Dec. 24, 1940. J. K. LYON, JR 2,225,702

BUBBLE-FORMING DEVICE

Filed April 17, 1940 2 Sheets-Sheet 1

Fig.1.

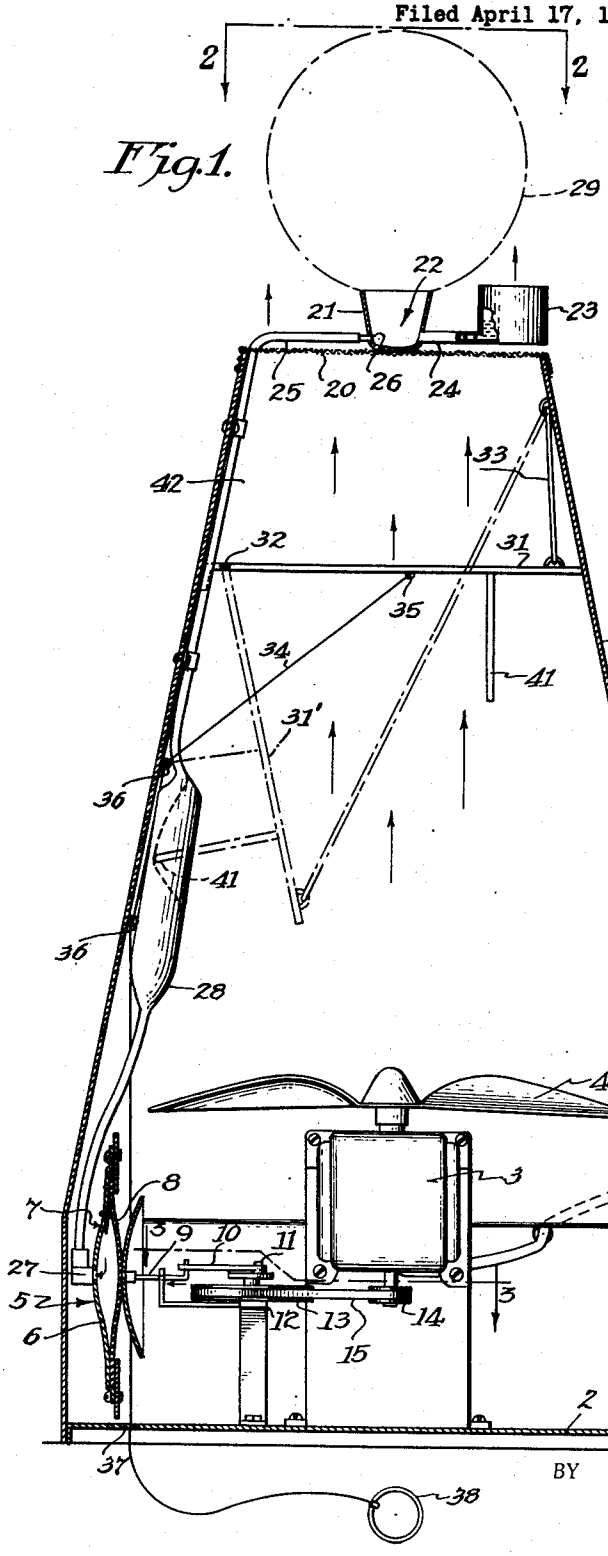


Fig.2.

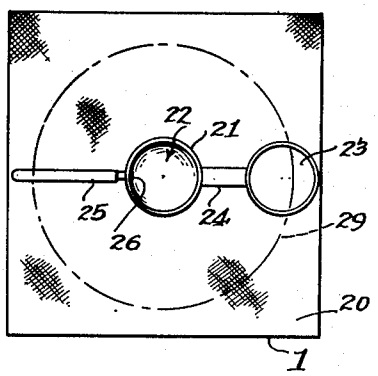
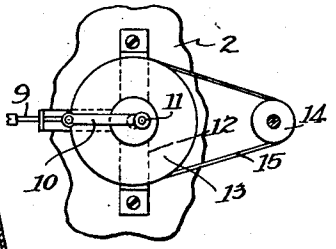


Fig.3.



JOHN K. LYON, JR.,
INVENTOR.

BY

Alfred W. Knight

ATTORNEY.

