

[54] **BUBBLE GUN TOY**

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[51] **Int. Cl.²** **A63H 33/28**

[58] **Field of Search** **46/6-9**

[56] **References Cited**

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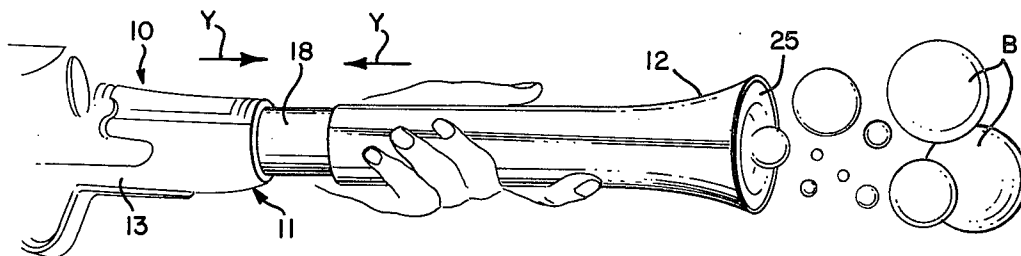
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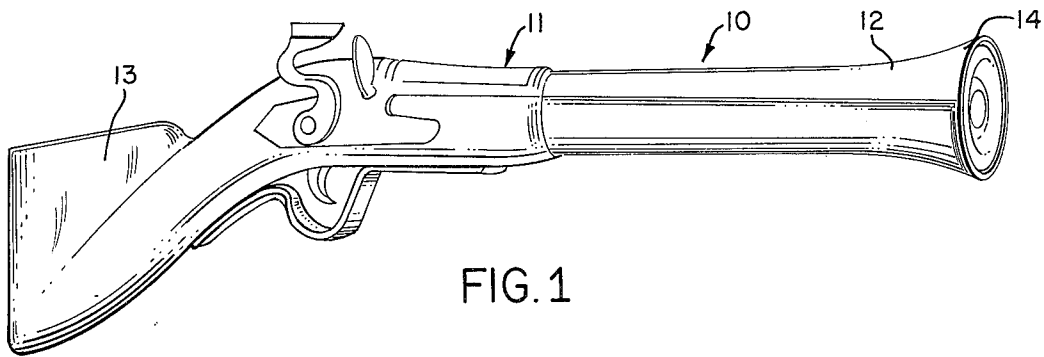
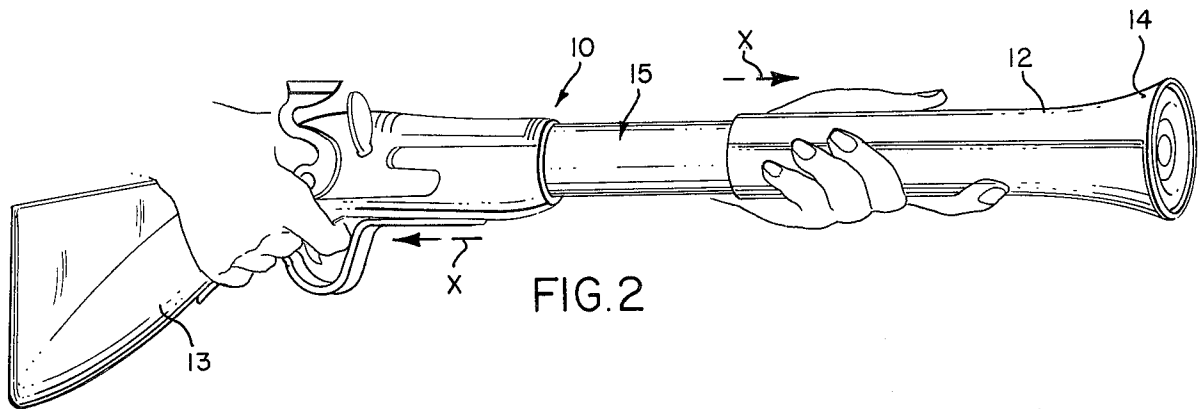
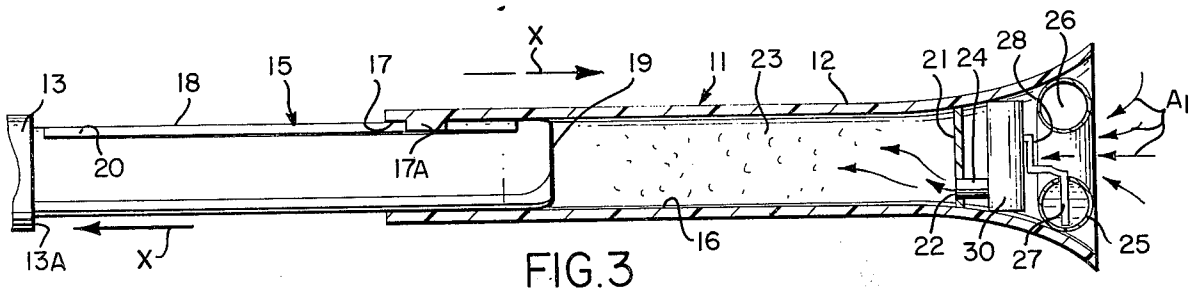
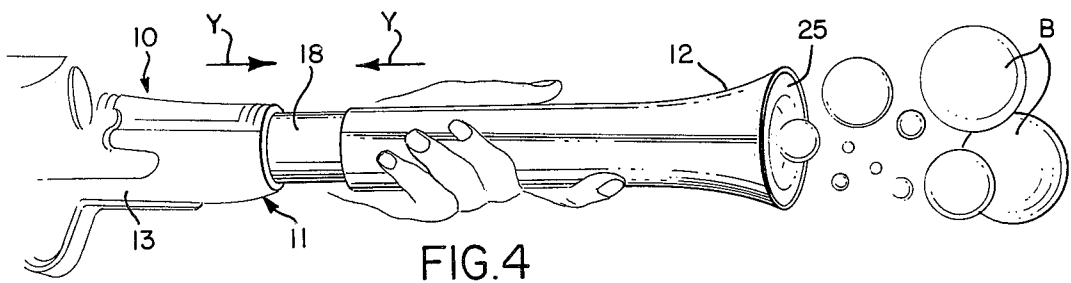
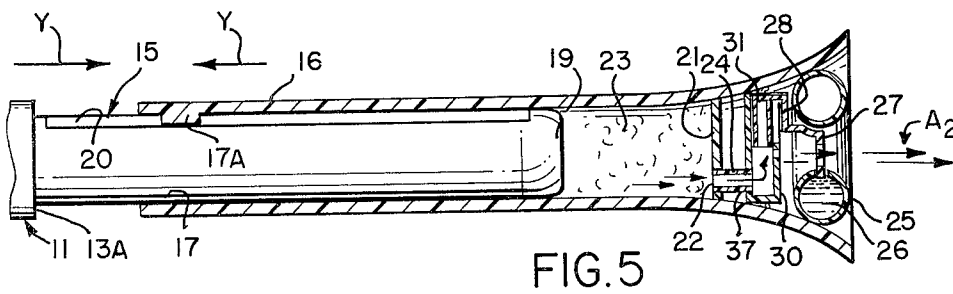
Primary Examiner—Louis G. Mancene
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[57] **ABSTRACT**

