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GB 1526161
GB 644760
GB 642580
US 4133138A
US 4128962A
US 4045049A
US 4016673A
(58) Field of search **A6S**

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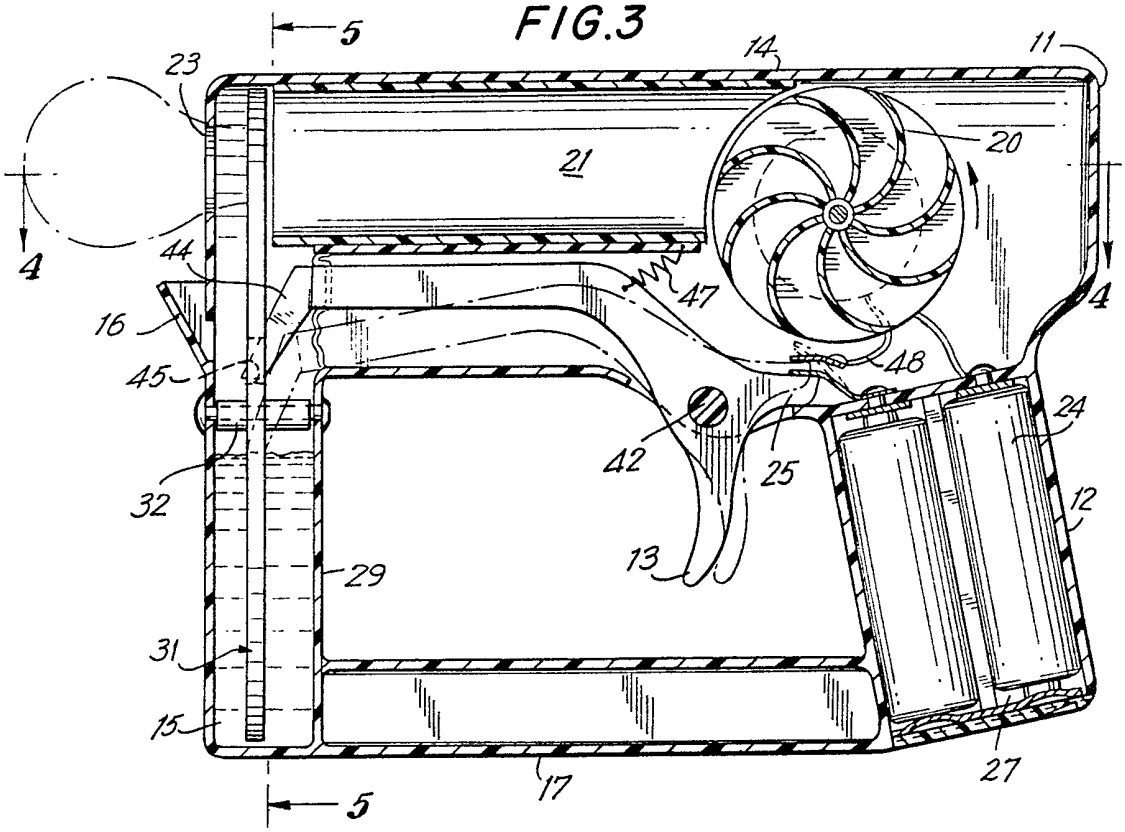
(54) **Bubble blowing device**

(57) A bubble blowing device has a chamber 15 for a soapy fluid, a rotor 31 with apertures 37 which rotate one-by-one downward into the fluid and then upward to a discharge position, an electrically-driven blower 20 with a nozzle or tube for directing a flow of air to the fluid-filled aperture 37 in the gun's discharge area, and drive means actuated by a trigger 13 for rotating said rotor and energizing the blower 20 to produce a stream of bubbles.

FIG.3



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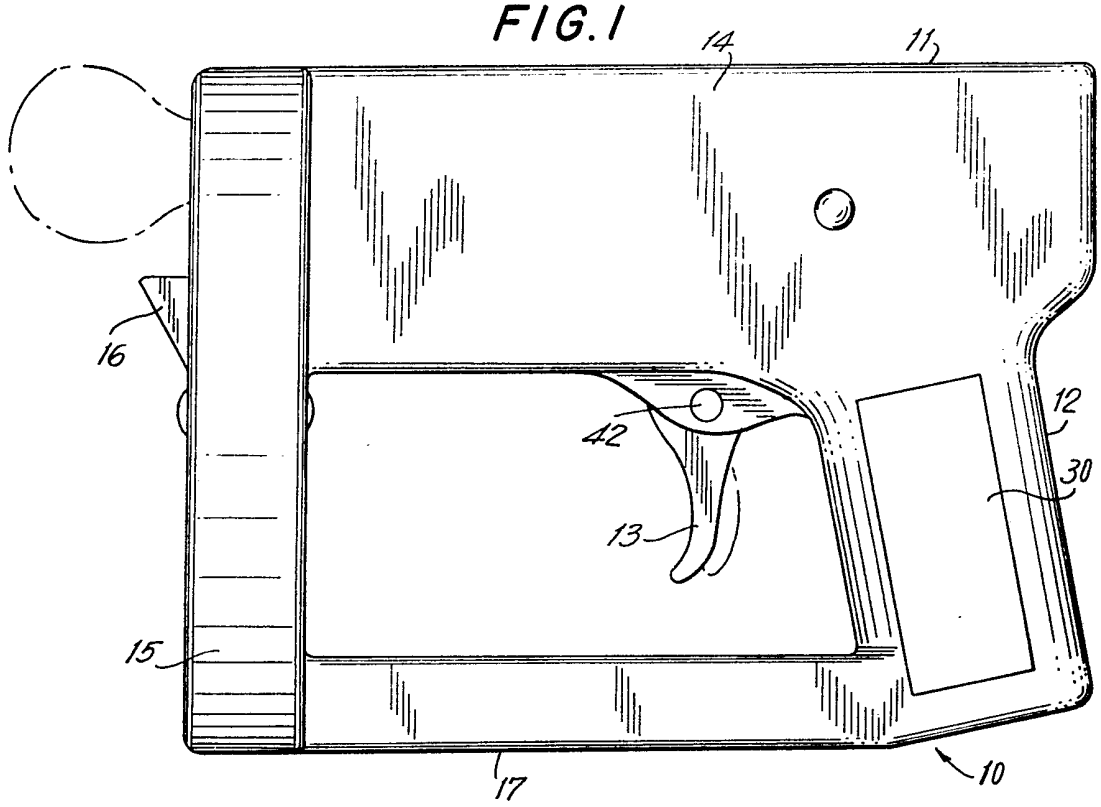
The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