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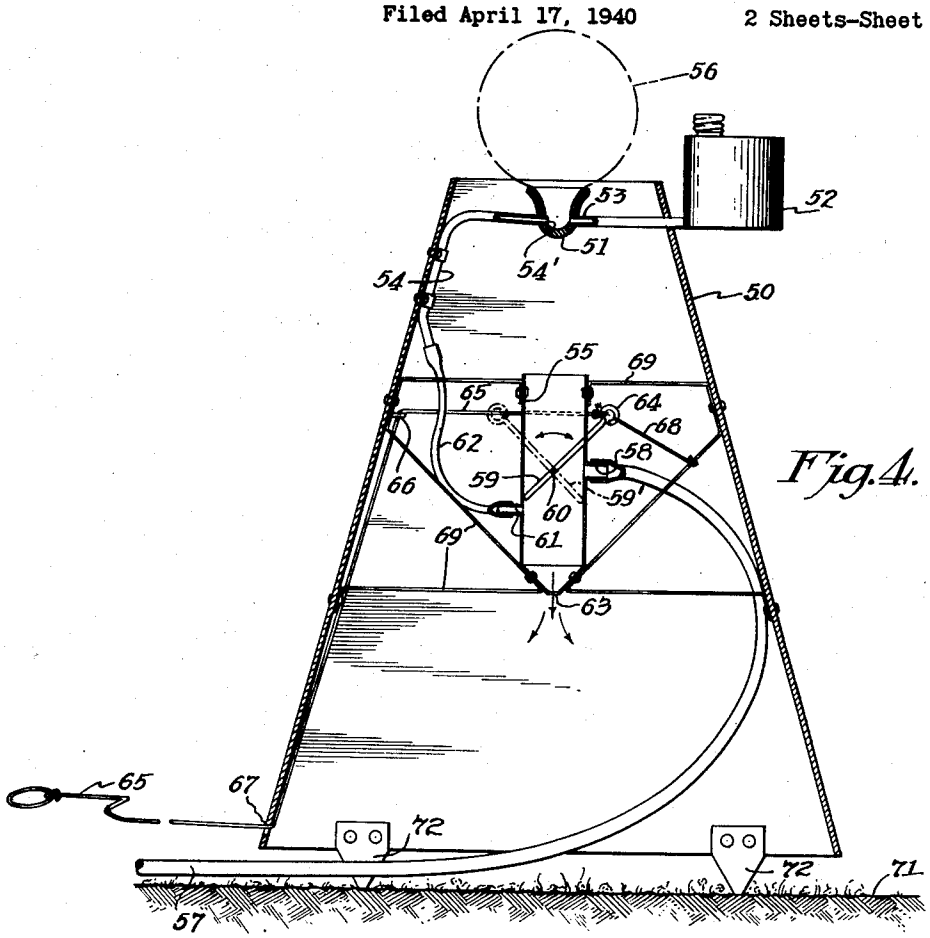


Fig. 4.

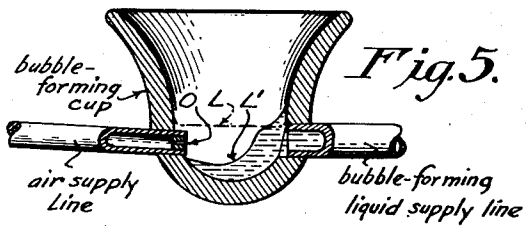


Fig. 5.

JOHN K. LYON, JR.,
INVENTOR.

BY Alfred A. Knight

ATTORNEY.

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2,225,702

BUBBLE-FORMING DEVICE

John K. Lyon, Jr., Pasadena, Calif.

Application April 17, 1940, Serial No. 330,108

8 Claims. (Cl. 46—8)

This invention relates to bubble-forming devices and pertains particularly to a device which may be employed to produce one or more bubbles under the control of and at the will of an operator.

The device is primarily intended to be used in target practice or the like, wherein one or more bubbles are released into the air in position to be shot at in the same manner as "birds" are released in trap or skeet shooting.

One of the particular objects of the invention is to provide a simple and inexpensive device which will repetitively produce a relatively large bubble and discharge the same into the air at the will of the operator. A further object of the invention is to provide a device having separately controlled and separately functioning air supply means for producing and discharging the bubble.

The accompanying drawings illustrate two embodiments of the device and referring thereto:

Fig. 1 is a vertical section of one embodiment of the construction;

Fig. 2 is a plan view thereof as taken on line 2—2 in Fig. 1;

Fig. 3 is a fragmentary detail thereof as taken on line 3—3 in Fig. 1;

Fig. 4 is a view corresponding to Fig. 1, showing a modified form of construction; and

Fig. 5 is a detail view of the bubble-forming cup member useful according to the invention, illustrating the action of the air and bubble-forming solution therein.

