

(21) Application No 0010920.7

(22) Date of Filing 06.05.2000

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(51) INT CL<sup>7</sup>  
F21S 6/00 10/00 , G09F 13/24 // F21W 121:00

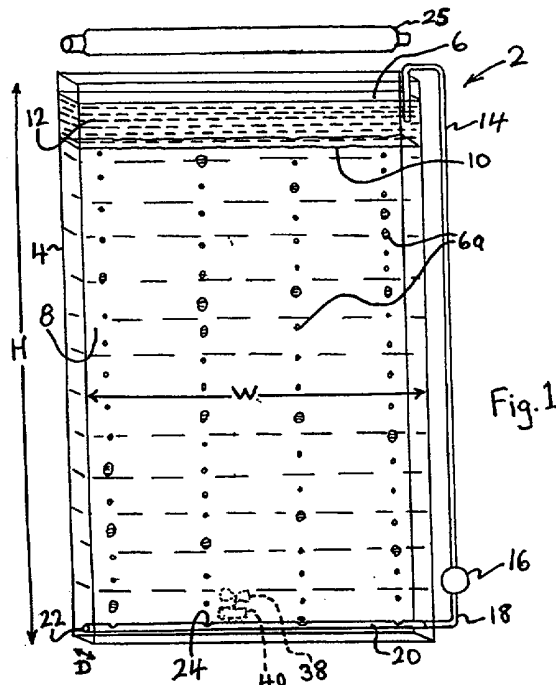
(52) UK CL (Edition S )  
F4R RAG RL R336 R39Y R409 R701