FIG. 1



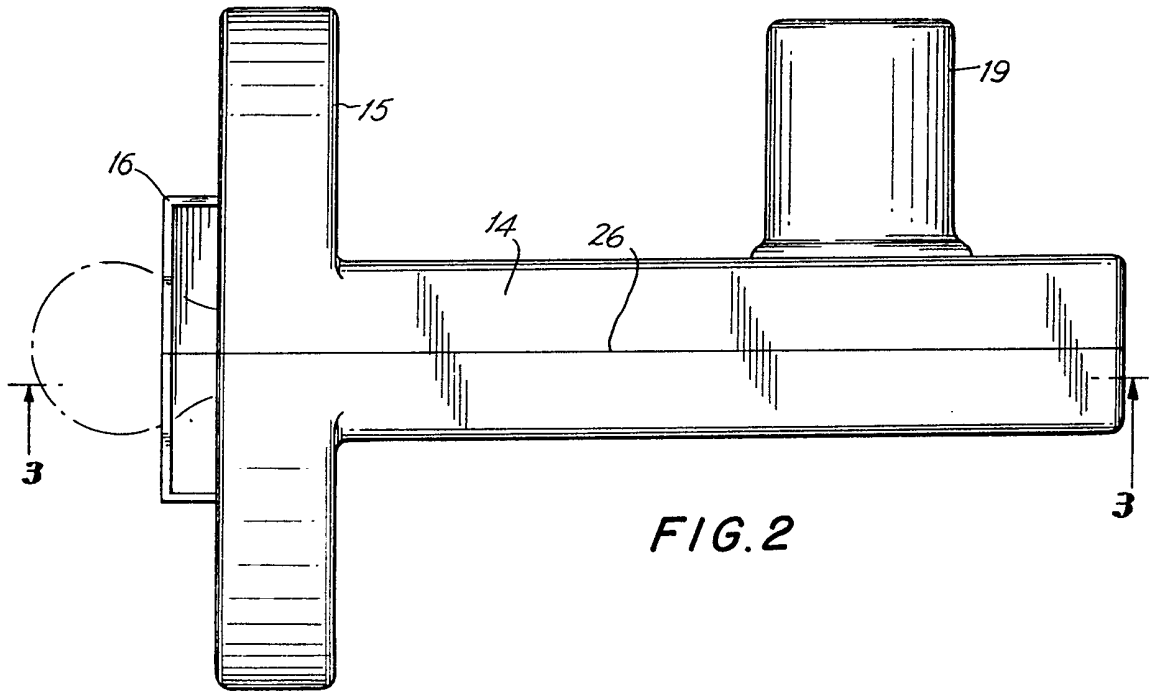
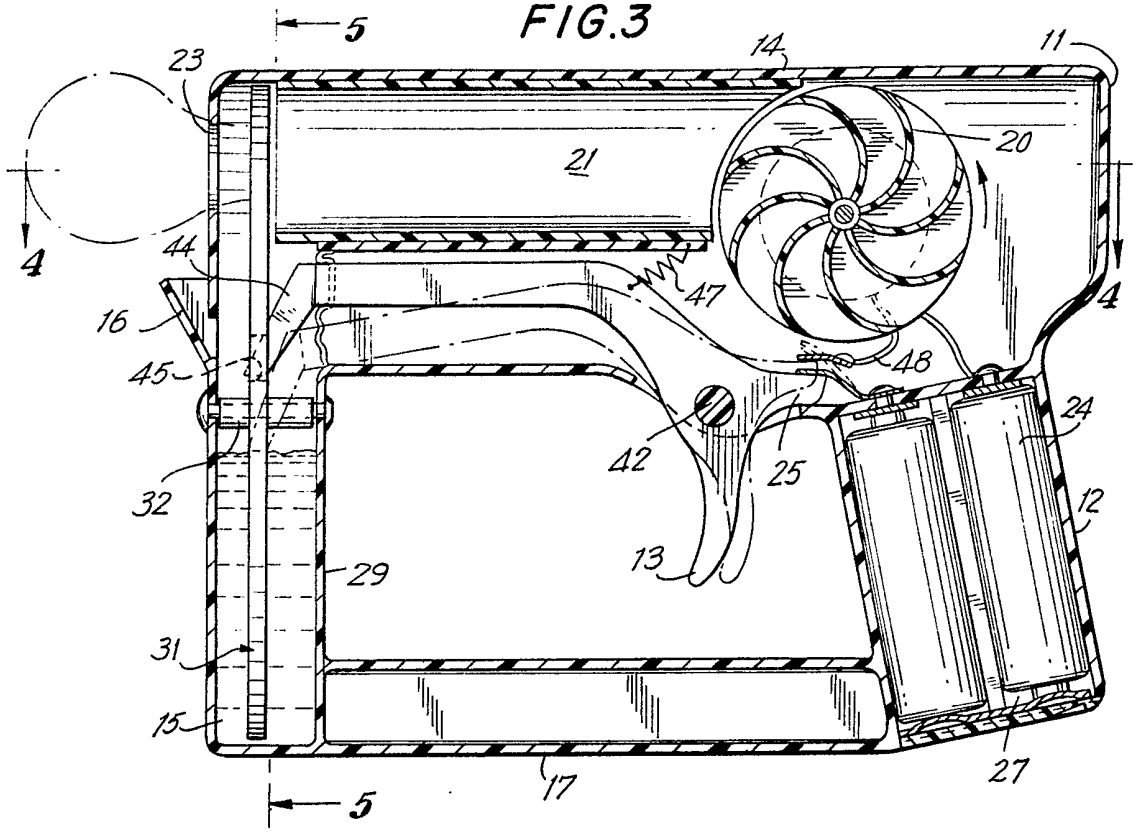


