Oct. 11, 1955 J. W. DORSAK ET AL 2,720,388

NEBULIZING DEVICE

Filed June 10, 1954

Fig. 1

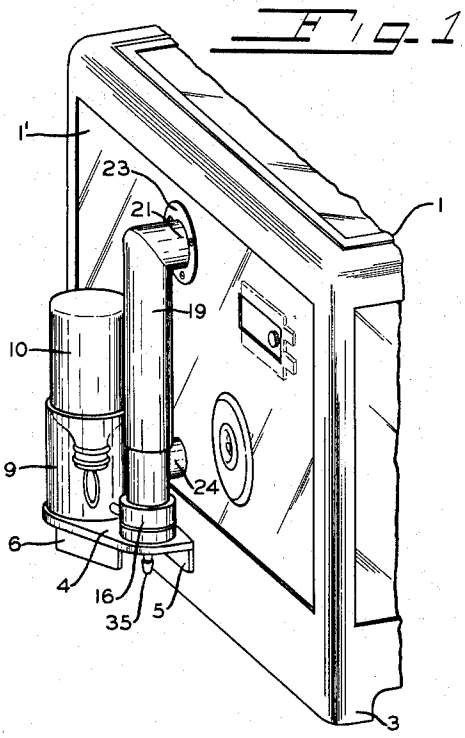


Fig. 6

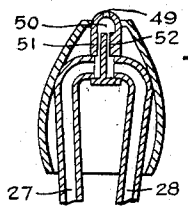


Fig. 4

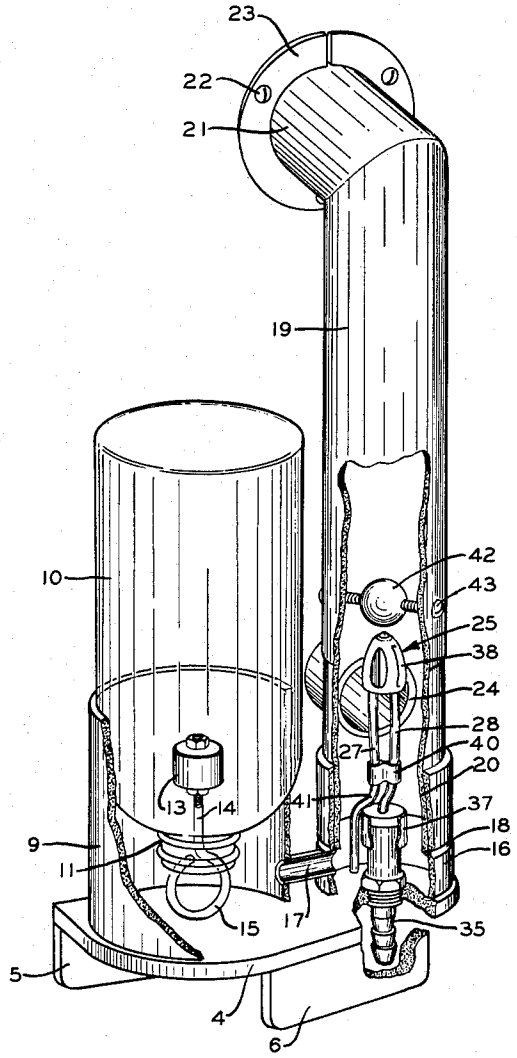


Fig. 2

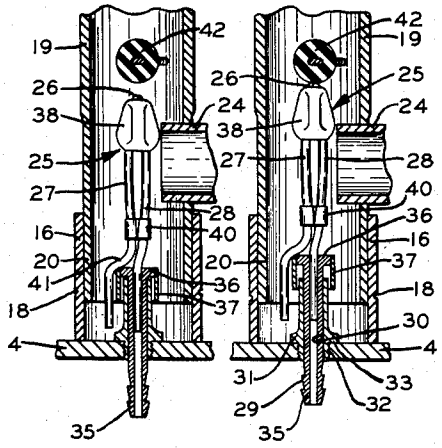
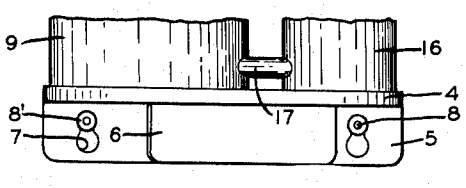