A simulated gun has a torus-shaped reservoir with bubble-producing liquid adjacent its muzzle and a pumping mechanism disposed in its barrel. Oriented across the barrel is a cylinder retaining a shuttle movable between a lower port and an intermediate port of the cylinder. A dip ring is carried by an arm projecting forwardly from the shuttle. As charges of air are alternately drawn into and discharged from the simulated gun by action of the pumping mechanism, the dip ring is respectively dropped into and lifted from the reservoir. Clusters of bubbles are thereby intermittently formed as successive charges of air being discharged are directed to impinge films loaded in the dip ring.

18 Claims, 10 Drawing Figures





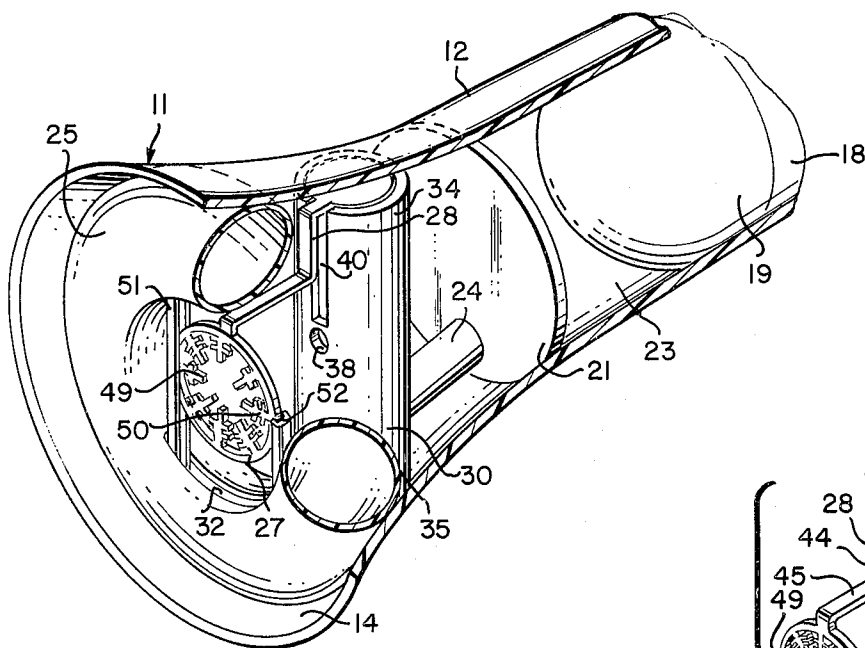


FIG. 6

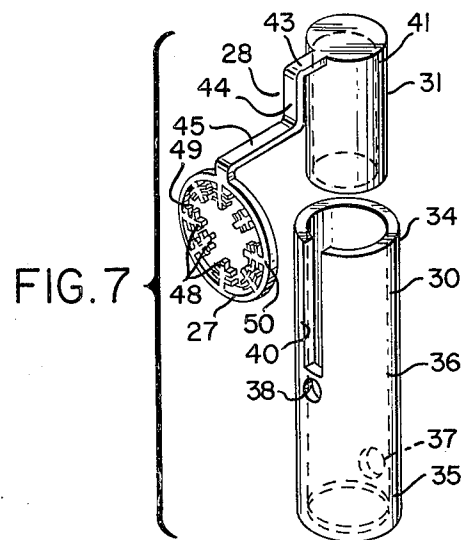


FIG. 7

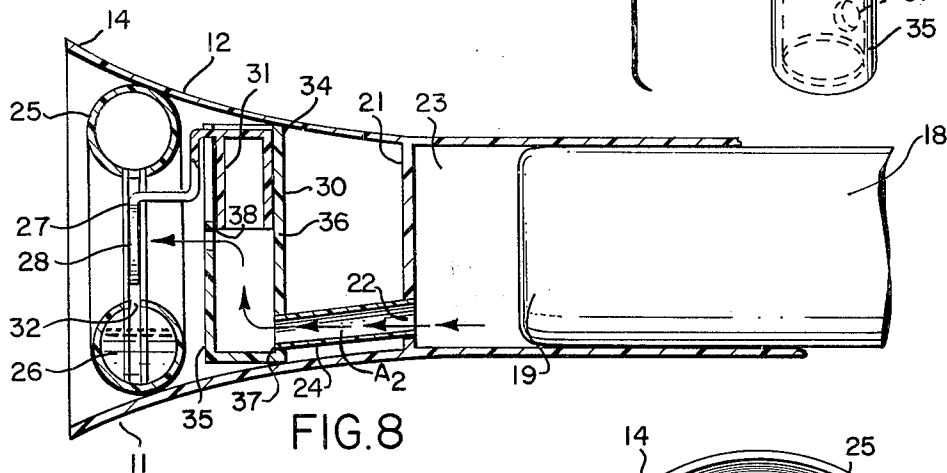


FIG. 8

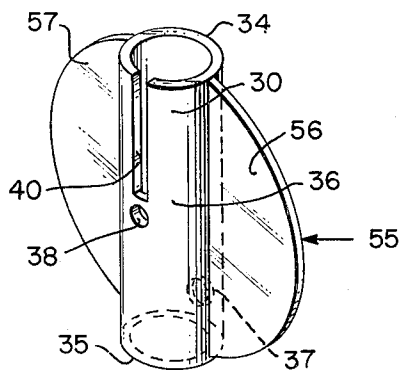


FIG. 10

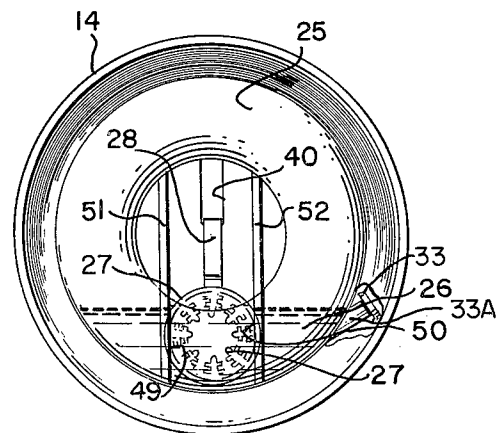


FIG. 9

BUBBLE GUN TOY

BACKGROUND OF THE INVENTION

This invention generally relates to bubble producing devices and more specifically to bubble gun toys capable of generating groups of bubbles intermittently.

