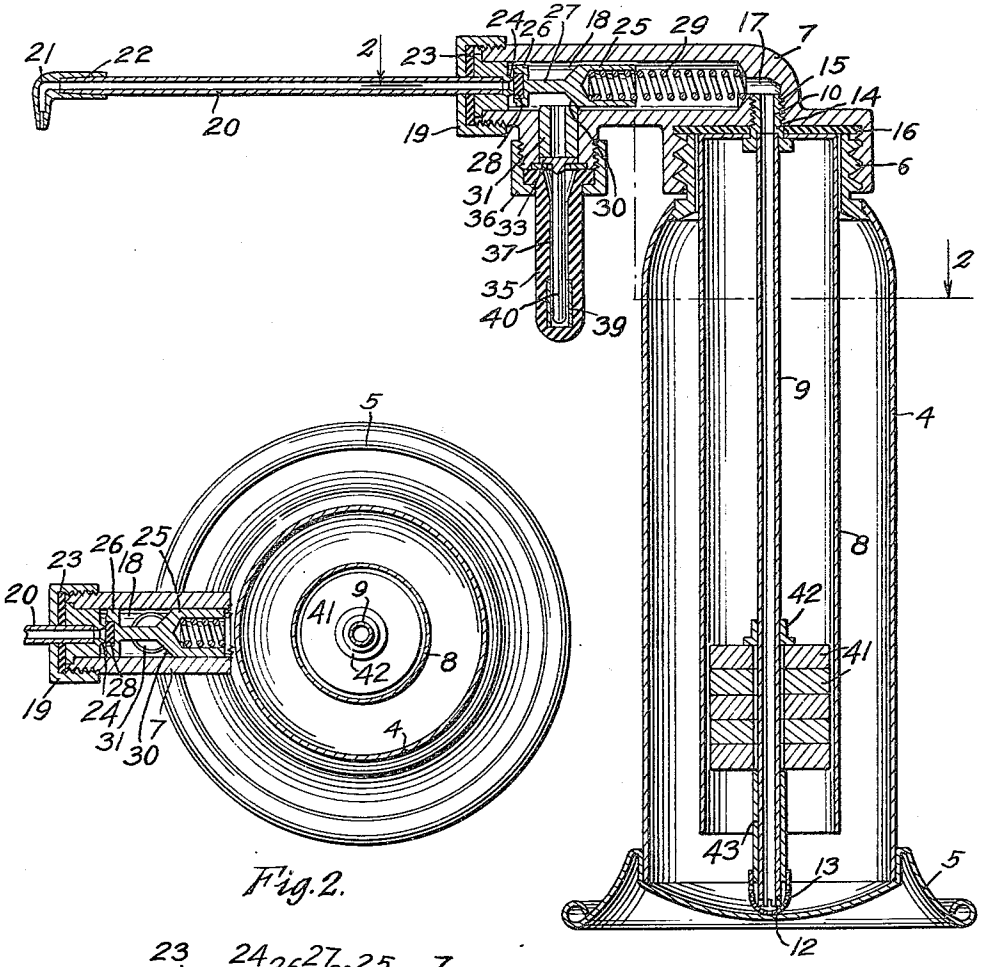


Fig. 1.

Fig. 2.

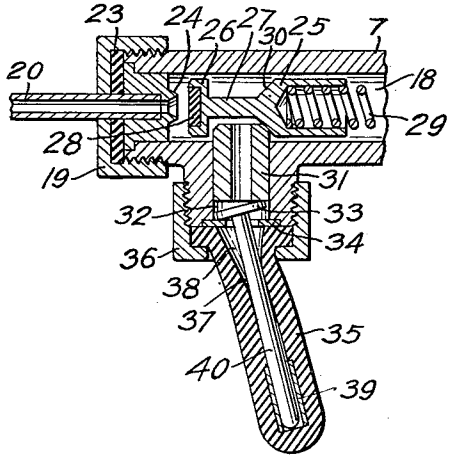


Fig. 3.

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Patented May 8, 1945

2,375,215

UNITED STATES PATENT OFFICE

2,375,215

ATOMIZER

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Application July 29, 1941, Serial No. 404,504

12 Claims. (Cl. 299—95)

This invention relates to atomizers, and more particularly relates to atomizers adapted for therapeutic purposes.