Fig. 3

Fig. 5



INVENTORS
JOHN W. DORSAK
THOMAS F. VAN DENBERG
BY
DES JARDINS, ROBINSON & KEISER
Albert F. Robinson
THEIR ATTORNEYS

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NEBULIZING DEVICE

John W. Dorsak, Cleveland, and Thomas F. Van Denberg, Chagrin Falls, Ohio, assignors to The Gordon Armstrong Company, Inc., Cleveland, Ohio, a corporation of Ohio

Application June 10, 1954, Serial No. 435,703

13 Claims. (Cl. 261—76)

This invention relates to a nebulizing device mounted in a housing unit adapted to be connected to the base of an infant incubator, and it particularly pertains to a nebulizer provided with an atomizing nozzle so mounted in the housing for being vertically movable in abutting relation against a member to cover said nozzle and prevent discharge therefrom but cause feed back of the gas, under pressure, through the liquid feed conduit for removing any obstruction therein.

The invention is an improvement over the construction disclosed in application Serial No. 373,860, filed August 12, 1953, and incorporated herein in full as a part of this disclosure.

In the previous construction referred to, over which this is an improvement, the atomizing nozzle is stationary in the housing, and a member is movable to abut against it for causing the feed back of the gas supply through the liquid feed conduit for purging the latter, whereas in the present construction said atomizing nozzle is vertically movable against the purging member which is stationary or in fixed position. However, this is more than a mere reversal of parts, and it involves a novel mounting for the nozzle.

One of the main objects of the invention is a nebulizer which is simple in construction and efficient in operation.

Another object of the invention is a nebulizer which is mounted to be vertically adjustable.

Another object of the invention is a nebulizer in which the liquid feed conduit can be quickly and easily purged.

Further objects, and objects relating to details of construction and economies of operation, will readily appear from the detailed description to follow. In one instance we have accomplished the objects of our invention by the device and means set forth in the following specification. Our invention is clearly defined and pointed out in the appended claims. A structure constituting a preferred embodiment of our invention is illustrated in the accompanying drawings, forming a part of this specification, in which:

Fig. 1 is a perspective view of a portion of an infant incubator equipped with a nebulizer, embodying the invention, mounted on a shelf with a fountain supply tank.

Fig. 2 is a vertical cross sectional view of a portion of Fig. 1 with the nebulizer in normal working position.

Fig. 3 is a similar vertical cross sectional view with the nebulizer in purging position.

Fig. 4 is an enlarged view of the nebulizer unit, including the fountain and shelf, with parts broken away to show the atomizer and the mounting thereof.

Fig. 5 is a detailed view showing the mounting of the shelf.

Fig. 6 is a side view of the nozzle head with a part broken away to show the internal structure of the spray outlet tip.

Referring specifically to the drawings in which like numerals designate like parts, numeral 1 is a conventional

baby incubator which has a treating compartment and a heating compartment separated by a dividing wall. The incubator is provided with four corner legs 3, and it is usually mounted upon a readily movable stand or pedestal.

To one end of the incubator is fixed a shelf 4 having a rear depending flange 5 and a front depending flange 6. These flanges 5 and 6 are of the same height to serve as legs or supports when the shelf is dismantled and set upon the floor. Holes 7 are formed in the rear flange 5 with a main part slightly larger than screw heads 8', threaded to the base of the incubator, to receive the shank of the screws 8. Accordingly, the shelf can be detachably fitted to the incubator by being first placed into position for the screw heads 8' to project through the screw head receiving portions of the holes 7 and then slightly lowered to overhang the side margins of the screw head engaging portions of the holes.

Mounted on the shelf is a cylindrical wall 9 forming, with the shelf, a well to be supplied with water from supply bottle 10 disposed in inverted position with its neck 11 extending into the top of the well and the top of said bottle held vertically disposed by the surrounding wall 9 of the well. The bottle stopper 13 is pushed in and out of the neck from closing position by the projection 14 extending therefrom and terminating in ring 15 which is in contact with the top of the shelf when the bottle is in upside down position in the well. When the bottle is removed from the well, the stopper is pulled back into the neck of the bottle for closing it, and the ring is, of course, larger in cross section than the bottle neck. The shelf and its depending flanges are preferably of plastic, as is the wall 9 of the well, and they can be cemented together as a unit with any suitable cement.

Another cylindrical wall 16 is also fitted to the top of the shelf to provide a supplemental well connected to the well 9 by conduit 17. The water supply bottle 10 is mounted at such an elevation that the liquid level will be maintained within the wells at about the height indicated by the mark 18, a circumferential groove, on the exterior surface of the wall 16.

