

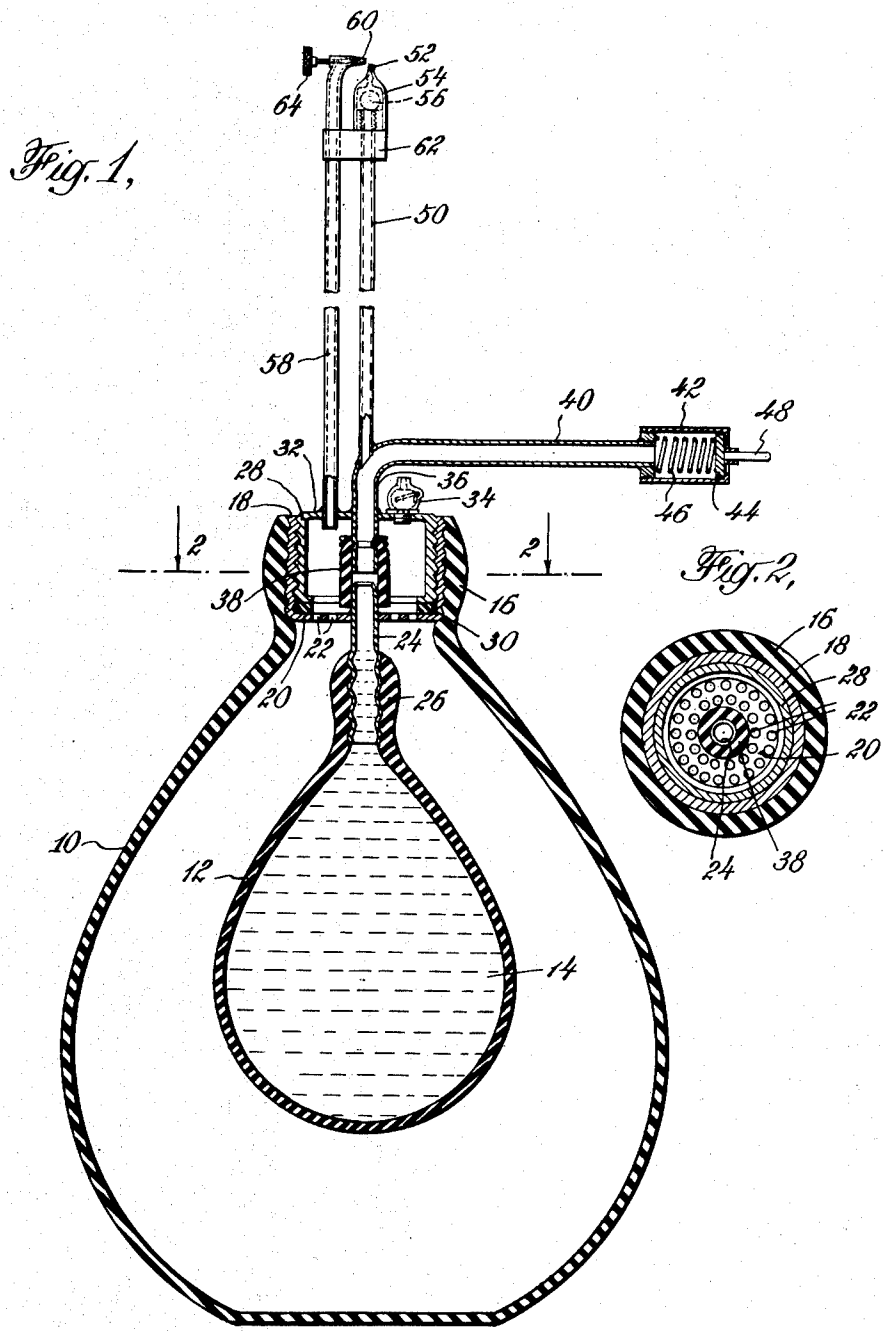
Oct. 13, 1953

N. C. INGELL

2,655,407

SELF-FILLING, HAND-OPERATED, ATOMIZER OR SPRAYING DEVICE

Filed Sept. 25, 1952



INVENTOR
NELSON CATLIN INGELL

BY
Permie Edwards, Martin, Barrow & Taylor
ATTORNEYS

UNITED STATES PATENT OFFICE

2,655,407

SELF - FILLING, HAND - OPERATED ATOMIZER OR SPRAYING DEVICE

Nelson Catlin Ingell, Brooklyn, N. Y.

