United States Patent [19]

Turnbull

[11] **3,811,671**

[45] **May 21, 1974**

[54] **CONTAINER FOR FORCED EXPIRATION EXERCISES**

[75] Inventor: **Charles H. Turnbull,** Old Lyme, Conn.

[73] Assignee: **Cheseborough-Pond's Inc.,** New York, N.Y.

[22] Filed: **Aug. 25, 1972**

[21] Appl. No.: **283,874**

[52] **U.S. Cl.** ..... **272/57 F,** 128/2.08, 220/23.2, 220/23.8, 272/DIG. 5

[51] **Int. Cl.** **A63b 23/00,** A61b 5/08

[58] **Field of Search** ..... 272/57 F, DIG. 5; 128/2.08; 46/1 D; 275/11 R; 220/20.5, 23.2, 23.8

[56] **References Cited**

UNITED STATES PATENTS

3,363,627	1/1968	Bidwell et al.	128/276
2,248,277	7/1941	Menard	220/20.5 X
3,661,288	5/1972	Noll	215/11 R
3,105,324	10/1963	Friedman	46/1 D
714,141	11/1902	Cady	128/2.08 X
2,445,275	7/1948	Lintern et al.	220/23.2

FOREIGN PATENTS OR APPLICATIONS

859,316	12/1940	France	272/57 F

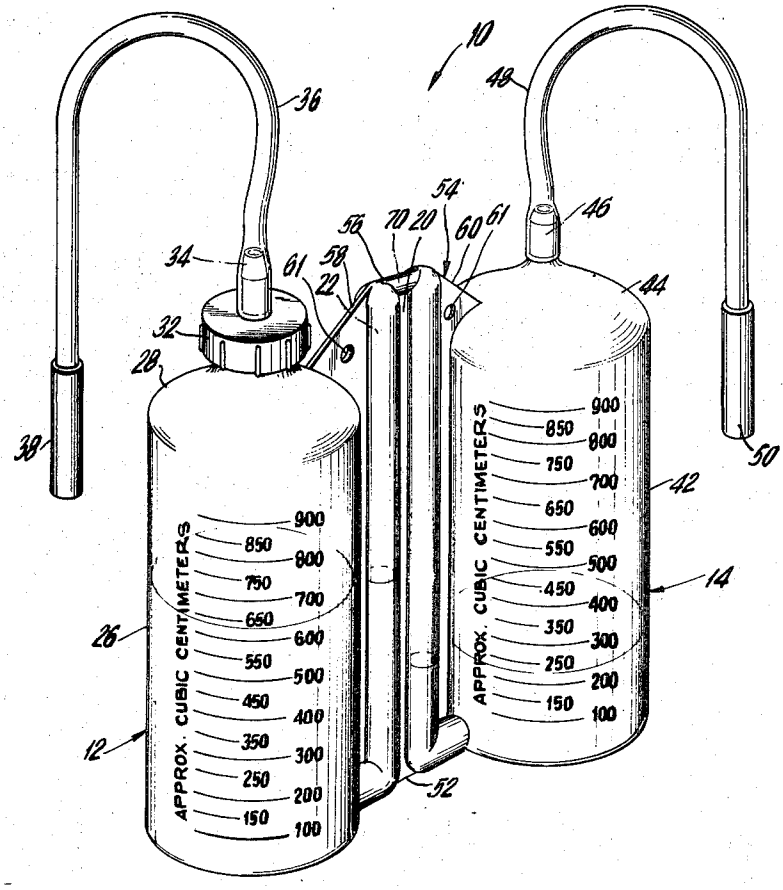
Primary Examiner—Anton O. Oechsle
Assistant Examiner—R. T. Stouffer

[57] **ABSTRACT**

A unitary, self-supporting, semi-rigid container for forced expiration exercises having a pair of compartments for containing liquid into which a patient seeking respiratory stimulation can forceably blow, a web between and integrally joined to the compartments providing rigidity for the container, and a conduit in the web for transferring the liquid from one compartment to the other in response to a patient forceably blowing into the liquid filled compartment.