FIG. 2

FIG.3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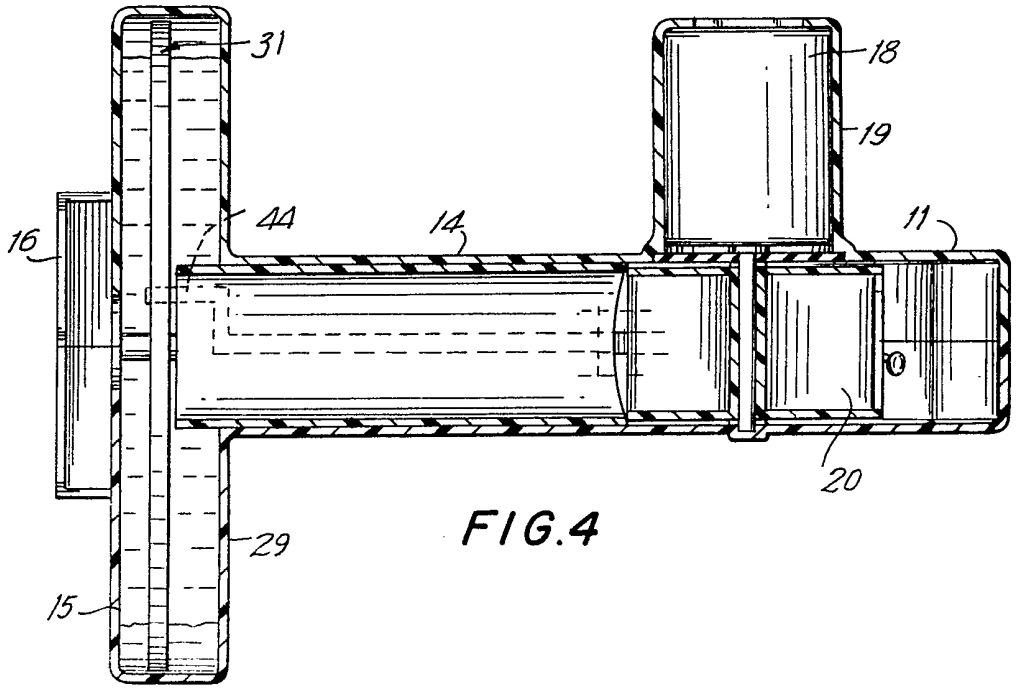
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FIG.4