Application September 25, 1952, Serial No. 311,357

8 Claims. (Cl. 299—89)

1

My invention relates to improvements in atomizers or spraying devices of the hand-operated type in which a current of air is forced across the end of a spray nozzle through which liquid is discharged and atomized.

Atomizers of this general type now in use comprise a container for the liquid to be sprayed and an air pump for forcing a current of air across the end of a nozzle connected into the liquid container. Such devices require the use of both hands of the operator. Furthermore, the container for the liquid must be provided with an opening, usually covered with a screw cap, by which liquid is poured into the container from a bottle or other supply. Spilling and waste of the liquid is a common result in handling such spraying devices or atomizers. This has resulted in recent years in wide spread use of aerosol pressure filled spray containers which are non-refillable and expensive.

The primary object of my invention is, therefore, to provide an inexpensive, hand-operated, self-filling atomizer or spraying device, which avoids the difficulties referred to above and which may be operated effectively by one hand.

A further object of my invention is to provide an atomizer or spraying device suitable for spraying liquids of any kind such as room deodorizers, insecticides, moth proofing compositions, detergents, coating compositions such as paints, lacquers and plastic solutions, or any other sprayable fluid mixture.

In accordance with my invention, I have discovered that a hand-operated atomizer or spraying device may be made in such a way that it is self-filling with the liquid to be sprayed and which is operable with one hand of the operator, thereby leaving the operator's other hand free to move or hold garden plants, flowers or other articles while they are being sprayed.

According to my invention, the improved atomizer comprises spaced outer and inner flexible self-distensible rubber bulbs, the inner bulb being located entirely inside the outer bulb and adapted to contain the liquid to be sprayed, while the outer bulb is adapted when compressed to supply air for atomizing the liquid in the inner bulb. In this construction, the neck of the outer bulb is provided with a connection including an air inlet and valve for admitting air to the outer bulb, an air tube for delivering air across a nozzle through which liquid is delivered by means of a spray tube connected into the inner bulb. The inner bulb includes a further connection provided with a liquid supply valve, normally spring biased to closed position, but operable upon being dipped in a body of liquid and operated by an exterior means, for admitting the liquid into the inner bulb when the latter expands from a collapsed condition. In this construction, the liquid-de-

2

livering tube or the nozzle connected therewith is provided with a check valve for preventing the admission of air to the inner bulb.

In the operation of this atomizer, the squeezing of the outer bulb by one hand of the operator compresses the air therein and thereby applies pressure to the outer surface of the inner bulb and to the liquid in the inner bulb forcing the liquid out through the liquid delivery nozzle, air being simultaneously forced across the end of the nozzle from the air delivery tube connected into the outer bulb. In the course of a spraying operation, the release of the outer bulb for the admission of air through the air valve inlet does not serve to release the inner bulb because of the valve closures referred to. Consequently, the inner bulb is continuously compressed and collapsed as hand pressure is intermittently applied to the outer bulb until all or substantially all of the liquid therein has been delivered to the spray nozzle.