Bubble making toys have, for many years, amused and fascinated children. Some are simple integral units as shown in U.S. Pat. No. 2,514,009 to Raspet (1950) while others combine moving parts as shown in U.S. Pat. No. 3,775,898 to Kalish (1973). Efforts have been undertaken to house bubble producing mechanisms in simulated pistol casings as disclosed for example, in U.S. Pat. Nos. 2,518,627 to Lorenz (1950), 2,560,582 to Limber (1951), 3,389,492 to Sullivan et al. (1968), 3,399,485 to Cashavelly et al. (1968), and, 3,733,736 to Glessner (1973).

Similarly, bubble making toys have been dressed or decorated in rifle simulating casings as disclosed in U.S. Pat. Nos. 2,393,039 to Gilchrist (1946), and 2,974,438 to Hopkins (1961).

Many of these known bubble gun toys have numerous movable parts that frequently malfunction or break which require either disposal or costly and irritating repairs. They also are often complicated, heavy, bulky, undependable and prone to annoying and excessive drippage.

The bubble gun toy of this invention is an improvement over these conventional devices and provides unique features while avoiding operating difficulties and undesired results.

SUMMARY OF THE INVENTION

This invention comprehends a bubble gun toy that is uncomplicated in construction, easy to operate and reload with bubble-producing liquid, and, dependable in intermittently generating clusters of bubbles.

In its broader aspects, the bubble gun toy has a casing that simulates a gun with a front section and a rear section. A cylinder is positioned within and extends laterally across the casing front section. The casing is provided with a first port through a lower end portion and a second port through an intermediate portion.

A pumping means is coupled to the casing for alternately driving a charge of compressed air sequentially through the first and second ports and drawing a fresh charge of ambient air sequentially back through the second and first ports.

A shuttle is arranged in the cylinder for travel between the first and second ports. The shuttle is lifted beyond the second port when a charge of compressed air is driven through the cylinder and the shuttle is dropped to a level adjacent the first port when a charge of ambient air is drawn through the cylinder. Suction forcibly pulls the shuttle downwardly.

An annular or torus-shaped reservoir capable of holding bubble-producing liquid is coupled to the casing front section and has a slot formed along its inner wall portion. A dip ring is carried by an elongated arm extending forwardly from the shuttle. The dip ring is oriented to pass through the reservoir slot and into the reservoir as the shuttle is dropped and be lifted from the reservoir as the shuttle is lifted.

The second port is positioned and the arm is shaped in such a manner that when the shuttle is lifted beyond the second port then the dip ring and second port are brought into registering alignment. A front side wall

portion of the cylinder is formed with a guide slot extending longitudinally from one end of the cylinder, and, the arm projects through this guide slot. The guide slot is longitudinally aligned with and terminates near the second port. The arm is preferably shaped in manner so that when the shuttle is lifted beyond the second port then the ring and second port are brought into registering alignment.

The reservoir is preferably torus-shaped and has a central opening concentrically aligned with the second port. Extending across the central opening of the torus-shaped reservoir is a pair of laterally spaced and parallel guide rails. Opposing side edges of the ring are positioned to slide along the guide rails.

The pumping means includes a first tube with an open rearward end coupled to the casing front section. A second tube of the pumping means has a closed forward end and is coupled to the casing rear section. The second tube is slidably disposed within the first tube. A diaphragm is positioned within the first tube and is formed with an air passage aperture. An air chamber is formed by the first tube, second tube and diaphragm for alternately compressing and drawing in air as the first and second tubes are slid longitudinally relative to one another.

BRIEF DESCRIPTION OF THE DRAWINGS

This invention will be fully appreciated and understood when the following detailed description is studied in conjunction with the drawings in which:

FIG. 1 is a perspective view of a bubble gun toy constructed in accordance with this invention, showing a front section generally retracted to a position against a rear section;

FIG. 2 is a perspective view of the bubble gun toy showing the front section generally extended from the rear section;

FIG. 3 is a side elevational, longitudinally sectional and fragmentary view of the front section of the bubble gun toy;

FIG. 4 is a perspective view showing the front section being drawn back towards the rear section as clusters of bubbles are being generated;

FIG. 5 is a side elevational, fragmentary and partially longitudinally sectional view;

FIG. 6 is a perspective sectional view of the front portion of the bubble gun toy;

FIG. 7 is a perspective fragmentary view showing the cylinder, shuttle, arm and dip ring components of the bubble gun toy;

FIG. 8 is a side elevational partially longitudinally sectional and fragmentary view of a front section of the bubble gun toy; and

FIG. 9 is a front elevational and partially fragmentary view of the bubble gun toy.