Heretofore in the atomizer art, it has been customary to introduce a measured quantity of liquid into a container, and then either introduce a measured quantity of gas into such liquid, or introduce a gas-evolving chemical into the liquid which will produce a measured quantity of gas in such liquid.

In either event, the result is that a uniform quantity of gas is mixed with a uniform quantity of liquid through a succession of operations.

It is an object of the present invention to provide a simple, durable, and efficient atomizer, the component parts of which are readily removable and easily cleaned.

Another object of the invention is the provision of means for selectively varying the amount of gas mixed with liquid within such an atomizer during repeated fillings thereof.

A further object of the invention is to provide a positive discharge control means mounted for universal movement permitting actuation of the atomizer by movement of such means in any direction.

Still another object of the invention is to provide a means for introducing a gas-evolving composition into the liquid body within such an atomizer in dry condition and its maintenance within such liquid body in dry condition until actuation by the operator to initiate the gas-evolving action.

A still further object of the invention is to provide a simple and efficient atomizer design capable of embodiment in a variety of materials such as metals and glass.

Other objects reside in novel details of construction and novel combinations and arrangements of parts all of which will appear more fully in the course of the following description:

To facilitate understanding of the invention, reference is now made to the accompanying drawing illustrating an embodiment of the invention. In the drawing, in the several views of which like parts have been designated similarly,

Fig. 1 is a vertical central section through an atomizer embodying the features of the present invention,

Fig. 2 is a developed section taken along the line 2—2 of Fig. 1, and

Fig. 3 is a fragmentary central section drawn to an enlarged scale and illustrating the actuating mechanism of Fig. 1 in its operative position.

The atomizer of the present invention comprises a cylindrical body 4 preferably having a base 5 on which the body 4 will stand in an upright position. At its top the body 4 is threaded as indicated at 6 to permit attachment of a control assembly comprising combined nozzle, valve housing and actuating member designated generally by the reference numeral 7.

Member 7 carries a depending tube or cylinder 8 adapted to extend into body 4 when member 7 is screwed upon thread 6. A conduit 9 communicating with a port 10 is carried on member 7 within tube 8 and at its lower end has an intake 12 covered by a screen 13.

The bore 10 preferably is provided in a hollow packing nut 14 maintained in threaded engagement with a threaded opening 15 in member 7 and acting as the support for the conduit 9 extending through the tubular enclosure 8. A gasket 16 preferably of rubber is seated in member 7 at the end of opening 15 for engagement with the end of tube 8 under pressure from packing nut 14.

At its upper end bore 10 opens into a laterally extending bore 17 in member 7 which acts as an extension of a cylindrical recess or passage 18 therein. At the end of recess 18 opposite port 17 a threaded cap member 19 is mounted on member 7 and carries a discharge nozzle comprising a conduit portion 20 and a nozzle element 21 preferably mounted for rotation on conduit 20 through a friction-fit as illustrated at 22. A suitable gasket 23 preferably of rubber composition is mounted in cap 19 to prevent any gas escaping when the cap is fastened on member 7.

The inner end of conduit 20 preferably terminates in an annular projection of the knife-edge type as illustrated at 24 to form a valve seat.

A slide valve is positioned in recess 18 and preferably comprises a hollow body member 25 of hexagonal cross section supporting a head or valve portion 26 on a neck member 27. The head 26 carries a resilient gasket 28 normally held against the annular projection 24 by the action of a spring 29 mounted within the hollow portion of body 25 and bearing against the opposite end of recess portion 18. The flat sides of the hexagonal body member provide for the passage of fluid between the member and the wall of the passage 18.

The surface of hexagonal body portion 25, which joins with neck 27, is tapered at 30 (Figs. 2 and 3) and engages a hollow piston element 31 fitted within a downwardly extending cylindrical recess 32 in member 7. The cylinder 31 rests upon a tappet member 33 seated on a disc 34 held between an end portion of member 7 and a resilient trigger member 35 by a screw cap or collar

36, the trigger member and screw cap retaining the piston 31 and the tappet 33 in their positions in the valve housing as a valve actuating assembly.