In a preferred form of construction the outer flexible rubber bulb has a neck portion carrying a head structure including male and female couplings, the female coupling, for example, being mounted in fixed position in or on the neck portion and including an internally threaded or other type of coupling means, this female coupling being open at its outer end and provided at its inner end with a bottom plate provided with perforations or holes and having a tube rigidly mounted axially therein. The inner flexible rubber bulb has a neck portion secured to the inner end of said metal tube below the bottom plate. The male coupling is fitted in the female coupling in a fluid-tight manner and provided with a valved air inlet for the supply of air to the outer flexible bulb through the perforations. A second tube is carried by the male coupling having a fluid-tight removable connection with the tube carried by the female coupling, the outer end of this tube being provided with a valve having a spring biased closure means through which liquid is supplied to the inner bulb. A spray tube is connected into the liquid supply tube and terminates in a check valve and spray nozzle, while the air tube is carried by the male coupling and connects through the perforations with the outer bulb, the air tube terminating in an air delivery nozzle arranged to deliver a current of air across the end of the liquid spray nozzle.

When the atomizer is provided with the coupling members referred to above, the male coupling and the spray tubes carried thereby may be substituted for a similar attachment having either longer or shorter spray tubes adapted for a particular use. For example, long spray tubes are advantageous in the spraying of relatively large plants where the tubes may be thrust between the branches and leaves of the plant to

make sure of thorough coverage. A spray connection with long tubes has other uses such as delivering spraying fluid among clothes hanging in a closet or in a clothes bag.

Other features, objects and advantages of the improved atomizer or spray device of my invention are described hereinafter in greater detail in connection with the accompanying drawings forming a part of my application.

In the drawings:

Fig. 1 is an elevational view partly in vertical section showing a preferred form of atomizer constructed in accordance with my invention; and

Fig. 2 is a horizontal sectional view taken on the line 2--2 of Fig. 1.

Referring to the drawings, my improved atomizer comprises an outer flexible rubber bulb 10 and an inner flexible rubber bulb 12 of smaller size than the outer bulb and adapted to contain the liquid 14 to be sprayed or atomized by the device. The bulbs 10 and 12 are of a known type commonly used on syringes and similar devices and are normally self-distending when collapsed.

The bulb 10 includes a neck portion 16 in which is secured, by vulcanizing or cementing or otherwise, a female coupling 18 having an open top and a bottom plate 20 provided with holes or perforations 22. A short tube 24 is axially mounted in fixed position in the plate 20 and extends both above and below this plate, the lower extension being connected into the neck portion 26 of the bulb 12 and secured thereto.

The female coupling 18 is adapted to receive a male coupling 28 illustrated as connected to the female coupling by a threaded connection and sealed with respect thereto by a rubber gasket 30. The male coupling is open at the bottom and is closed at the top by a plate 32 provided with an air inlet connection including a check valve 34 for the admission of air into the outer bulb 10, this valve being arranged to prevent discharge of air when the bulb 10 is being collapsed. The plate 32 carries an axially extending tube 36 fixed in the plate and extending into the coupling 28 to a point a short distance from the upper end of the tube 24, the tube 26 being provided with a piece of rubber tubing 38 fastened thereto and having a portion adapted to extend over the upper end of the tube 24 in fluid-tight relation therewith when the couplings are in the positions shown in Fig. 1.

The tube 36 includes a portion 40 which extends laterally with respect to the portion 36, but which may extend in any convenient direction, to provide a liquid supply tube for the inner bulb 12. The tube portion 40 carries a valve 42 at its outer end having a closure means 44 biased to closed position by a compression spring 46, the closure means 44 being attached to a projecting plunger 48.

The liquid 14 to be sprayed is delivered through the tubes 24 and 36 into a spray tube 50 connected into the tube 36 and extending generally axially with respect to the bulbs and the couplings although it may extend in any direction. The tube 50 terminates in a liquid delivery nozzle 52 through which liquid is delivered from the bulb 12 and is provided with a non-return check valve 54 which may include a metal ball 56 adapted to prevent the entry of air into the tube 50. The valve 54 is arranged so that the ball 56 will be lifted by water pressure in the tube 50 and bulb 12 and will not prevent flow to the delivery nozzle 52.