A tubular member 19 is provided on the end wall 1' of the incubator having one end 20 thereof telescoping with the cylindrical wall 16 of the supplemental well, its opposite end 21 being angularly disposed, as an elbow, to be fitted to a flange collar 23 that is secured to said end wall by screws 22. The flange collar is in two sections spaced apart for the end of the elbow to be frictionally gripped between them. This tubular member 19 is also connected, near its bottom end, to the end wall 1' of the incubator by a tubular arm 24 so that air, in the incubator, can be circulated through the tubular member 19, adjacent to a nebulizer 25 housed therein and mounted on the shelf 4 at the bottom end of said tubular member 19.

The nebulizer 25 comprises an atomizing nozzle 26 connected to a liquid feed pipe 27 for the well and connected to a feed pipe 28 for oxygen or any other gas, said nebulizer 25 being mounted in a nipple 29 that is slidably fitted in the cylindrical bore 30 of the fitting 31. This fitting 31 has one end screwthreaded at 32, adjacent the annular flange 33 which abuts the bottom of the well when said fitting is screwed into an opening formed therethrough. The nipple 29 has bottom end portion 35 adapted to be fitted to one end of a hose leading to an oxygen or other gas supply tank. The opposite or top end of the nipple 29 is provided with an enlarged head or flange 36 overhanging the top end of the nipple 29, and there is a flange 37, depending from said flange 36, forming an annular skirt surrounding the upper end of the fitting 31. This skirt or flange 37 extends from a point above the water level to a point therebelow to effect

an air seal. The nipple **29** is vertically slidable in the fitting **31** for vertically moving the pipes **27** and **28** which are mounted on said nipple **29** by the bottom end of the pipe **28** being snugly fitted into the bore of the nipple **29**.

The two pipes **27** and **28** are secured together into a single unit by means of a head fitting **38** and a clip **40** spaced from the head fitting. The supply pipe **27** has a top end disposed adjacent the top end of the other supply pipe **28** to be connected to the spray nozzle **26** for raising the liquid from the well by the oxygen pressure feed. The opposite end of pipe **27** terminates adjacent the bottom of the well, and its intermediate portion may be bent at **41** to seat upon the top end of the nipple and offset the bottom end of said pipe. This also permits the main portions of the pipes to be brought closer for being more easily secured together.

An elastic member, in the form of rubber ball **42**, is mounted on rod **43** at a slightly spaced distance from the spray nozzle **26** which normally is in lowered position as shown in Fig. 2. In this position, the elastic member **42** is in the path of the sprayed liquid and gas mixture and serves to break up the sprayed liquid into finer particles for being better dispersed and mixed with the air circulated through the tubular member or housing of the nebulizer above the spray nozzle from the incubator chamber. Whenever the liquid supply pipe **27** becomes clogged, the spray nozzle **26** can be raised to bring it against the elastic member **42**, thereby causing the oxygen, discharged from the pipe **28**, to be forced back down through said liquid feed pipe **27** for freeing the latter of any obstruction or clogging. This rubber ball or elastic member may be generally referred to as a nozzle outlet sealing means. The rod **43** is mounted at opposite ends on the tubular member **19**, and it may preferably by screwthreaded for the ball **42** to be screw-threadedly fitted thereto for being adjusted in registering position to cover the top of the nozzle.

The nozzle **26** (Fig. 6) is of the same general construction shown and described in application Serial No. 373,860 (Fig. 6) above referred to. It has a discharge opening **49** from the chamber **50** which is connected to feed pipes **27** and **28** by respective ports **51** and **52**. This opening **49** is closed when the nozzle unit is raised to abut the discharge end of the nozzle against the member **42**.

From the foregoing description of the construction, its operation is obvious. Water is maintained in the well of the fountain from the supply bottle at the desired level. The spray nozzle forcibly raises the water from the well by reason of the oxygen, fed under pressure from a tank supply. The sprayed water strikes against the ball to be further broken down into smaller particles for more intimately commingling with the oxygen and the air that is being circulated in the incubator through the nebulizer housing. But whenever the water feed pipe **27** becomes clogged or obstructed, all that is necessary to do is to raise the spray nozzle and the fitting on which it is mounted so that its discharge end is brought against and covered by the ball for causing the oxygen supply to be forced down the liquid supply pipe for removing any accumulations or obstructions therein.