The trigger member 36 preferably is composed of rubber to seal the recess 32 and also to provide the desired degree of flexure and has a bore 37 extending substantially throughout the length thereof and preferably tapered at its upper end as illustrated at 38 in Fig. 3. A cylindrical sleeve or bearing 39 is fitted in the lower end of bore 37 for engagement with the lower end of the rod 40 of tappet member 33 which is completely covered by the member 35. The members 33 and 35 thus constitute a trigger assembly, the member 33 being biased to its normal position both by the member 35 and the spring 29.

When it is desired to operate the atomizer the body 4, which acts as a reservoir, is filled with liquid, usually water. Due to an arrangement hereinafter to be described, a measured amount of liquid is not required in the reservoir.

While the member 7 is detached from body 4, a predetermined number of discs 41 of a gas-evolving composition are inserted on the lower end of conduit 9 and held within tubular enclosure 8 by a sleeve element 43 inserted on the end of conduit 9 co-acting with a stop member 42 held on rod 49 in spaced relation thereto. If desired, sleeve 43 and screen 13 may be made integrally; although for certain purposes it will be desirable to have interchangeable sleeve elements 43 of different lengths on which the screen 13 can be mountd by a friction-fit.

As the discs 41 are located within tube 8, they will be protected by an air seal against contact with the liquid so long as tube 8 is moved into reservoir 4 in a substantially vertical direction. At the same time, excess liquid in reservoir 4 will be displaced by insertion of tube 8 into the liquid and as no gas is evolved during this operation, it serves as a control for maintaining a uniform level. When this has been done and the connection between reservoir 4 and member 7 has been sealed by screwing the latter tightly on threaded connection 6, the atomizer is in condition for gas generating action.

To accomplish this the operator tips the reservoir sufficiently to allow the gas in the air pocket in the lower end of tube 8 to escape into reservoir 4 and escaping gas is displaced by liquid from the reservoir which moves into contact with discs 41 initiating the gas-evolving action. As this action proceeds the discs disintegrate and eventually completely dissolve.

The evolved gases rise to the top of the cylindrical container and form a pressure medium to force liquid into conduit 9 and thence through bores 10 and 17 into the cylindrical recess 18 where they escape past the body 25 of the slide valve due to its non-cylindrical shape and thus fill recess 18.

Thereafter any movement of trigger 35 will cause tappet member 33 to tilt on its seat 34 lifting piston 31 which thereupon moves the slide valve against the compression of the spring 29 and permits the fluid, subject to the pressure of the gas within container 4, to escape through conduit 20 and nozzle 21.

Upon release of pressure on trigger 35, the spring returns the slide valve to its closing position against conduit 20 and piston 31 assumes a normal position in recess 32.

When the slide valve is in closed position, the atomizer is effectively sealed against the escape of gas by the combined action of spring 29 and the pressure of the gas and the contents may stand for relatively long periods without use, free from any appreciable deterioration.

The atomizer of the present invention is particularly suited for therapeutic uses particularly in the treatment of the mouth, nose, throat, and ears. Apart from this, the atomizer design is also suited for other purposes such as spray painting, force lubrication, and the like.

In its use as an atomizer, the gas-evolving action may be produced by a number of compositions. However, it has long been known that carbon dioxide has a beneficial action in the treatment of many parts of the body and the discs 41 preferably are a composition which evolves carbon dioxide gas upon introduction into water. For example, a mixture of sodium bicarbonate and tartaric acid may be pressed into tablets of the desired size and on mixture with the water will produce the desired effervescing condition. By using weighed amounts of the composition in the production of the tablets or discs a uniform quantity of gas will be evolved by each such disc.

Therefore, when more or less gas is required in connection with a given filling of the atomizer, the number of discs inserted on conduit 9 will be increased or decreased according to the requirements. By suitable instruction the operator knows the gas pressure within the container that will be developed for a given filling and particularly in its uses by doctors and dentists this feature is of considerable importance as for one purpose a light gas pressure may be desired while for another a much greater pressure will be necessary.

Additionally the discs 41 may include various ingredients employed for their medicinal properties such as iodine, mercurochrome, and the like. The gas-generating action serves to dissolve such compositions and thoroughly mix the same prior to discharge from nozzle 21. For the above stated reasons the present invention is well suited for a variety of therapeutic purposes.

It will be observed that the component elements constituting the assembly are readily removed and easily cleaned or sterilized. Likewise, where the atomizer is used for a variety of treatments, the nozzle portion is readily removable independently of the other components and one nozzle 21 may be readily substituted for another of a different form or removed for cleaning and sterilizing without disturbing the contents and without removal of the other parts.