Air for atomizing the liquid delivered through the nozzle 52 is supplied through an air tube 58, parallel to tube 50, connected through and fixed to the plate 32 of the male coupling in fluid-tight relation. The air tube 58 terminates in a nozzle 60, arranged in the position shown, for forcing a current of air across the end of the nozzle 52. The tubes 50 and 58 are held in fixed position with respect to each other at their outer ends by means of a clamping bracket 62, thereby insuring proper delivery of the air stream from the nozzle 60 across the open end of the nozzle 52. The nozzle portion 60 of the air tube 58 is provided with a needle valve 64 for regulating the air stream used in atomizing the liquid delivered through the nozzle 52. Liquids which are relatively more fluid than others may be suitably atomized by the use of a smaller stream of air than is necessary for more viscous liquids.

In operating the atomizer or spraying device shown in the drawings and described above, the liquid to be atomized and contained in a bottle or other container is supplied to chamber 12 by compressing the outer bulb 10 to in turn compress the inner bulb 12 until it is collapsed, thereby driving out all of the air in the bulb 12, assuming that it contained no liquid and was distended. In this condition, the valves 42 and 54 maintain the bulb 12 in collapsed condition, the spring 46 having sufficient strength to keep the closure 44 in closed position, even though the bulb 12 is completely collapsed. Now the operator with the bulb 10 in his hand inserts the tube 40 and the valve 42 into the liquid in the bottle or container at the same time engaging the plunger 48 against the wall of the container so as to open the valve 42 and permit the liquid to flow into the bulb 12 as it distends to the filled condition shown in Fig. 1, the liquid being sucked through the valve 42 and tubes 40, 36 and 24 into the bulb 12. During the filling of the bulb 12, the air replaced in the bulb 10 escapes freely through the nozzle 60.

Now on the application of hand pressure to the air bulb 10, the air inlet valve 34 closes and the air in bulb 10 is placed under pressure, thereby applying a pressure to the bulb 12 and the liquid therein forcing the liquid through the nozzle 52. At the same time, air is forced under pressure through the air tube 58 and the nozzle 60 to atomize the liquid delivered through the nozzle 52. In this operation the bulb 10 is alternately compressed and allowed to distend. When the bulb 12 is empty it remains collapsed and may be quickly refilled in the manner described above.

While the atomizer or spray device of the present invention has been described and illustrated in connection with the preferred embodiment shown in the drawings, it is to be understood that the device may be made without the removable head comprising coupling members 18 and 28 by providing a neck member which will include the proper tubes or passageways for the valve 34, the air tube 58 and the tube 36, which may be arranged directly in the neck of the bulb 12 without any intermediate removable connection. However, the removable connections provided by the couplings 18 and 28 and their associated elements provide a distinctly advantageous construction by which the spray tubes 50 and 58 may be changed. For example, relatively short tubes may be used for many kinds of spraying operations, while a separate head and coupling with long spray tubes may be desirable for

other spraying operations. The spray tubes may extend in the direction illustrated in the drawings or at any desired angle, while the filling tube 40 may extend axially with respect to the coupling 28. It is also to be understood that the male coupling may be fixed to the neck of bulb 10 while the female coupling is included in the removable part of the head structure.

The relative sizes of the flexible rubber bulbs 10 and 12, as shown in Fig. 1, may vary considerably from that shown in the drawings. In any case, there must be sufficient air space in the bulb 10 outside the bulb 12 to supply the required stream of air at the nozzle 60, it being desirable that the pressure applied to the bulb 12 results from the air pressure produced in the bulb 10. The bulbs may be of rubber or of other similar acting materials capable of the functions described for the bulbs 10 and 12.

The couplings 18 and 28 and the tubes 24, 36, 40, 50 and 58 are preferably made of metal, but may be made of other suitable materials.

What I claim is:

1. In an atomizer of the type including a nozzle for the delivery of the liquid to be atomized and an air delivery nozzle for forcing a current of air across the end of the liquid delivery nozzle, spaced outer and inner flexible self-distensible bulbs, the inner bulb being located entirely inside the outer bulb and adapted to contain the liquid to be atomized, means including an air inlet check valve for admitting air to the outer bulb, an air tube for delivering air from the outer bulb to the air delivery nozzle, a tube having a non-return valve therein for conducting liquid from the inner bulb to the liquid delivery nozzle, a filling tube connected into the inner bulb for delivering liquid thereto, a filling valve in said filling tube biased to closed position for preventing discharge of liquid from the inlet of the filling tube, and means for actuating the valve in the filling tube for admitting liquid thereto.