FIG. 10 shows an alternate cylinder configuration.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawing and in particular to FIGS. 1 through 4, a bubble gun toy 10 constructed in accordance with this invention has a general housing or casing 11 configured to simulate a musket. The casing 11 has a general front section 12 constituting part of the barrel and a blunderbuss muzzle 14. A rear section 13 of casing 11 constitutes a simulated stock, trigger mechanism, etc.

Incorporated within the bubble gun toy is a pumping means 15 which has an elongated tube 16 extending rearwardly from the muzzle 14 and terminating in an open rear end 17. The pumping means 15 includes another elongated tube 18 fixed to the stock or casing rear section 13 and it has a flat or concave closed front end 19. Stop means 17a and guide means 20 are provided.

Positioned within elongated tube 16 is a circular or disc-shaped diaphragm 21 formed therethrough at a relatively lower portion with an air passage aperture 22. An air chamber 23 is constituted by the combined surfaces of tube 16, tube 18 and the diaphragm 21. As shall be subsequently explained, the air chamber 23 of the general pumping means 15 alternately collects ambient air represented by arrows A₁ and discharges compressed air indicated by arrows A₂ shown in FIG. 5.

Secured to and confined generally within the muzzle 14 is a torus-shaped reservoir 25 for holding any suitable and commercially available bubble-forming liquid 26. A dip ring 27 can be slipped into and out of the reservoir 25 by action of the pumping means 15 in a manner that shall be fully explained. The dip ring 27 is carried by the outer extremity of a crank shaped arm 28 projecting forwardly from an upper part of a cylinder 30. A shuttle 31 is capable of travelling within cylinder 30 during operation of the pumping means 15. Linking tube 24 is provided.

The directional arrows X illustrated in FIGS. 2 and 3 indicate relative sliding movement between elongated tubes 16 and 18 to enlarge the chamber 23 and fill it with ambient air A₁. The directional arrows Y illustrated in FIGS. 4 and 5 indicate relative sliding movement by the elongated tubes 16 and 18 in a reverse direction to thereby diminish the size of chamber 23 and expel compressed air A₂. The chamber 23 may be enlarged to draw in ambient air A₁ by shifting tube 16 to the right, shifting tube 18 to the left or shifting both simultaneously. Similarly the chamber 23 can be forced to discharge or pump out compressed air A₂ by shifting tube 16 to the left, shifting tube 18 to the right or shifting both tubes simultaneously in these directions. The child may operate the pumping means 15 in these different ways either instinctively or according to some predetermined manipulation.

Referring now primarily to FIGS. 6, 7, 8 and 9 the lower inner peripheral portion of the torus-shaped reservoir 25 is formed therethrough with an arcuate slot 32 sized for insertion by dip ring 27. The cylinder 30 has a relatively top portion 34 secured to a relatively top portion of the toy front section 12 and a bottom portion 35 attached to the relatively bottom portion of the toy front section 12. A port 37 is formed through the cylinder bottom end portion 35. The port 37 may extend through the cylindrical side wall as shown or a bottom flat wall section, each being considered an end portion of the cylinder 30. Extending through a middle portion 36 of the cylinder 30 is another port 38. The ports 37 and 38 are shown on diametrically opposed rear and front side wall strips of cylinder 30 respectively.

A guide slot 40 is cut or molded into cylinder 30 and extends from the edge of cylinder top portion 34 to a point adjacent air port 38. Projecting outwardly and forwardly from the general top 41 of shuttle 31 is the arm 28. Arm 28 has a first or upper segment 43 connected directly to shuttle 31 a second or lower section 45 connected directly to dip ring 27 and being parallel

to segment 43, and, an intermediate segment 44 perpendicular to and interlinking the other segments 43 and 45. Upper segment 43 slides along and within guide slot 40 as the pumping means is actuated to drive the shuttle 31 up and down within cylinder 30.

Circumferentially spaced along and projecting radially inwardly from the rim of dip ring 27 is a plurality of soapholding elements 48. These soap holding elements increase the capacity of dip ring 27 for holding a film of the bubble producing liquid 26.