The provision of the stop means 42 in tube 8 serves to prevent excessive gas production as its position on conduit 9 is determined with reference to the maximum gas containing capacity of the atomizer. Under these conditions the insertion of a lesser quantity of discs 41 than the maximum capacity of the lower portion of tube 8 always insures the gas content being held within safe limits.

This is particularly valuable when the body or reservoir 4 is formed of glass or other destructible composition as sometimes may be required for commercial purposes.

While the invention has been described with reference to a reduction to practice found best suited for present purposes, it is obvious that various structural changes may be resorted to within the spirit and scope of the invention. Thus the tube 8 may be a separate and distinct element which can be inserted through the suitable opening in bottom plate 5 rather than attached

to cap element 7. Similarly it might be inserted into reservoir 4 from the top and held in the neck of the reservoir by a friction-fit rather than by attachment to member 7.

The slide valve also is capable of embodiment in a variety of forms, but the present design has been found to provide a positive closing action and free movement in the actuation of the trigger element.

Where the composition of materials of the component parts have been described, such materials are referred to merely for purposes of illustration and it will be understood that other materials capable of functioning similarly may be substituted therefor within the spirit and scope of the invention.

What I claim and desire to secure by Letters Patent is:

1. In apparatus of the character described, a container for liquid having a top opening communicating with a discharge outlet, said container being normally held in an upright position, a conduit extending from said top opening into the lower portion of the container and having an intake opening for the liquid at its lower end, an imperforate tube extending into the container and having its lower end open, and an effervescent composition held within the lower portion of the tube in partitioning relation thereto to provide an air pocket in the lower end of the tube maintaining said composition in dry condition while the container is held in upright position.

2. In apparatus of the character described, a container for liquid having a top opening communicating with a discharge outlet, said container being normally held in an upright position, a conduit extending from said top opening into the lower portion of the container and having an intake opening for the liquid at its lower end, an imperforate tube extending into the container and having its lower end open, a plurality of tablets of effervescent composition held within the lower portion of the tube and in spaced relation to its end to provide an air pocket maintaining said composition in dry condition while the container is held in upright position, and a stop member located within the tube to limit the number of tablets that can be so positioned within the tube.

3. In atomizers, in which a pressure fluid is discharged through a restricted outlet by the opening of a valve, the improvement which comprises a valve housing having a slide valve arranged therein and normally closing the restricted outlet and having a tapered surface, a compression spring acting on said slide valve for holding the same in the outlet closing position, said housing having a recess therein and a piston disposed in said recess at substantially right angles to the slide valve and engaging its tapered surface, an actuating member for said piston extending laterally from said housing, and means including a flexible cover enclosing said actuating member for sealing said recess and for affording movement of said member, said last mentioned means being constructed and arranged to retain said piston and said actuating member in their positions in said housing.

4. In atomizers, in which a pressure fluid is discharged through a restricted outlet by the opening of a valve, the improvement which comprises a valve housing having a slide valve arranged therein and normally closing the restricted outlet and having a tapered surface, a compression spring acting on said slide valve for holding the same in the outlet closing position, said housing having a recess therein and a piston disposed in said recess at substantially right angles to the slide valve and engaging its tapered surface, a tappet-member extending laterally from said housing and against which the piston seats, and a flexible cover for the tappet member for sealing said recess to prevent escape of the pressure fluid and for permitting tilting of the tappet to actuate the piston and move the valve away from the outlet against the compression of the spring.

5. In atomizers having an upright body portion acting as a container for liquid, the improvement which comprises a normally upright tube having its top end closed and its bottom end open and containing a dry effervescent composition at a distance from its bottom disposed within the container in depending relation to its top portion, said tube being arranged to discharge surplus liquid from the container by displacement during insertion into the container and maintaining an air seal between the liquid and the effervescent composition during said inserting movement.