The conduit includes a pair of spaced channels each connected at its lower end to the adjacent compartment and at its upper end to an interconnecting restriction for controlling the quantity of liquid flowing through the downstream channel to prevent siphoning from occurring when a recuperating patient blows into the liquid filled compartment and causes liquid in that compartment to flow through the conduit into the other compartment.

12 Claims, 4 Drawing Figures



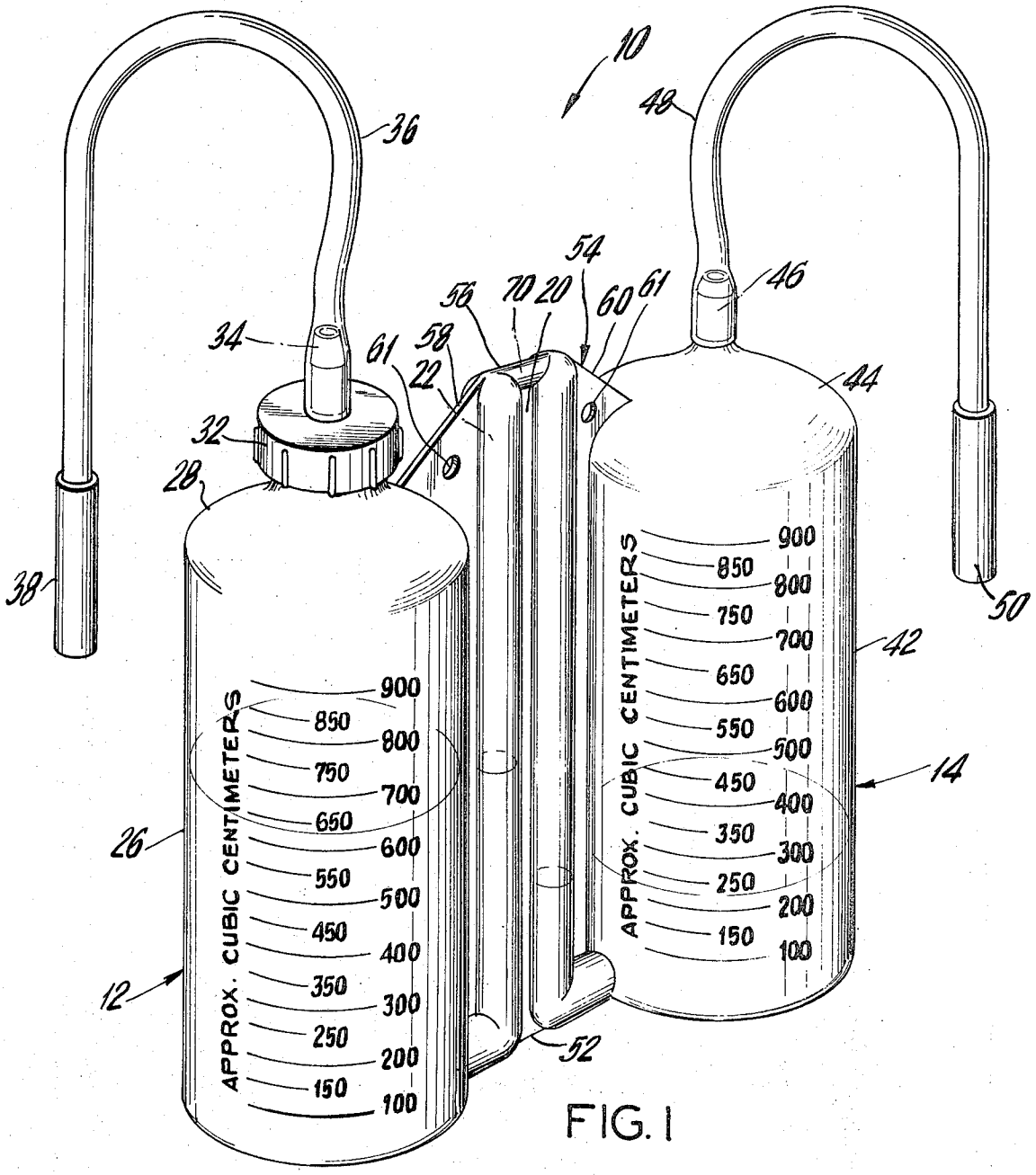


FIG. 1

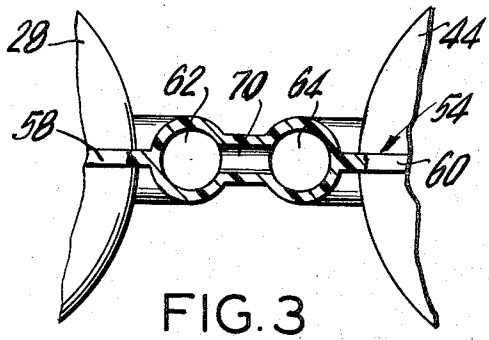


FIG. 3

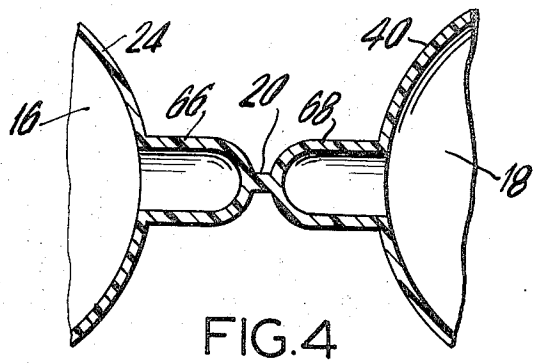


FIG. 4

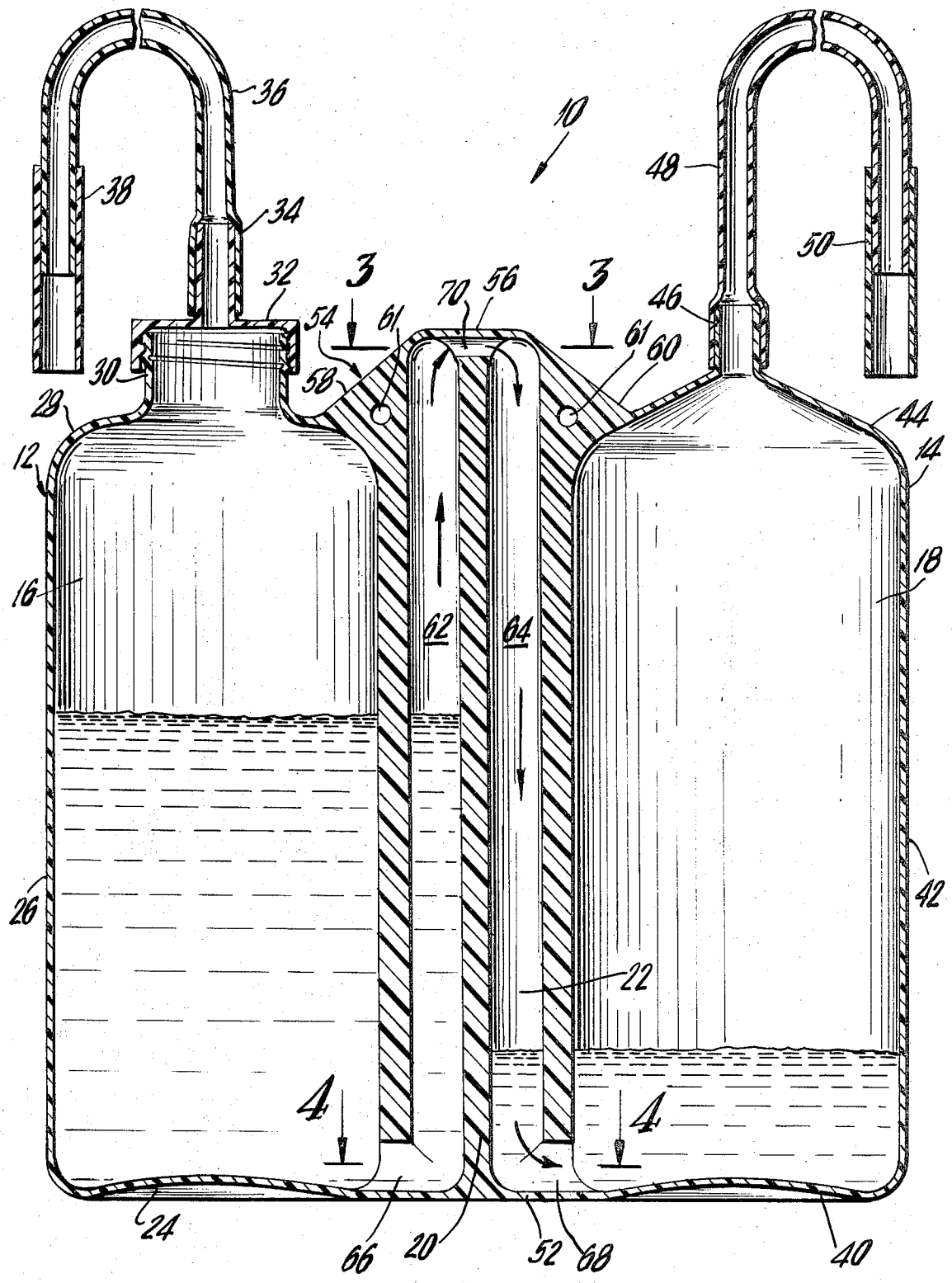

10
12
14
16
18
20
22
24
26
28
29
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
61
62
64
66
68
70
3
3
4
4

FIG. 2

CONTAINER FOR FORCED EXPIRATION EXERCISES

FIELD OF THE INVENTION

This invention relates to a respiratory stimulator, and more particularly to a unitary device having compartments between which liquid is transferred by forceably blowing thereinto.

BACKGROUND OF THE INVENTION

In the treatment of a patient it is often required to force respiratory stimulation to insure proper ventilatory effort. The post-surgical patient, the geriatric, and the bed-ridden patient are prime examples of where respiratory stimulation must be induced. This stimulation reconditions chest and abdomen muscles, promotes healing, and, most importantly, avoids conjestion of the lungs which can lead to hypostatic pneumonia.