The dip ring 27 has a pair of lateral and diametrically opposed sides 49 and 50 that are slidably coupled with a pair of upstanding and parallel guide rails 51 and 52 respectively as best seen in FIG. 9. The guide rails are not essential but do facilitate in centering dip ring 27 and facilitating its registering alignment with port 38 during the bubble generating stroke of pumping means 15.

The dip ring 27 acts and operates much like a bubble producing wand except that there is no need to grasp it directly which often results in drippage and messiness. When it becomes necessary or desirable to replenish the supply of bubble producing liquid 26 then the releasable cap 33, located on the lower region of the torus-shaped reservoir 25, may be temporarily opened. Ordinarily the bubble producing liquid 26 would not completely fill the torus shaped reservoir 25 but rather would be filled to a level just below the arcuate slot 32 so as to avoid excessive spillage. A refill neck 33A is provided.

The arcuate slot 32 as best seen in FIGS. 5 and 6 is slightly larger than the thickness of dip ring 27. This close tolerance permits a wiping action which assists in loading the dip ring 27 with a soapy film as it is repetitively withdrawn from the reservoir 25. Agitation of the bubble producing liquid 26 as naturally caused by operation of the pumping means 15 and jiggling of the bubble gun toy 10, creates a foamy-frothy mass across the arcuate slot 32 and generally within at least the lower region of reservoir 25.

Therefore, when the bubble producing liquid 26 is essentially depleted or shifted by sloshing or rotation away from directly beneath the arcuate slot 32 — this wiping action permits the generation of bubbles to be prolonged for awhile.

As the air stream A₁ is being drawn into the air chamber 23, the resultant suction causes the dip ring 27 to be forcibly pulled through arcuate slot 32 and into the reservoir 25. This eliminates the tendency which otherwise might exist of the dip ring 25 sticking at some elevated position within the center of the torus-shaped reservoir 25.

Referring again primarily to FIGS. 3 and 5, the stop means is attached to the general rearward end of elongated tube 16. The stop means is in the form of a radially inwardly projecting key 17A. The elongated tube 18 incorporates the guide means in the form of a longitudinally extending guide groove 20 into which key 17A is inserted. The stop means 17A prevents tube 16 from sliding off tube 18 when a full stroke by the pumping means 15 has been accomplished. When tube 16 is fully retracted then its open end 17 will engage a stop shoulder 13A formed by the casing rear section 13.

In addition to coacting to limit travel by and prevent separation of elongated tube 16, the key 17A and guide groove 20 have a further function. More specifically, they work together to assure constant alignment between tubes 16 and 18 by preventing them from experi-

encing mutual rotation. Rotation by tube 16 would cause dip ring 27 to twist out of preferred alignment or orientation with the rear section 13 of the bubble gun toy 10. Such temporary misalignment, while not adversely affecting the operation of toy 10, could be annoying to smaller children. Continuous perfect alignment between dip ring 27 and the casing rear section 13 is also helpful during those times when the torus-shaped reservoir 25 is being replenished with bubble producing liquid 26. The bubble gun toy 10 may be maintained horizontal and erect as bubble producing liquid is introduced through refill neck 33A which importantly terminates at a level fully beneath the reservoir arcuate slot 32. By this arrangement when the liquid level has risen in reservoir 25 to the optimum predetermined height, the refill neck 33A will become full with liquid and serve as a warning or signal to cease further replenishment. While the releasable cap 33 and refill neck 33A are handy as a feature of the bubble gun toy 10, they can be eliminated entirely. Under such circumstances, the bubble producing liquid 26 could be introduced directly through the arcuate guide slot 32 by way of a spout or with the aid of a funnel.

FIG. 10 shows an alternative construction for the cylinder 30. The embodiment of cylinder 30 shown in FIG. 6 has a linking tube 24 extending between the air port 37 and aperture 22 of diaphragm 21, in order to place variable air chamber 23 and cylinder 30 in fluid communication. The linking tube 24 forces the incoming air streams A_1 and outgoing air streams A_2 to pass directly through cylinder 30 instead of around it. The particular barrier 55 shown in FIG. 10 achieves the same function. In this embodiment, both the disc diaphragm 21 and linking tube 24 are eliminated.

The air blocking barrier 55 is equipped with a pair of wing walls 56 and 57 that extend from diametrically opposite sides strips of cylinder 30. The outer peripheries of the wing walls 56 and 57 make fluid tight sealing engagement against the interior walls of the casing front section so that air streams are generally forced to pass through cylinder ports 37 and 38. The cylinder 30 and barrier 55 constitute an integral unit.