6. In atomizers, in which a pressure fluid is discharged from a reservoir through a restricted outlet in a nozzle by the opening of a valve, the improvement which comprises a horizontally-disposed body having a small bore providing a fluid-conducting passage between the reservoir and the nozzle, and having a cylindrical recess of greater diameter than the passage intermediate the ends of the passage, a valve member supported in the recess for sliding movement therealong, said member comprising a hollow body portion and a head extending therefrom in a position to seal the nozzle end of the bore, an exterior surface of the body between its hollow portion and the head being conical, pressure means acting on the hollow interior of the body for urging the head into sealing engagement with the nozzle end of the bore, a cylindrical recess in the body in radial alinement with the conical surface, a piston therein, and means for extending the piston into progressive engagement with the conical surface to thereby slide the valve against the resistance of the pressure means to a bore-opening position.

7. In atomizers, in which a pressure fluid is discharged from a reservoir through a restricted outlet in a nozzle by the opening of a valve, the improvement which comprises a horizontally-disposed body having a small bore providing a fluid-conducting passage between the reservoir and the nozzle, and having a cylindrical recess of greater diameter than the passage intermediate the ends of the passage, a valve member supported in the recess for sliding movement therealong, said member comprising a hollow body portion and a head extending therefrom in a position to seal the nozzle end of the bore, an exterior surface of the body between its hollow portion and the head being conical, a spring acting on the hollow interior of the body for urging the head into sealing engagement with the nozzle end of the bore, a cylindrical recess in the body in radial alinement with the conical surface, a piston therein, and means for extending the piston into progresive engagement with the conical surface to thereby slide the valve against the resistance of the spring to a bore-opening position.

8. In atomizers, in which a pressure fluid is discharged from a reservoir through a restricted outlet in a nozzle by the opening of a valve, the

improvement which comprises a horizontally-disposed body having a small bore providing a fluid-conducting passage between the reservoir and the nozzle, and having a cylindrical recess of greater diameter than the passage intermediate the ends of the passage, a valve member supported in the recess for sliding movement therealong, said member comprising a hollow body portion and a head extending therefrom in a position to seal the nozzle end of the bore, an exterior surface of the body between its hollow portion and the head being conical, pressure means acting on the hollow interior of the body for urging the head into sealing engagement with the nozzle end of the bore, a cylindrical recess in the body in vertical alinement with the conical surface, a piston therein, and means for elevating the piston into progressive engagement with the conical surface to thereby slide the valve against the resistance of the pressure means to a bore-opening position.

9. In apparatus of the character described, a container for liquid having a top opening communicating with a discharge outlet, said container being normally held in an upright position, a conduit extending from said top opening into the lower portion of the container and having an intake opening for the liquid at its lower end, an imperforate tube extending into the container and having its lower end open, an effervescent composition held within the lower portion of the tube in partitioning relation thereto to provide an air pocket in the lower end of the tube maintaining said composition in dry condition while the container is held in upright position, and means for holding said effervescent composition at a distance from the lower end of the tube.

10. In apparatus of the character described, a container for liquid having a top opening communicating with a discharge outlet, said container being normally held in an upright position, a conduit extending from said top opening into the lower portion of the container and having an intake opening for the liquid at its lower end, an imperforate tube extending into the container and having its lower end open, an effervescent composition held within the lower portion of the tube in partitioning relation thereto to provide an air pocket in the lower end of the tube maintaining said composition in dry condition while the container is held in upright position, and means for holding said effervescent compositions in selective positions above the lower end of the tube.

11. An atomizer comprising a container for liquid normally held in an upright position and having an opening at its top, means including a control assembly for closing said opening, said assembly including a conduit opening into the lower portion of said container and having a discharge outlet exteriorly of the same, said assembly also including means for providing a downwardly opening enclosure within said container forming an air pocket and arranged to hold a quantity of gas-evolving composition normally out of contact with the liquid in the container, said composition being brought into contact with the liquid upon tipping of the container to initiate the gas evolving action, and means including a valve in said assembly for controlling the discharge of liquid from said container under the pressure of the evolved gas.

12. In atomizers in which a pressure fluid is discharged through a restricted outlet by the opening of a valve, the improvement which comprises a valve housing having a valve arranged therein and a spring biasing said valve to close the restricted outlet, said housing having a recess therein, a valve actuating assembly arranged in said recess and having an actuating member extending from said recess, said actuating member being arranged to open said valve upon lateral movement in any direction, means including a flexible cover enclosing said member for retaining said assembly in position in said recess and for sealing said recess to prevent leakage of the pressure fluid, and a bearing mounted in said cover for engagement with said actuating member, said cover having sufficient stiffness to bias said member to its central position.

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