We are aware that there may be various changes in details of construction without departing from the spirit of our invention, and, therefore, we claim our invention broadly as indicated by the appended claims.

Having thus described our invention, what we claim as new and useful and desire to secure by U. S. Letters Patent, are:

1. A nebulizer unit for an incubator comprising a hollow tube adapted to be fitted to the side wall of the incubator for circulating air therethrough, an atomizer mounted in the tube having a spray nozzle, provided with an outlet tip, connected with gas and liquid supply pipes, nozzle outlet sealing means mounted on and within the tube adjacent the spray nozzle but normally spaced therefrom, and means for moving the outlet tip of the spray nozzle in abutting relation with said adjacently placed nozzle outlet sealing means for causing the gas supply to be directed through the liquid supply pipe.

2. The nebulizer unit of claim 1 in which the means for moving the spray nozzle is a member movably fitted to the unit and on which said spray nozzle is mounted.

3. A nebulizer unit for an incubator comprising a shelf, a liquid supply fountain on said shelf, a tubular housing mounted on said shelf, a fitting in the bottom of the housing, a nipple slidably mounted in said fitting and adapted to be connected to the end of a gas supply hose, a spray nozzle, provided with an outlet tip, mounted on said nipple and movable therewith, a liquid supply feed from the liquid supply fountain to the nozzle, and means mounted on and within the tube in the movable path of the spray nozzle against which the outlet tip of the spray nozzle is adapted to be moved in abutting relation for sealing said outlet tip.

4. The nebulizer unit of claim 3 in which means for forming with the liquid supply a liquid seal is provided between the fitting and the nipple.

5. The nebulizer unit of claim 4 in which the liquid seal is provided by the fitting extending above the liquid level and means on said nipple extending below the liquid level.

6. The nebulizer of claim 5 in which the liquid seal is formed by an annular skirt depending from the top of the nipple.

7. The neubilizer of claim 6 in which the annular skirt is circumferentially spaced from the nipple.

8. A nebulizer unit for an incubator comprising a hollow tube adapted to be fitted to the side wall of the incubator, an atomizer mounted in the tube having a spray nozzle, provided with an outlet tip, connected with gas and liquid supply pipes, nozzle outlet sealing means mounted on and within the tube adjacent the spray nozzle but normally spaced therefrom, means for moving the spray nozzle to bring its outlet tip in and out of abutting relation with the nozzle outlet sealing means, and means for adjusting said first mentioned means to bring it in registration with the spray nozzle.

9. The nebulizer unit of claim 8 in which the nozzle outlet sealing means is longitudinally adjusted upon a supporting rod disposed at an angle to the movement of the spray nozzle.

10. The nebulizer of claim 9 in which the rod is mounted on the tube and is screwthreaded to the longitudinally adjustable nozzle outlet sealing means.

11. A nebulizer unit for an incubator comprising a tubular fitting adapted to be mounted on the bottom of a liquid supply fountain, a hollow tube slidably mounted within said fitting, having an annular skirt on one end adapted to overhang the end of the fitting within the fountain for providing, with the liquid supply, a liquid seal and its opposite end adapted to be connected to a gas supply hose, a spray nozzle mounted on the tube by means of a pipe in communication with the gas hose, and a liquid feed pipe connecting the nozzle with the liquid supply fountain.

12. A nebulizer unit of claim 11 comprising a housing for the nebulizer unit and a nozzle outlet sealing means mounted on and within the housing adjacent the spray nozzle in position for the outlet tip of said nozzle to be moved in and out of contact with said outlet sealing means for opening and closing the spray nozzle outlet.

13. A nebulizer unit for an incubator comprising the combination of a vapor tube, a vapor tube well connected with the lower end of said vapor tube, a liquid supply connected to maintain a quantity of liquid in said well, an atomizer mounted in said well with the atomizer nozzle within said tube and coaxial therewith, liquid supply connections from said well to said nozzle, a gas supply connection to said nozzle, and a ball mounted in said tube above the nozzle, with its center in line with the longi-

tudinal axis of said nozzle, said ball being spaced from the nozzle tip, when the apparatus is functioning, a distance less than the diameter of the ball, and said diameter being less than half the internal diameter of the vapor tube, whereby said ball serves to nebulize the spray atomized by said nozzle, said atomizer being movable in its mounting to bring the nozzle tip into and out of contact with said ball.

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