Referring to Figs. 1 to 3 the device may comprise a supporting structure 1, having a base 2, carrying a motor 3 provided with a connecting power cord, and a fan 4 positioned to produce an upward circulation of air. The motor 3 may comprise also a driving means for a pressure pump 5 which may be of the so called "diaphragm" type comprising a casing 6, provided with a valved intake 7, and a flexible diaphragm 8 secured to the casing 6 and actuated through a push rod 9 and a pitman 10 connected to a crank 11 carried on suitable bearings 12 and provided with a pulley 13 which may be connected to the drive pulley 14 on the motor 3 through any suitable belt means such as a rubber band 15.

The bubble-forming portion of the construction is located at the upper end of the support 1, preferably above a protective screen member 20, and comprises a bubble cup 21 having an upwardly directed open end 22, a container 23 in fluid communication with the interior of cup 21 as through a conduit 24, said container being adapted to hold the body of bubble-forming fluid such as a soap solution and to deliver portions of the same to said cup member in restricted amounts. Conduit means are provided for supplying air to the interior of the bubble forming cup 21, such as a conduit 25 opening through the side wall of the cup 21 as at 26 and communicating with the discharge port 27 of the pump 5. The conduit 25, in this form of the invention is preferably provided with an enlarged section 28 having a deformable side wall, the function of which will be hereinafter set forth.

According to this invention air is supplied to the interior of the cup through the conduit 25 from the pump 5 and in the presence of a small amount of bubble-forming fluid within the cup 21 the supply of air to the cup with result in the formation of a bubble at the upper open end of the cup as indicated in dotted lines at 29. In order to utilize the bubble 29 for target purposes it is necessary to dislodge the same from the upper end of the bubble cup and to direct it upwardly into the atmosphere. In this embodiment of the invention the upward circulation of air from the fan 4 is utilized to dislodge the bubble and move it upwardly, and it is desirable that the supply of air to the interior of the cup 21 be interrupted when the upward blast of air about the cup is established. For this purpose I provide a valve means comprising a damper member 31 pivotally secured to the supporting structure 1 as at 32 and biased into an upper or closed position as shown in full lines through the agency of a rubber band or other suitable spring member 33. An operating member for moving the damper out of the way to permit the upward circulation of air to take place is provided as by means of a string or cable 34 secured to the damper as at 35 and extending through a suitable eyelet or the like 36 on the side wall of the supporting structure and thence through the base 2 as at 37, terminating in a loop or the like as at 38 in position for operation by the person having the device under his control. In order to shut off the supply of air to the interior of the cup 21 I may provide a wire loop or the like 41 attached to the damper 31 and adapted to engage the flexible side wall portion of the enlarged section 28 and thus close the conduit 25 when the damper 31 is pulled to its lower position such as indicated in dot-dash lines at 31'. In this position the supply of air to the interior of the cup 21 is interrupted (the enlarged section 28 of the conduit 25 serving as a reservoir) and the full blast of the fan 4 is directed upwardly past the cup 21, which will dislodge the bubble 29 and force it

upwardly into the atmosphere. The blast of air from the fan 4 is preferably directed past the exterior of the cup 21 and for this purpose I may provide the supporting structure with enclosing side walls 42 which in effect form an upwardly extending conduit for the direction of such blast.

It will be appreciated that the device may be operated to produce a consecutive series of individual bubbles 29 as long as the soap container will supply fluid to the interior of the cup, and that the period between the discharge of successive bubbles may be controlled by the operator inasmuch as he may hold the damper 31 in the lower position for as many seconds as he chooses (during which time there will be no formation of a bubble owing to the lack of air supply), then release the damper to its upper position some 4 or 5 seconds before he wishes to discharge a bubble into the atmosphere, during which 4 or 5 seconds the supply of air to the interior of the cup will produce a bubble 29 of a desired size. It has been found that bubbles approximately 4'' in diameter may be produced at the rate of about ten per minute with this device, using a pump 5 which has a capacity in the neighborhood of 400 cubic inches of free air per minute.