OPERATION

To operate the bubble gun toy 10 the cap 33 is opened and bubble producing liquid 26 is introduced through refill neck 33A and into the reservoir 25 to a level slightly below the arcuate slot. The shape and location of refill neck 33A will cut off the flow of liquid 26 when the optimum level is reached, so that spillage is thereby avoided. The muzzle 14 of front section 12 of the toy 10 is then shaken crosswise to cause a foamy-frothy mass around and within the arcuate slot 32. This movement is not necessary, since action by the pumping means 15 alone will suffice, although extra agitation will cause a foamy-frothy mass to form more quickly for initial usage.

The gun 10 may be rolled, aimed in infinite directions and maneuvered vigorously by the child without causing substantial spillage of the bubble producing liquid 26 since it will generally flow around and stay within the torus cavity of the reservoir 25. The foamy-frothy mass adjacent the arcuate slot 32 is, alone, adequate to load the dip ring 27 for producing successive clusters of bubbles B.

Bubble B are produced by operating the pumping means 15 with one or more simple hand motions. The child can, for example, hold front section 12 stationary

while reciprocating rear section 13 or conversely hold rear section 13 relatively stationary while shifting front section 12 back and forth. Alternatively, both front section 12 and rear section 13 can be moved successively toward and away from each other in order to cause induction of ambient air streams A_1 and expulsion of compressed air streams A_2 .

During the bubble producing stroke of pumping means 15 the compressed air A_2 is driven through diaphragm aperture 22 (referring to the FIG. 6 embodiment) or directly through cylinder port 37 (referring to the FIG. 10 embodiment) to thereby force shuttle 31 to rise or experience displacement to a level just beyond the intermediate port 38.

As the shuttle 31 is thus lifted the dip ring 27 is withdrawn from reservoir 25, loaded with a soapy film and brought into registering alignment with the center of reservoir 25 and intermediate port 38. The outflowing air stream A_2 issues through port 38 and into impinging engagement or contact with the soapy film to thereby create a cluster of various sized bubbles B. The pumping means 15 can be operated with relatively rapid short strokes in order to produce a stream of single bubbles. Larger bubbles in groups can be readily produced by making relatively slower and longer strokes with the pumping means 15. During the longer or shorter strokes alignment is maintained by way of the guide means 20 and the tubes 16 and 18 are prevented from separating due to the stop means 17A.

The suction produced during the reverse or retracting stroke of the pumping means 15 forcibly pulls the shuttle 31 in a reverse direction through the cylinder 31 while simultaneously forcibly dropping dip ring 27 through the arcuate slot 32 and once again depositing it in the reservoir 25.

The child may steadily or periodically play with the bubble gun toy 10 to shoot pretend bullets in the form of single bubbles, or bubble clusters until the bubble producing liquid 26 is exhausted and the frothy foam mass is dissipated. Thereafter, a new supply of bubble producing liquid 26 can be quickly and conveniently deposited in reservoir 25 enabling the child to resume shooting pretend bullets or imaginary projectiles.

The bubble sizes can be somewhat controlled by varying the size of port 38, the distance between dip ring 27 and port 38 and operation of the pumping means 15 as previously explained.

In view of the foregoing it can be understood how the unique benefits of this bubble gun toy are accomplished.

What is claimed is:

1. A bubble gun comprising:

- a. a casing simulating a gun and having a front section and a rear section;
- b. a cylinder positioned within and extending laterally across the casing front section;
- c. a first port through an end portion of the cylinder;
- d. a second port through an intermediate portion of the cylinder;
- e. pumping means coupled to the casing for alternately driving a charge of compressed air sequentially through the first and second ports and drawing a fresh charge of air sequentially back through the second and first ports;
- f. a shuttle in the cylinder arranged for travel between the first and second ports, the shuttle being lifted beyond the second port when a charge of compressed air is driven through the cylinder and