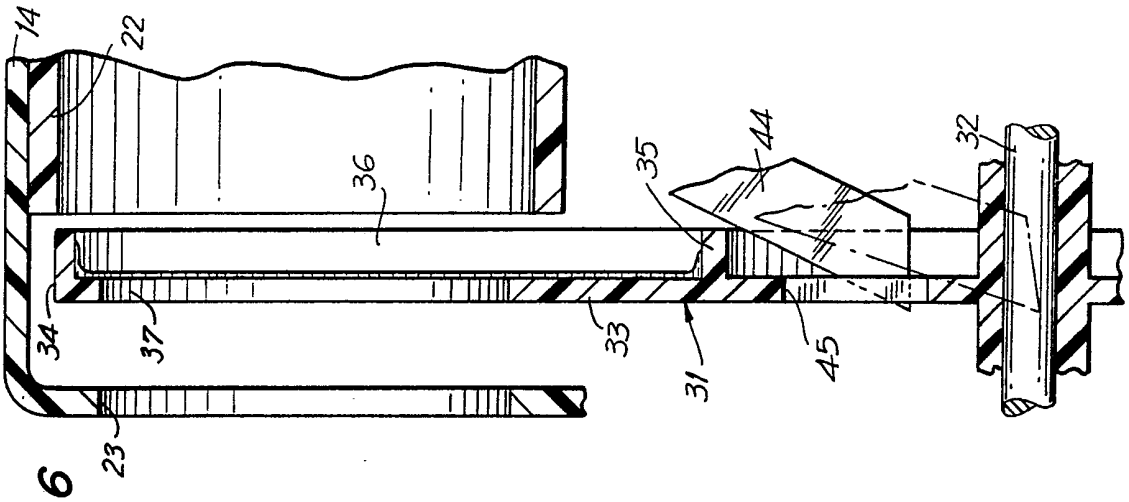

FIG.6

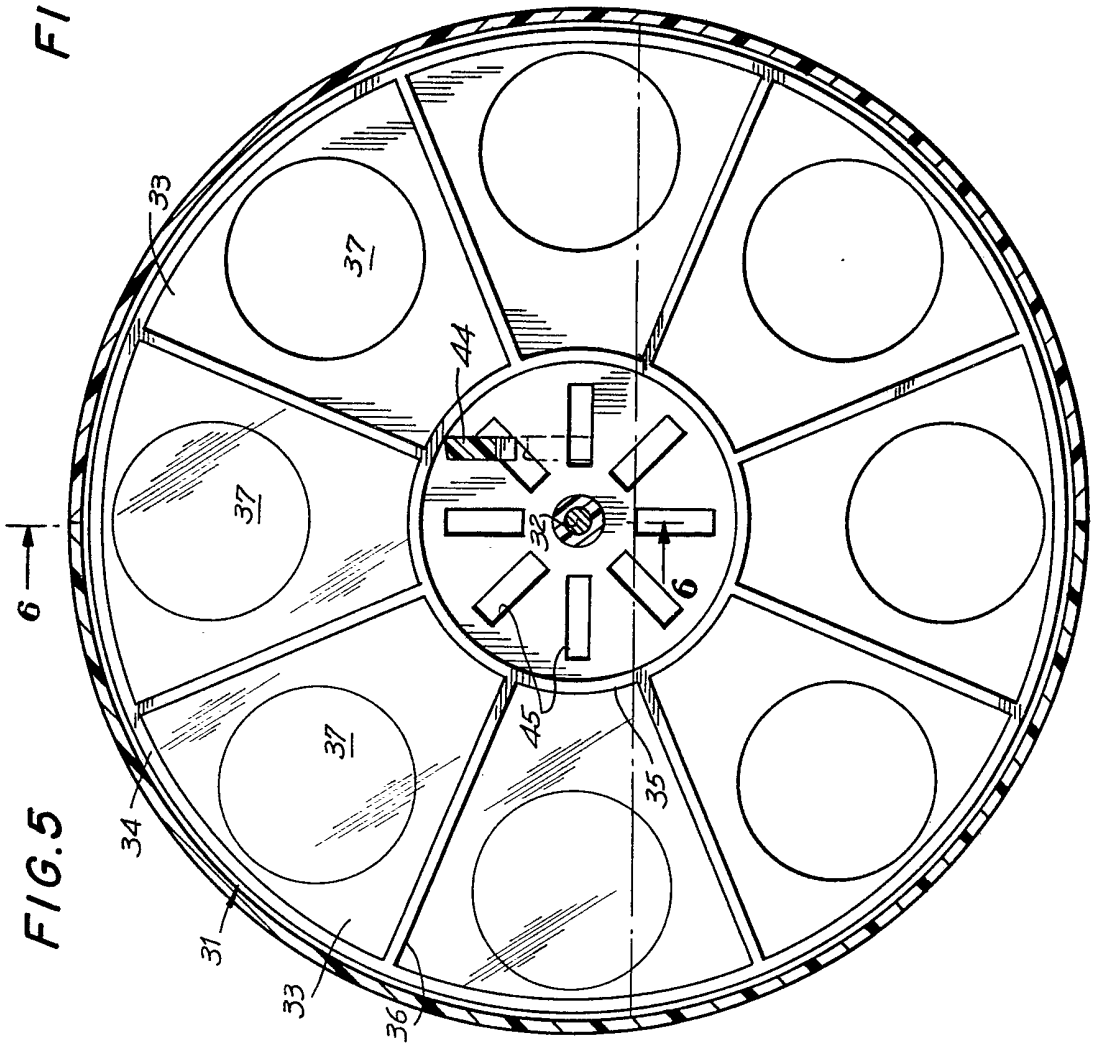

FIG.5

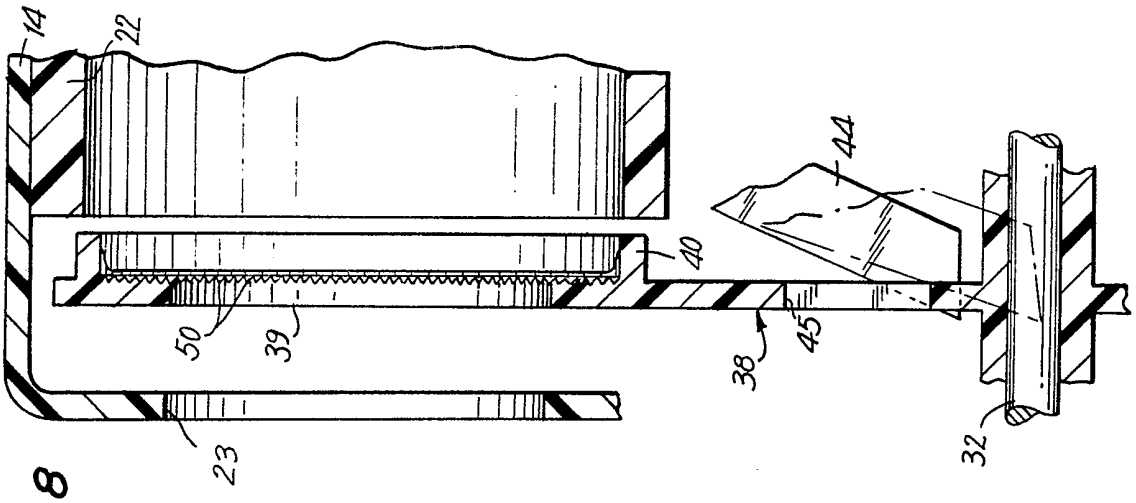

FIG.8

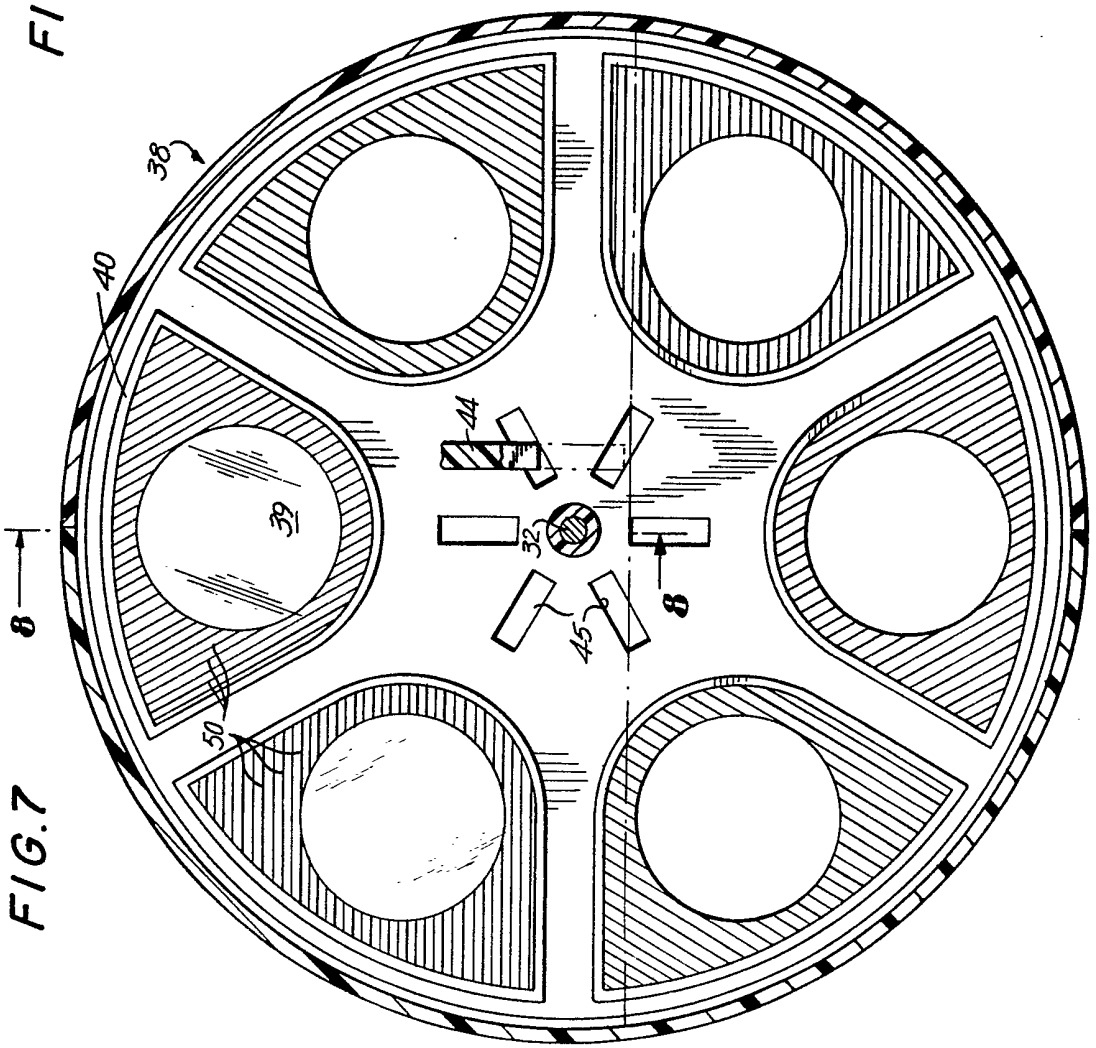

FIG.7

SPECIFICATION

Bubble blowing device and method

This invention is in the field of bubble blowing devices which have been popular children's toys for many years. A typical bubble blower consists of a handle with a wire loop at one end defining a circular hole or aperture. To use this device the loop part is dipped into and then out of a soapy water solution with a resulting film of solution formed across the entire aperture. In use the loop is placed near the child's mouth and a stream of air if blown at one side of the film causing a stream of bubbles to be formed and blown out of the opposite side of the film. An alternate method of use is to swing the handle and film-filled loop through the air which produces a similar resulting stream of bubbles.