2. An atomizer as claimed in claim 1 in which said filling valve is located at the inlet end of the filling tube and said actuating means comprises an projection adapted to engage the wall of a container for liquid to be delivered through the filling tube.

3. In an atomizer of the type including a liquid delivery nozzle and an air delivery nozzle arranged for forcing a current of air across the end of the liquid delivery nozzle for atomizing the liquid delivered therethrough, spaced outer and inner flexible self-distensible bulbs, the inner bulb being located inside the outer bulb and adapted to contain the liquid to be atomized, the outer bulb being hand-operable and including a neck portion, a female coupling fixed in the neck portion, a male coupling removably engaging in the female coupling in a fluid-tight manner, means including a check valve carried by the male coupling for supplying air to the outer bulb, an air tube connected into the male coupling for delivering air from the outer bulb to the air delivery nozzle, a tubular connection carried by the female coupling and connected into the inner bulb, a liquid delivery tube carried by the male coupling having a removable fluid-tight connection with said tubular connection leading to the inner bulb and having a connection to the liquid delivery nozzle, whereby the application of hand pressure to the outer bulb compresses the air around the outer surface of the inner bulb thereby forcing liquid

therefrom to the liquid delivery nozzle and at the same time forces a current of air from the outer bulb through the air tube and across the end of the liquid delivery nozzle.

4. An atomizer as claimed in claim 3 in which the female coupling includes a perforated plate at its lower end, said tubular connection being fixed axially in said plate and including a portion extending above the plate.

5. An atomizer as claimed in claim 3, including a filling tube for liquid carried by the male coupling and connected into said tubular connection.

6. In an atomizer of the type including a liquid delivery nozzle and an air delivery nozzle arranged for forcing a current of air across the end of the liquid delivery nozzle for atomizing the liquid delivered therethrough, spaced outer and inner flexible self-distensible bulbs, the inner bulb being located inside the outer bulb and adapted to contain the liquid to be atomized, the outer bulb being hand-operable and including a neck portion, a head structure attached to said neck portion including a pair of separable coupling members one of which is fixed to said neck portion, means including a check valve carried by the other coupling member for supplying air to the outer bulb, an air tube connected into said other coupling member for delivering air from the outer bulb to the air delivery nozzle, a tubular connection carried by the coupling member fixed to said neck portion and connected into the inner bulb, a liquid delivery tube carried by said other coupling member having a removable fluid-tight connection with said tubular connection leading to the inner bulb and having a connection to the liquid delivery nozzle, whereby the application of hand pressure to the outer bulb compresses the air around the outer surface of the inner bulb thereby forcing liquid therefrom to the liquid delivery nozzle and at the same time forces a current of air from the outer bulb through the air delivery nozzle and across the end of the liquid delivery nozzle.

7. An atomizer as claimed in claim 6, including a filling tube for liquid carried by the removable coupling of the head structure and connected into said tubular connection.

8. An atomizer as claimed in claim 7, including a non-return valve in said liquid delivery tube, a valve in said filling tube having a closure means biased to prevent discharge of liquid, and an actuating means for said closure means for moving said closure means to open position to admit liquid to the filling tube and the inner bulb, the valves in the liquid delivery and filling tubes cooperating to prevent admission of air to said inner bulb, whereby said inner bulb is prevented from distending during an atomizing operation when the outer bulb distends.

NELSON CATLIN INGELL.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,862,636	Rodgers -----	June 14, 1932
2,120,297	Reinecke -----	June 14, 1938

FOREIGN PATENTS

Number	Country	Date
395,994	Great Britain -----	July 27, 1933
658,036	France -----	Jan. 22, 1929