One type of apparatus being used for forced expiration exercises includes a pair of separate blow bottles with multiple segments of independent interconnecting tubing. In practice, the patient blows liquid from one bottle into the other bottle through flexible interconnecting tubing. Because the bottles are separate considerable relative movement or racking has been experienced in handling and use. In an attempt to avoid racking, an elastic strap has been used which is slipped about both bottles. While the strap has been found to limit racking it does not eliminate, altogether, undesirable relative movement.

Furthermore, the bottles are not joined permanently because they each must be screwed into caps. In one version tubing through which the patient blew and a rigid tube adapted to extend into the bottom of one of the bottles had been attached to one of the caps. From the rigid tube then extended flexible tubing which was connected to the other cap which, in turn, was secured to the other bottle. In operation, the patient blew through the tubing attached to the liquid filled bottle which caused liquid to flow upwardly through the rigid tube and on through the interconnecting tube into the other bottle. After the liquid had been transferred to the other bottle, the caps with the tubes were removed and bottles reversed, so that the exercise could be repeated in reverse order.

To eliminate the necessity of interchanging the caps and tubing, another version had attached to each cap in a preassembled manner a blow-through tube and a depending rigid tube from which extended flexible tubing attached to the other cap. With this version, however, it was found that when a patient blew into one of the bottles, the liquid flowing into and the air escaping from the other bottle often created a siphoning effect in which the liquid would continue to flow until the level of liquid in each bottle was the same. Thus, by effecting a siphon the patient obviated the purpose of the exercise. To overcome this drawback, one way flutter valves had been attached to the liquid transferring interconnecting tubes which allowed the flow of liquid into a bottle only in response to continued forced breathing. But in so doing, still additional parts had been thereby made necessary.

Accordingly, while the liquid in the blow bottles provided the resistance necessary to produce prolonged expiration and measurement of the patient's effort, as well as to bring relatively unused muscles into play, the multiplicity of independent and relatively movable parts makes the combination cumbersome and awkward to handle and use for both the patient and the nurse or therapist.

It is, therefore, an object of this invention to provide a new and improved respiratory stimulator for forced expiration exercises without the attendant disadvantages of the presently employed blow bottles.