In an examination of this known device and associated methods of use, it becomes apparent that the rate at which bubbles can be made and the quality of the bubbles depends upon factors like, how fast and how much air the user blows into the film or how fast the user swings the loop, how fast the user dips the loop into the solution and repositions the film-filled loop for bubble-making, how much energy the user has for this procedure, and other less personal factors like, the quality of the solution for its intended use, the temperature, humidity, and movement of the air into which the bubbles are formed and blown.

The present invention provides an automatic or a semi-automatic machine-gun type apparatus which forms and blows a huge number of bubbles at an extremely rapid rate that could not even be approached by a typical individual child using the known prior art.

According to the invention, there is provided a bubble blowing device operable with soapy-like liquid and comprising a reservoir for containing a quantity of said soapy-like liquid, blower means for providing a moving stream of air, housing means for attaching together said blower means and said reservoir, a bubble-forming element having a first part that defines therein an aperture, and drive means for dipping at least said first part of said element into and then out of said liquid in said reservoir and for moving said aperture of said first part of said element into said stream of air, whereby said liquid forms a membrane across and filling said aperture when said first part is dipped into and out of said liquid in said reservoir and whereby a stream of bubbles is formed when said membrane is positioned in said air stream.

Also according to the invention, there is provided a method of forming bubbles from a soapy-like liquid, comprising the steps, providing a bubble-forming element with a plurality of apertures, providing a quantity of said liquid in a reservoir, moving one aperture at-a-time of said element into and out of said liquid in said reservoir, thereby forming a film or membrane of said liquid across and filling each aperture, and directing a stream of air from an electric blower to and through each liquid-filled aperture after it moved out of said reservoir.

There is particularly disclosed herein a bubble blowing machine gun which has a housing, a chamber within the housing for soapy-like fluid, and a rotor with apertures which rotate one-by-one downward into the fluid in the chamber and then upward to a discharge position. An electric blower has a nozzle for directing a flow of air to the fluid-filled aperture as it is rotated to the bubble-discharge area. An electric or manual drive mechanism actuated by the machine gun's trigger rotates the rotor and energizes the blower in a specifically timed relationship to produce a stream of a large number of bubbles in a very brief period of time. In one embodiment the blower is re-started with each trigger operation, thereby producing a cyclic air flow where pressure upon the fluid film builds up after the fluid-filled aperture is positioned, as contrasted with moving the fluid-filled aperture into full power air stream. The apertures are located along a circular path about the rotor's axis, and the shape of each aperture is typically round.

A small flange or rib in the axial direction may be extended from the peripheral edge of each aperture which enables the aperture to hold a greater quantity of fluid and thereby produce a greater quantity of bubbles. Additional flanges may divide the rotor into pie-shaped sections for containing and segregating the fluid. Near the bubble discharge area at the front of the machine gun is a combination fill-funnel for receiving fluid into the chamber and drip collector to catch fluid drip at the conclusion of each bubble discharge.

In the functional sense in the new machine gun, a loop or apertured frame is dipped into or passed through a soapy-like fluid or in some other manner the fluid is caused to create a film or membrane filling the aperture. For example a quantity of fluid can be directed to cyclicly fill the aperture that is stationary. Instead of a rotor a single frame could be repeatedly dipped; however the rotor has been found to provide a very rapid cycle time for successful production of a great number of bubbles. In this preferred embodiment this rotor is mechanically driven by each action of the trigger, but other mechanical or electrical means may be employed to revolve the rotor. The cyclic or variable air flow referred to above can be achieved not only with cyclic operation of the blower, but with a constant running blower and a cyclic interruption of the air stream. Still further variations are possible with a constant running blower in some relation to fluid-filled apertures cyclicly presented to the air stream.

The structural details of a preferred embodiment of this invention are illustrated in the appended drawings and explained in the description that follows.

Fig. 1 is a side elevation view of the new bubble-blowing device;

Fig. 2 is a top plan view thereof;

Fig. 3 is a sectional view taken along line 3—3 of Fig. 2.

Fig. 4 is a second sectional view taken along

line 4—4 of Fig. 1.

Fig. 5 is a third sectional view taken along line 5—5 of Fig. 2.

Fig. 6 is a fragmentary sectional view taken along line 6—6 of Fig. 5.

Fig. 7 is a front elevation view of a second embodiment of a rotor.

Fig. 8 is a sectional view taken along line 8—8 of Fig. 7.

The new bubble-blowing machine gun 10 illustrated in the drawings has a housing 11 which incorporates a handle 12, a trigger 13, a barrel 14, a fluid chamber or reservoir 15, a fluid filling inlet 16, and a lower support beam 17.

The sectional view of Figs. 3 and 4 illustrate the basic internal components of this device which are all mounted within housing 11. At the upper rear part of the housing near the handle an electric motor 18 is securely mounted and contained within a projecting part 19 of the housing. A squirrel-cage blower 20 is rotated by the motor causing a stream of air 21 to flow axially in air discharge tube 22 part of barrel 14 toward outlet 23 in the housing. Batteries 24 in handle 12 are the power source for the motor, and trigger 13 has rear projection 25 which closes a switch means 48 to energize the battery-motor circuit to produce the air stream. It should be apparent that a great variety of motors and/or fans or complete blower sub-units are possible so long as the proper air flow is provided. The power source shown in for a DC motor which obviously is a convenient arrangement for a fully portable bubble-blowing machine gun; however AC current or even a separate mechanical drive can be used with appropriate connections.