The embodiment shown in Fig. 4 may comprise a housing or support structure 50 provided at its upper end with a bubble-forming cup 51, a soap solution container 52 communicating with the interior of the cup 51 as at 53, a conduit 54 supplying air to the interior of the cup 51 and an air-directing member 55 adapted to direct a blast of air upwardly around the cup 51 when it is desired to dislodge a bubble 56 from the upper end of the cup. The air supply for both the cup 51 and the air blast which is directed by the member 55 is in this embodiment provided by an external supply of air under low pressure, such as a small compressor, a pressure cylinder, or the like. The supply line from such a source is indicated at 57, and this supply line is brought laterally into the member 55 at some convenient position preferably intermediate its length, as at the side neck 58. Valve means are provided for alternatively supplying air through the conduit 54 or through the upper end of the directing member 55, such as a damper 59 pivotally mounted as at 60 on the member 55 and adapted in its full line position to seal off the upper end of the member 55 and direct the incoming air in part through a side neck 61 thence through a flexible connection 62 to the conduit 54 and in part downwardly through open lower end 63 of the member 55. The size of the opening 63 will be so selected with respect to the opposition offered by the conduit 54 to the flow of air to the cup 51, in relation to the volume of air supplied at 58, that the requisite amount of air for bubble-forming purposes is supplied to the interior of the cup 51. When the valve structure is moved to the dot-dash position 59' so that the damper 59 will seal the lower end of the member 55 from the inlet 58 (such movement being readily obtained through the agency of a crank arm 64 provided with an operating string 65 extending through an eyelet 66 on the side wall of the support 50 and thence outwardly of the device through an opening 67 adjacent the lower end of the supporting structure), air will be directed upwardly about the cup 51 and dislodge the bubble 56 therefrom. The damper 59 is preferably biased toward the position shown in full lines through the agency of a rubber band or suitable spring member 68 in much the same manner as the damper 31 is biased to its upper position in the form shown in Figs. 1 to 3.

The directing member 55 may be supported centrally below the cup 51 through the agency of spacer members 69, and the supporting structure 50 may be supported above the ground 71 through the agency of foot or peg elements 72 secured to the lower portion thereof, this spacing being desirable to permit easy egress of the air discharged through the opening 63 during the formation of a bubble 56. It will be appreciated that the above form of device will operate in a manner entirely comparable to that of the form first described in that when the operating cord 65 is released, allowing the damper to come to its full line rest position, air will be supplied to the cup 51 and in the presence of the soap solution a bubble 56 will be formed. When it is desired to discharge this bubble into the atmosphere the cord 65 is pulled taut moving the damper 59 to the position 59' to direct the full supply of air furnished through the line 57 upwardly around the cup 51, and thus dislodge the bubble 56.

I have found it of some advantage to position the bubble-forming solution supply conduits 24 and 53 substantially opposite the inlets 26 and 54' at which air is admitted to the interior of the cups 21 and 51. This arrangement of the respective conduits is beneficial from the standpoint of preventing an undue supply of soap solution or other bubble-forming fluid to the cups in that when the conduits 25 and 54 are interrupted by the respective valve members the soap solution can drop from the containers into the bottom of the cup but upon the introduction of air into the interior of the cup excess soap solution will be forced into the soap solution conduit and further supply of bubble-forming solution will thus be interrupted until a bubble is formed, dislodged and a further quantity of bubble-forming solution allowed to enter the bubble-forming cup. Proper proportioning of the size of the bubble-forming solution inlet will be within the skill of the art, and will in part be controlled by the viscosity of the bubble-forming solution which is employed.

Referring to Fig. 5, I have illustrated a preferred arrangement of the air supply pipe (25 or 54) with respect to the cup (21 or 51) and the soap solution supply line (24 or 53). The air supply line is preferably brought into the cup near the bottom, in such position with respect to the liquid supply line that when no air is being forced into the cup the liquid level of the soap solution will be somewhat above the opening O in the air supply pipe, as is indicated at L. When the air is supplied to the cup the liquid will be blown away from the opening O as at L', and the film of soap solution which covered the opening O will be blown into a bubble. When the air supply is cut off, the liquid will return to the level L, placing the cup in condition for the formation of a new bubble.

It will be appreciated that wherever the word "air" is used in the appended claims, any suitable gaseous fluid is contemplated, for example, while when a diaphragm pump is used as in the first form of the invention, air will be the gaseous fluid used both for forming the bubble and for dislodging the same into the atmosphere, it would be entirely feasible to use oxygen or acetylene, for example, in connection with the second described form of device if such a gaseous fluid were available under pressure.