Among the other objects of this invention are to provide a unitary container which employes liquid for inducing respiratory stimulation and which can be easily handled and used by both the patient or nurse or therapist; to provide such a unitary container without the need for valves or other independent parts to prevent a recuperating patient from creating a siphoning effect, to provide such a unitary container to effectively eliminate the need for expensive equipment for forced breathing exercises; and to provide such container which saves time in setting up and in instructing a patient on how to effectively use the device.

Additional objects and advantages will be set forth in part hereinafter and in part will be obvious herefrom or may be learned with the practice of the invention, the same being realized and obtained by means of the respiratory stimulator recited in the appended claims.

SUMMARY OF THE INVENTION

In accordance with the invention, there is provided a respiratory stimulator for forced expiration exercises, comprising a unitary, self-supporting container formed of plastic, preferably of a semi-rigid or rigid, translucent or transparent, one-piece construction. The container has a pair of compartments through which liquid contained therein can be seen. These compartments are spaced apart by an integral strengthening web having a conduit therein for transferring liquid from one compartment to the other in response to a patient forceably blowing into the liquid filled compartment.

The conduit in the web includes a pair of spaced channels, each of which is opened at its lower end to the lower end of one of the compartments, and an interconnecting restriction positioned in the web at the level of the upper portions of the compartments. The interconnecting restriction in the conduit is in the form of an orifice having a breadth less than the breadth of the channels to prevent siphoning while allowing the flow of liquid through the conduit when a recuperating patient forceably blows into one of the compartments. For in the present invention, the interconnecting orifice controls the quantity of liquid which flows through the downstream channel so that liquid flowing therethrough does not remove the air from that channel and thereby effect siphoning.

Preferably the compartments and channels are substantially vertical and the interconnecting orifice is formed by a substantially horizontal channel having a diameter less than the diameter of the channels which prevents a siphoning effect from occurring when a recuperating patient blows into the liquid filled compartment and liquid flows through the channels into the other of said compartments.

BRIEF DESCRIPTION OF THE DRAWINGS

The following is a detailed description together with accompanying drawings of a preferred embodiment of the invention. It is to be understood that the invention is capable of modification and variation apparent to

those skilled in the art within the spirit and scope of the invention.

In the drawings:

FIG. 1 is a perspective view of a unitary respiratory stimulator constructed in accordance with the present invention.

FIG. 2 is a longitudinal view, in section, of the respiratory stimulator illustrated in FIG. 1.

FIG. 3 is a cross-sectional view, taken along the lines 3—3 of FIG. 2.

FIG. 4 is a cross-sectional view, taken along the lines 4—4 of FIG. 2.

Referring first to FIGS. 1 and 2 there is shown a unitary self-supporting, semi-rigid container **10** formed from a see through plastic in a one piece construction. The container **10** includes a pair of compartments **12** and **14** forming vertical chambers **16** and **18** for containing liquid, and an intermediate web **20** having an interconnecting conduit **22** extending therethrough.

The compartment **12** has a base **24** from which extends a cylindrical wall structure **26** with an inwardly and upwardly sloping top portion **28** from which, in turn, extends a threaded neck **30** for receiving a complimentary threaded closure, such as screw cap **32.** Extending upwardly from the screw cap **32** is a nipple **34** over which is slidably fitted flexible tube **36** which terminates at its other end in a mouthpiece **38.**

Correspondingly, the compartment **18** has a base **40,** a cylindrical wall structure **42** and an inwardly and upwardly sloping top portion **44** from which extends a nipple **46** over which a flexible tube **48** is slidably fitted which terminates at its other end at a mouthpiece **50.**

To help the physician in prescribing the desired level of exercise and to measure the patient's progress, the compartments **12** and **14** are incrementally graduated. As illustrated, the measured capacity of each compartment is 900 cc (about 1 quart) graduated in 50 cc increments.

The interconnecting web **20** is integrally joined to the central portions of the compartment wall structures **26** and **42** and is of a flat solid construction so as to act as strengthening member which provides rigidity to the container **10.** In the described embodiment of the invention the web **20** is about 8.0 inches high, 2.0 inches wide between compartments **12** and **14** and 0.125 inches thick.