The housing 11 is conveniently formed of mating shells of injection molded plastic with a parting line 26 extending axially as shown in Fig. 2. The housing 11 has various transverse walls illustrated in Fig. 3, which define battery chamber 27 in handle 12, the fluid chamber 15 formed by front and rear walls 28 and 29 respectively. Batteries may be replaced via access panel 30 in handle 12.

For actual bubble formation there is the rotor 31 shown in Figs. 2—5 which has the form of a disc that rotates about its central axle 32, the ends of the axle being secured in walls 28 and 29 of the fluid reservoir. Any other mounting for the rotor would be acceptable so long as the major part of the disc web and its apertures will dip into the fluid of the reservoir. The rotor preferably has six or eight pie-shaped sections 33, each bordered by a small axially extending flange. The flange, or rib, or rim is formed as an outer periphery arc 34, an inner ring 35, and/or radial ribs 36, which are illustrated more particularly in Figs. 5 and 6. The apertures 37 are shown as circles, but could be oval or a variety of other shapes. It is also possible to form a rim or rib completely around each aperture as shown in Figs. 7 and 8, where rotor 38 has apertures 39 and circular ribs 40. The objective is to have the rotor section associated with each aperture hold a large quantity of fluid and/or for the fluid to form a relatively thick membrane across the aperture, so that a very large number of bubbles can eventually be formed and blown from each aperture.

A rotor drive mechanism is provided to sequentially revolve the rotor one step or one aperture each time the trigger is pulled. The arrangement shown in Figs. 3 and 5 is a simple mechanical drive where arm 41 extending from trigger 13 is pivotted about point 42 when finger lever 43 is pulled rearward. This motion causes tip 44 of arm 41 to swing forward and downward into slot 45 and thence to drive rotor 31 counterclockwise (Fig. 5) until the next aperture moves into alignment with air discharge tube 21. Upon release of trigger 13, it is pulled back by spring 47 to its ready position, until the trigger is again pulled.

Adjacent the rear projection 25 of the trigger is an electrical switch 48 which is closed by part 25 when trigger 13 is pulled. Upon closing of the switch which in series with the batteries, the blower motor 20 energized and a stream of air 21 begins to flow down tube 22. With this arrangement the air flow will have to build up from zero before the trigger was pulled to maximum or some lesser amount depending on how long the trigger is held depressed. Accordingly as the air stream 21 approaches the fluid membrane in the rotor aperture aligned with the air discharge tube, the lead air is moving slowly under only slight pressure. The air flow speed and pressure rapidly increases, and a stream of many bubbles is produced until the fluid of the membrane and in the rotor's ribbed section surrounding the aperture is so consumed that no more bubbles will form. When the trigger is released and then re-pulled, the rotor will again revolve one step, bringing a fresh fluid-filled aperture into alignment with the air discharge tube.

This sequence of steps in the operation of the new bubble machine gun may be repeated until the fluid reservoir is so depleted that fluid membranes cease to form and fill the rotor apertures. In the preferred embodiment illustrated a very impressive number of bubbles in the range of 25 to 110 is formed with each trigger-operated sequence. Two 1-1/2 volt batteries in series energize the blower motor which operates at about 8000 revolutions per minute. The soapy fluid may be actual baby shampoo, liquid soap for typical home uses, bubble solution or other equivalent fluids. The rotor of this particular device has eight apertures each having diameter of about 7/8 inch. The ribs or rims or vanes may define boundaries around each aperture or around a rotor web area larger than the aperture, but in which the aperture is situated, and/or the rim may simply extend along the outer peripheral edge. The height of such rims, ribs or vanes extending transversely of the rotor web is in the range of 1/64 to 1/8 inches. To add certain realism a noise-making element may be attached to the trigger or to the blower to simulate gun fire.

When using a rotor with eight apertures as

shown in Fig. 5, and when one particular fluid-filled aperture is at top dead center, one adjacent fluid-filled aperture is above the mid-point of the rotor and thus is in air above the surface of fluid in the reservoir. Thus this "adjacent" fluid filled membrane is waiting to be rotated into alignment with air discharge tube 22, and during the waiting time fluid will tend to flow by gravity out of the aperture and out of the fluid zone associated with that aperture. It has been found that operation of this bubble machine gun will be very successful, if the trigger is pulled and released and re-pulled repeatedly at approximately one to three second intervals, to bring freshly filled fluid membranes to the air stream for optimal bubble production. Because of the many factors influencing bubble formation and bubble breakdown, especially including the particular soapy fluid selected and the size and power of the air stream, the optimal rate of trigger pulling will vary. The structure of the rotor may have variations, such as a roughened surface to slow drainage of fluid from the aperture or vane area; also the surface may have grooves 50 or protruding ribs or veins which are curved or lie in a direction other than down when the fluid-filled aperture is in waiting position above the fluid surface level, or in action aligned for firing. This obviously will restrain the fluid from quickly flowing away, and thus will retain fluid to produce the maximum amount of bubbles. The outer periphery rim on the rotor serves an additional purpose. When the reservoir level is low, perhaps too low to fully cover the bottom-most aperture, the rim can help the rotor scoop up enough fluid to flow into and fill the aperture.

One additional feature that was found useful in the embodiment and shown in Fig. 3 is locating the top aperture in action position about 3/8 inch inward from and aligned with the gun's housing outlet 23. It has been found that some bubbles will form from both apertures 37 and 23 simultaneously, which may provide support for bubbles during their formation.