- dropped to a level adjacent the first port when a fresh charge of air is drawn through the cylinder;
- g. an arm connected to the shuttle;
 - h. an annular-shaped reservoir for holding bubble-producing liquid coupled to the casing front section and having a slot formed in an inner wall portion; and,
 - i. a dip ring carried by the arm and oriented to pass through the reservoir slot and into the reservoir as the shuttle is dropped, and, be lifted from the reservoir as the shuttle is lifted.
2. The structure according to claim 1, wherein: the second port is positioned and the arm is shaped in such a manner that when the shuttle is lifted beyond the second port then the ring and second port are brought into registering alignment.
3. The structure according to claim 1, wherein: a front side wall portion of the cylinder is formed with a guide slot extending longitudinally from one end of the cylinder; and,
- the arm projects through the guide slot.
4. The structure according to claim 3 wherein: the guide slot is longitudinally aligned with and terminates near the second port; and,
- the arm is shaped in a manner so that when the cylinder is lifted beyond the second port then the ring and second port are brought into registering alignment.
5. The structure according to claim 3 wherein the arm is confined within the casing front section and has:
- a first segment projecting through the guide slot;
 - a second segment parallel to the first segment and connected to the ring; and,
 - a third segment interconnecting the first and second segments;
6. The structure according to claim 1 wherein: the reservoir is torus-shaped having a central opening generally concentrically aligned with the second port.
7. The structure according to claim 6 including: a cap releasably secured to a refill neck coupled to the reservoir.
8. The structure according to claim 7, wherein: the reservoir slot is arcuate shaped, and,
- the neck extends to a level fully beneath the reservoir arcuate slot.
9. The structure according to claim 6 wherein: a pair of laterally spaced and parallel guide rails are connected to the reservoir and extend across its central opening; and,
- opposing side edges of the dip ring are positioned to slide along the guide rails.
10. The structure according to claim 1, wherein the pumping means includes:
- a first tube with an open rearward end, the first tube being coupled to the casing front section; and,
 - a second tube with a closed forward end, the second tube being coupled to the casing rear section and slidably disposed within the first tube.
11. The structure according to claim 10 wherein: a variable sized air chamber is formed within the first tube and second tube for alternately compressing and drawing in air as the first and second tubes are slid longitudinally relative to one another.
12. The structure according to claim 11 including: a diaphragm positioned within the first tube and formed with an air pressure aperture; and,

- a linking tube extending between the air passage aperture and cylinder first port in order to place the cylinder and air chamber in mutual fluid communication.
13. The structure according to claim 11, including: an air barrier secured to the cylinder and positioned to generally block the flow of air around the cylinder.
14. The structure according to claim 13 wherein: the air barrier has a pair of wing walls extending laterally from opposite sides of the cylinder into contact with the casing front section.
15. The structure according to claim 10 including: stop means for preventing the first tube from sliding off the second tube; and,
- guide means to prevent relative rotation and twisting between the first tube and second tube.
16. The structure according to claim 15 wherein: the guide means includes a longitudinally extending guide slot formed in one of said tubes; and,
- the stop means includes a key fixed to the other of said tubes and projecting into the guide slot, the key being arranged to slide within the guide slot and make contact after a predetermined length of travel.
17. A bubble gun toy comprising:
- a. a casing simulating a gun and having an elongated hollow front section and a rear section;
 - b. a cylinder positioned within and extending laterally across the casing front section;
 - c. a guide slot formed in a front side wall portion of the cylinder and extending longitudinally from the top end of the cylinder;
 - d. a first port formed through the lower end of the cylinder;
 - e. a second port formed through an intermediate portion of the cylinder, the guide slot being longitudinally aligned with and terminating near the second port;
 - f. pumping means coupled to the casing for alternately driving a charge of compressed air sequentially through the first and second ports to assist in forming bubbles, and, drawing a fresh charge of air sequentially back through the second and first ports;
 - g. a shuttle in the cylinder arranged for travel between the first and second ports, the shuttle being lifted beyond the second port when a charge of compressed air is driven through the cylinder and pulled forcibly to a level adjacent the first port when a fresh charge of air is drawn through the cylinder;
 - h. an arm connected to the shuttle and projecting through the guide slot;
 - i. a torus-shaped reservoir for holding bubble producing liquid coupled to the casing front section and having an arcuate slot formed in an inner wall portion, the reservoir having a central opening concentrically aligned with the second port; and,
 - j. a dip ring carried by the arm and oriented to pass through the reservoir arcuate slot and into the reservoir as the shuttle is forcibly pulled, and, be lifted from the reservoir as the shuttle is lifted.
18. The structure according to claim 17 wherein: the arm is shaped in a manner so that when the shuttle is lifted beyond the second port then the dip ring and second port are brought into registering alignment;

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a pair of laterally spaced and parallel guide rails are connected to the reservoir and extend across its central opening with opposing side edges of the ring being positioned to slide along the guide rails; 5
and,
the pumping means includes a first tube with an open

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rearward end, and, a second tube with a closed forward end - the tubes being coupled to respective casing sections and disposed for mutual sliding engagement.

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