At its lower end the web **20** terminates in a straight base **52** at the compartment bases **24** and **40.** At its upper end the web **20** is in the form of a truncated shaped crest **54** positioned at the level of the nipples **34** and **46** with a horizontal upper edge **56** and depending sides **58** and **60** which extend downwardly at oblique angles and are integrally joined to the compartment top portion **28** and **44.** To facilitate hanging or suspending of container **10,** holes **61** are molded into or drilled through the web crest **54** on opposite sides of conduit **22.**

The conduit **22** in the web **20** includes a pair of vertical channels **62** and **64** having elbow shaped segments **66** and **68** at their lower ends which open into the lower portion of the chambers **16** and **18.** At their upper ends, the channels **62** and **64** extend into the top of the web **20** where they are interconnected by a channel **70** horizontally positioned within the upper segment of the crest **54.** The diameter of the horizontal channel **70** is less than the diameter of the vertical channels **62** and **64** to prevent siphoning of the flowing liquid when a recuperating patient blows into one of the chambers **16** and **18,** but is of sufficiently large diameter to provide an interconnecting orifice which allows the transfer of liquid from one vertical channel to the other during forced expiration exercises. In the illustrated embodiment of the invention the inner diameter of each vertical channel **62** and **64** is 0.6875 inches and the inner diameter of the horizontal channel **70** is 0.1875 inches.

In using the container **10** of the invention for forced expiration exercises, the vertical chamber **16** is filled with water which can be colored by dropping a tablet thereinto. The cap **32** is then screwed firmly onto the chamber neck **30.**

The patient can blow into the chamber **16** either via the nipple **34** or the mouthpiece **38** and the flexible tube **36** attached to the nipple **34.** For example, where the patient is prone in bed, the flexible tube **36** should be used. Correspondingly the flexible tube **48** and mouthpiece **50** can be used for blowing into the chamber **18** by simple sliding the tube **48** over the nipple **46.** In the illustrated embodiment flexible tubes of about 15.0 inches in length have been found to be satisfactory.

With the chamber **16** filled with colored water and the flexible tubes **36** and **48,** if desired, in place, the patient blows into mouthpiece **38** which causes water in the chamber **16** to flow upwardly through the upstream channel **62** across orifice **70** and down through the downstream channel **64** into the chamber **18.**

Once the patient completes the forced expiration exercise which transfers water from chamber **16** to chamber **18** the described procedure is reversed. This procedure of blowing the water from one chamber to the other is then repeated as often as desired.

In the preferred embodiment of the invention the orifice **70** is of a sufficient diameter to allow that water to flow as described in response to the blowing action of the patient while being sufficiently constricted relative to the breadth of the channels **62** and **64** to prevent water in the descending downstream channel from sweeping the air therein along with it. In so doing the container **10** is constructed to prevent a recuperating patient from effecting siphoning which would occur if the air in the downstream channel was swept out into the chamber **18** by the downwardly cascading water.

However, where desired the relationship in the sizes or breadths of the channels **62** and **64** and orifice **70** can be constructed so that a recuperating patient would not be unable to effect siphoning whereas a fully recovered patient could effect siphoning after expending a substantial effort. In this embodiment the siphoning provides an indication that patient's respiratory system no longer needs forced stimulation.

The unitary container **10** of the invention is formed from plastic materials, preferably thermoplastics which are inert and stable in the formed container and which lend themselves to processing by plastic forming techniques, and will, when formed, provide the see through, self-supporting, semi-rigid or rigid container described and claimed herein. In the preferred embodiment the container is formed by blow molding high density polyethylene through which the colored water in the compartments and conduit can be seen. Other thermoplastic materials which in the formed container are translucent or transparent also can be used, including low den-

sity polyethylene, polycarbonate and polypropylene. Further, in blow molding incremental graduations in the compartments **12** and **14** are formed as raised ridges along with the capacity of each chamber **16** and **18** being indicated at each graduation by raised numerals. When the container of the invention is formed in parts by molding or other techniques, the parts are preferably permanently joined by seams at their mating segments to provide a one-piece, semi-rigid or rigid container.

The invention in its broader aspect is not limited to the specific described embodiments and departures may be made therefrom within the scope of the accompanying claims without departing from the principals of the invention and without sacrificing its chief advantages.