A variety of structural equivalents to features particularly disclosed and illustrated are possible, and the scope of the invention should be interpreted consonant with the advance which it contributes to the art.

CLAIMS

1. A bubble blowing device operable with soapy-like liquid and comprising a reservoir for containing a quantity of said soapy-like liquid, blower means for providing a moving stream of air, housing means for attaching together said blower means and said reservoir, a bubble-forming element having a first part that defines therein an aperture, and drive means for dipping at least said first part of said element into and then out of said liquid in said reservoir and for moving said aperture of said first part of said element into said stream of air, whereby said liquid forms a membrane across and filling said aperture when said first part is dipped into and out of said liquid in said reservoir and whereby a stream of bubbles is formed when said membrane is positioned in said air stream.

2. A machine gun toy device for blowing bubbles, this device operable with soapy-like liquid and comprising a housing, a reservoir in the housing for containing a quantity of said liquid, blower means carried by said housing for providing a moving stream of air to pass across a certain bubble-formation space relative to said housing, a bubble-forming element having a first part that defines therein an aperture, and drive means carried by said housing for moving at least said first part of said element into and then out of said liquid in said reservoir and for moving said aperture of said first element into said bubble-formation space that will be in the path of said moving stream of air, whereby said liquid forms a membrane across and filling said aperture when said first part is dipped into and out of said liquid in said reservoir, and whereby a stream of bubbles is formed when said membrane is positioned in said bubble-formation space in the path of said stream of air.

3. A device according to claim 2 wherein said bubble-forming element is pivotable about an axis whereby said aperture in said first part of said element is movable between first and second positions, the first position being in said reservoir where said liquid membrane can be formed across said aperture, and the second position being in said bubble-formation space in said path of said air stream.

4. A device according to claim 3 wherein said bubble-forming element is a rotor comprising a disc-like web rotatable about a central axis therethrough, said web defining therein a plurality of apertures spaced on a circular path about said axis, said rotor being rotatable so that each aperture is movable cyclicly back and forth between said first and second positions.

5. A device according to claim 2 wherein said housing comprises a handle part adapted to be held in a person's hand and said drive means comprises a trigger movably mounted in said housing and adapted to be pulled and released between on and off positions respectively by a finger on said user's hand, said drive means moving said apertures of said bubble-forming element one-at-a-time into said second position each time said trigger is moved to its on position from its off position.

6. A device according to claims 1 or 2 wherein said blower means comprises an electric motor, a blower driven by said motor, and air discharge duct for directing said air stream to said second position, a battery power unit for energizing said motor, and circuit means including switch means interconnecting said motor and battery power unit.

7. A device according to claim 5 wherein said blower means comprises an electric motor, a blower driven by said motor, and air discharge duct for directing said air stream to said second position, and a battery power unit for energizing said motor.

8. A device according to claim 7 wherein said drive means further comprises an electric circuit including in series said battery power unit, said electric motor, and a switch operable between on and off positions respectively for closing and opening said circuit said trigger further comprising a first drive part which engages and actuates said switch between its on and off positions when the trigger is moved between its on and off positions respectively.

9. A device according to claim 8 wherein said drive means moves each aperture to said first position approximately the same time said trigger's first drive part actuates said blower motor.

10. A device according to claim 7 wherein said battery power unit is located in said handle.

11. A device according to claim 4 wherein said rotor web lies in a plane perpendicular to said axis of rotation and said rotor further comprises rib means extending transversely from said web for enhancing the capability of the rotor and each aperture therein to hold a substantially large quantity of said liquid from said reservoir, said rib means comprising at least one of the following:

(a) a rim outward of and surrounding each aperture;

(b) ribs extending radially between and separating each two adjacent apertures;

(c) an outer peripheral rim surrounding all the apertures;

(d) an inner peripheral rim inward of all the apertures; and

(e) outer and inner rims according to (c) and (d) above and radial ribs situated between each two adjacent apertures and extending radially between and engaging said outer and inner rims.

12. A device according to claim 3 wherein said housing further defines an outer aperture adjacent, downstream of and aligned with said aperture of said bubble-forming element when it is in its second position.

13. A device according to claim 3 wherein said outer aperture has approximately the same diameter as and is situated approximately 3/8 inch downstream from said bubble-forming element.

14. A device according to claim 6 wherein said cousing comprises sealing means for preventing said liquid in said reservoir from contacting said motor or said battery power unit.

15. A device for blowing bubbles, the device operable with a soapy-like liquid and comprising: a reservoir for containing a quantity of said liquid, blower means for providing a moving stream of air, a bubble-forming element having a first part that defines therein an aperture, means for causing a small amount of said liquid from said reservoir to fill said aperture thereby forming a film or membrane thereacross, and control means for actuating said blower means and for directing said moving stream of air to and through said aperture, thereby forming bubbles from said liquid in and in the vicinity of said aperture.

16. A device according to claim 15 wherein said control means further comprises means for sequentially alternating the steps of forming a liquid membrane across said aperture and directing said air stream to said membrane and forming bubbles.

17. A method of forming bubbles from a soapy-like liquid, comprising the steps, providing a bubble-forming element with a plurality of apertures, providing a quantity of said liquid in a reservoir, moving one aperture at-a-time of said element into and out of said liquid in said reservoir, thereby forming a film or membrane of said liquid across and filling each aperture, and directing a stream of air from an electric blower to and through each liquid-filled aperture after it is moved out of said reservoir.

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