Other modifications of the construction will occur to those skilled in the art and I do not choose to be limited to the specific embodiments herein delineated but rather to the scope of the subjoined claims.

I claim:

1. A bubble-forming device which comprises: a support structure; a bubble-forming cup member having an upwardly directed open end disposed adjacent the upper end of said support structure; means for supplying a bubble-forming liquid to the interior of said cup member; conduit means for supplying air to the interior of said cup member; air-directing means positioned below said cup member for directing an air blast upwardly about said cup member; and air supply means for supplying air to said conduit means and said air-directing means, and including valve means movable between a position shutting off said conduit and a position shutting off said air-directing means whereby air may successively be supplied to the interior or exterior of said cup member.

2. A bubble-forming device which comprises: a support structure defining an upwardly directed conduit; a bubble-forming cup member having an upwardly directed open end disposed adjacent the upper end of said support structure; means for supplying a bubble-forming liquid to the interior of said cup member and including a storage receptacle; air supply means disposed below said cup member and adapted to produce an upwardly directed air stream; a damper member disposed between said cup member and said draft producing member in position to close said conduit against such upward circulation of air; conduit means for supplying air to the interior of said cup member and including an air supply means therefor; and an actuating member movable to open said damper member and close said last named conduit means.

3. A bubble-forming device which comprises: a support structure defining an upwardly directed conduit; a bubble-forming cup member having an upwardly directed open end disposed adjacent the upper end of said support structure; means for supplying a bubble-forming liquid to the interior of said cup member and including a storage receptacle; a fan disposed below said cup member in position to produce an upwardly directed air stream; a damper member disposed between said cup member and said fan member to close said conduit against said air stream; conduit means for supplying air to the interior of said cup member and including an air supply means therefor; an actuating member movable to open said damper member and close said conduit means; and means for operating said fan.

4. The device set forth in claim 3, said conduit means being provided with a compressible side wall portion, and said damper member being provided with a contact member adapted to engage said side wall portion of said conduit means to close said conduit means and interrupt supply of air to the interior of said cup member.

5. A bubble-forming device which comprises: a support structure defining an upwardly directed conduit; a bubble-forming cup member having an upwardly directed open end disposed adjacent the upper end of said support structure; means for supplying a bubble-forming liquid to the interior of said cup member and including a storage receptacle; a fan disposed below said cup member and positioned to direct an air stream upwardly through said conduit and around said cup member; driving means for said fan; a pump operatively associated with said driving means; a conduit member extending from said pump to said cup member for supplying air from said pump to the interior of said cup member, said conduit member being provided with a portion having a flexibly deformable side wall; a damper member pivotallly secured to said support structure and biased to a position extending across said upwardly directed conduit in position to close said conduit against such upwardly directed air stream and having an engaging portion adapted to engage said side wall of said conduit member to interrupt supply of air to said cup member upon pivotal movement of said damper member to a position opening said upwardly directed conduit; and an actuating member for moving said damper to said lower position.

6. A bubble-forming device which comprises: a support structure; a bubble-forming cup member having an upwardly directed open end disposed adjacent the upper end of said support structure; means for supplying bubble-forming liquid to the interior of said cup member at a given level therein; conduit means for supplying air to the interior of said cup member at a position below said given level; air-directing means positioned below said cup member for directing an air blast upwardly about said cup member; and air supply means for supply of air to said conduit means and said air-directing means, and including valve means movable between a position shutting off said conduit and a position shutting off said air-directing means whereby air may successively be supplied to the interior or exterior of said cup member.

7. A bubble-forming device which comprises: a support structure; a bubble-forming cup member having an upwardly directed open end disposed adjacent the upper end of said support structure; means for supplying a bubble-forming liquid to the interior of said cup member and including a storage receptacle; a source of air under pressure; an air directing member disposed below said cup member and associated with said source, said member being positioned to direct a stream of air supplied by said source upwardly about the exterior of said cup member; an air supply conduit for supplying air to the interior of said cup member; and valve means associated with said air directing member, said source, and said supply conduit, said valve means being movable between a position shutting off said air-directing means and a position shutting off said supply conduit whereby air may alternatively be supplied to the interior or exterior of said cup member.

8. The device set forth in claim 7, said air-directing member comprising a tubular element provided with a cooperating damper to define said valve means.

JOHN K. LYON, JR.