What is claimed is:

1. A unitary self-supporting container for forced expiration exercises comprising: a pair of compartments for containing liquid into which a patient can forceably blow to achieve respiratory stimulation, a web between and integrally joined to said compartments, and a conduit in said web which includes a pair of substantially vertical spaced channels each of which is connected to the lower portion of said adjacent compartment and each of which extends upwardly therefrom in said web to the level of the upper portions of said compartments and a restriction in said web at the level of the upper portions of said compartments interconnected with and having a breadth less than the breadth of said channels for the transfer of the liquid from one compartment to the other when a patient forceably blows into the compartment containing the liquid.

2. A unitary self-supporting container for forced expiration exercise comprising: a pair of compartments for containing liquid into which a patient can forceably blow to achieve respiratory stimulation, a web between and integrally joined to compartments, and a conduit in said web for transferring the liquid from one compartment to the other in which said conduit includes a pair of vertical spaced channels each of which is connected to the lower portion of said adjacent compartment and each of which extends upwardly therefrom in said web to the level of the upper portions of said compartments and an orifice in said web at the level of the upper portions of said compartments interconnected with and having a breadth less than the breadth of said channels for controlling the quantity of liquid which can flow through said channel downstream of said orifice so that the liquid flowing therethrough will not remove the air therein and effect siphoning when a recuperating patient blows into the liquid containing compartment to cause the liquid in said compartment to flow through said conduit and into the other of said compartments.

3. The unitary container according to claim **2** wherein said container is semi-rigid and of a one piece construction.

4. The unitary container according to claim **3** wherein said container is at least translucent and is formed from thermoplastic materials selected from the group consisting of high or low density polyethylene, polycarbonate and polypropylene.

5. A unitary self-supporting, semi-rigid container for forced expiration exercises comprising: a pair of compartments for containing liquid, wherein one of said compartments has a removable cap for filling said compartment with liquid and to which is attached means for allowing a patient to blow into said compartment, and wherein the other of said compartments has means attached thereto for allowing a patient to blow into said compartment, has means attached thereto for allowing a patient to blow into said compartment; a strengthening web to provide rigidity to said container between and integrally joined to said compartments; and a conduit in said web for transferring the liquid from one compartment to the other in which said conduit includes a pair of substantially vertical spaced channels each of which is connected to the lower portion of said adjacent compartment and each of which extends upwardly therefrom into the upper portion of said web and an orifice located in the upper portion of said web interconnecting said channels and having a breadth less than the breadth of said channels for allowing the flow of liquid between said channels while preventing a siphoning effect from occurring when a recuperating patient blows into the liquid containing compartment to cause the liquid therein to flow through said channels and into the other of said compartments.

6. The conduit according to claim **5** wherein said interconnecting orifice is formed by a substantially horizontal channel in said conduit having a diameter less than the diameter of said vertical channels.

7. The container according to claim **5** wherein said compartments are substantially vertical and the web is integrally joined thereto along the height of such compartments.

8. The container according to claim **7** wherein said web has a pair of holes therethrough on opposite sides of the conduit in said web for suspension of said container.

9. The container according to claim **5** wherein said compartments have incremental graduations in the form of integral raised edges along with the capacity of said compartments being indicated by raised numerals at each graduation.

10. The container according to claim **5** wherein said means for blowing into the compartments includes a hollow nipple.

11. The unitary container according to claim **5** wherein said means for blowing into each compartment includes a nipple, a flexible tube fitted over said nipple, and a mouthpiece attached to the other end of said flexible tube.

12. A unitary self-supporting, semi-rigid container for forced expiration exercises comprising: a pair of vertical compartments for containing liquid into which a patient seeking respiratory stimulation can blow; a strengthening web to provide rigidity to said container between and integrally joined to said compartments along the height of each; and a conduit in said web for transferring liquid between said compartments in which said conduit has a pair of vertical channels each of which is connected at its lower end to the lower portion of the adjacent compartment and extends upwardly therefrom into the upper portion of said web, and a horizontal channel in the upper portion of said web interconnecting said vertical channels and having a diameter less than the diameters of said vertical channels so that when a recuperating patient blows into the liquid filled compartment liquid therefrom flows upwardly through said adjacent vertical channel across said horizontal channel and downwardly through said other vertical channel into its adjacent compartment without effecting siphoning.

* * * * *