(56) Documents Cited  
GB 2270106 A WO 99/04380 A WO 97/44772 A  
WO 95/19026 A

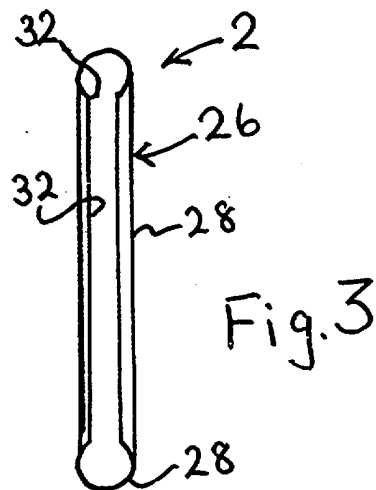
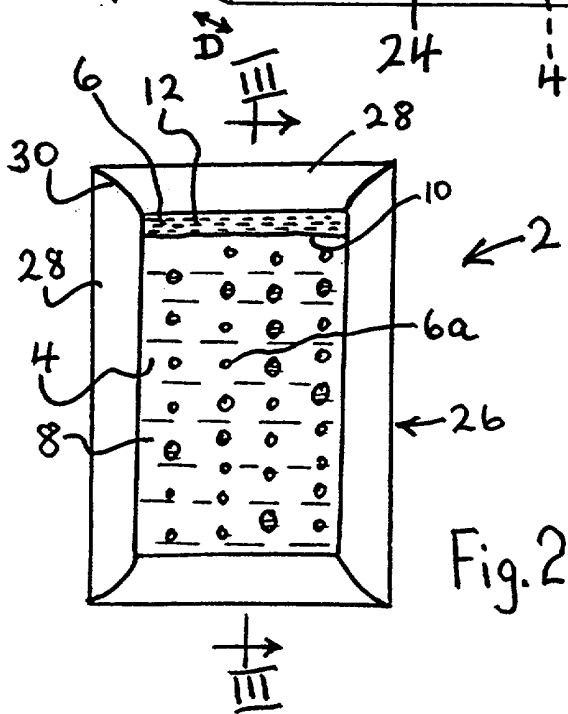
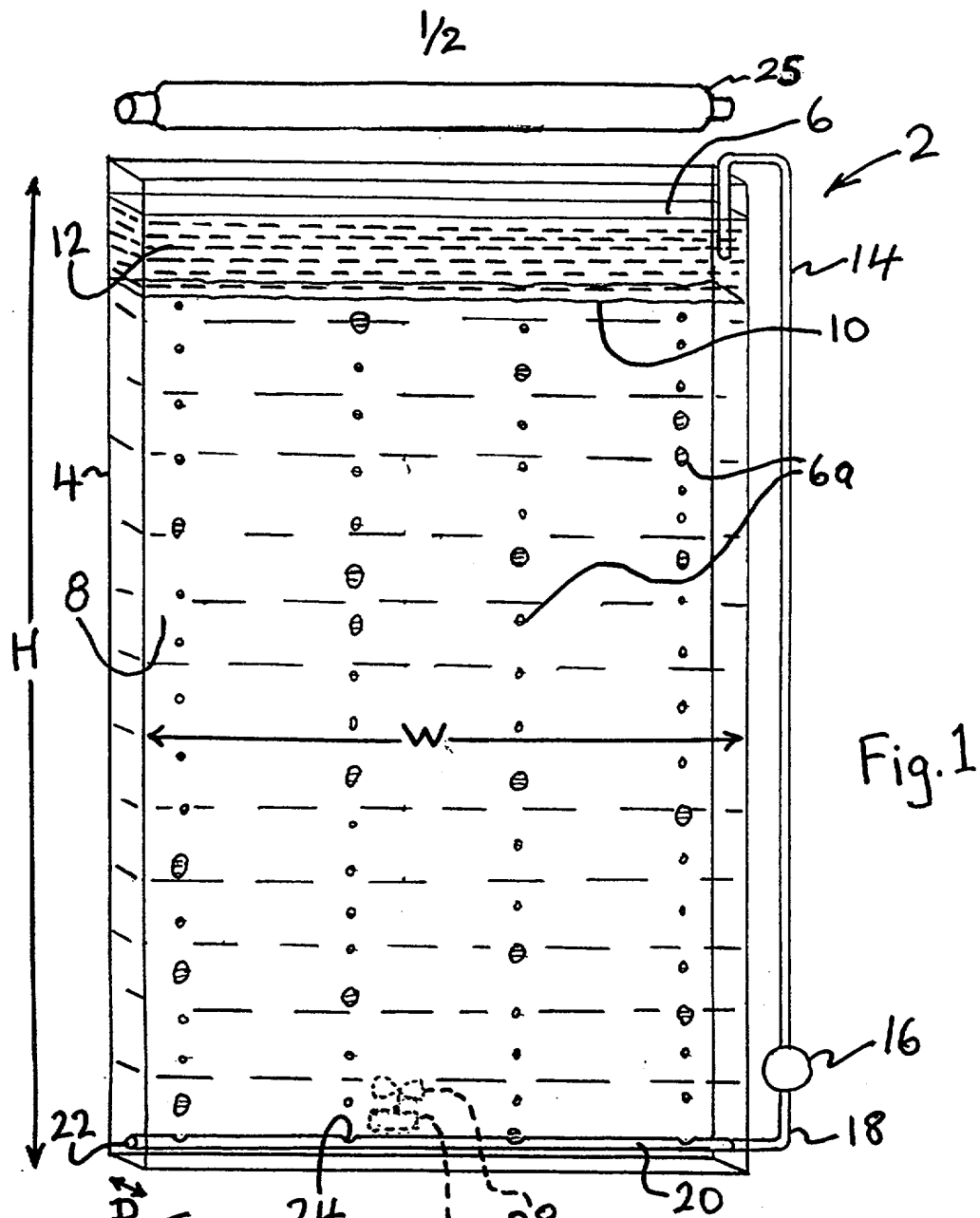
(58) Field of Search  
UK CL (Edition S ) F4R RAG RE RFN RL  
INT CL<sup>7</sup> F21S 2/00 6/00 10/00 11/00 , F21V 9/12 ,  
G09F 13/24  
Online: WPI EPODOC JAPIO

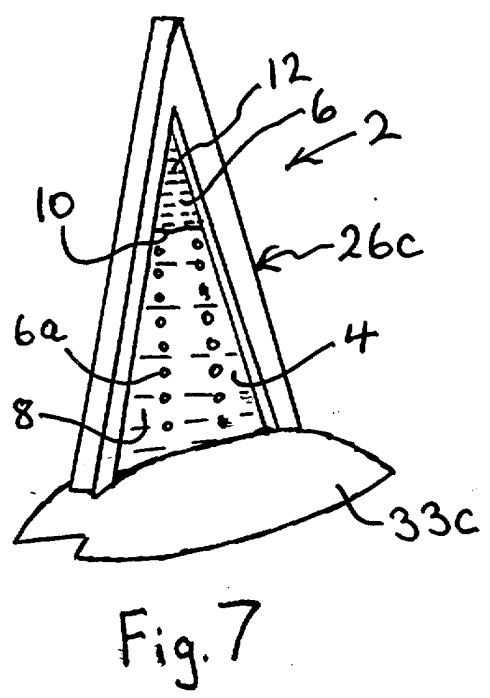
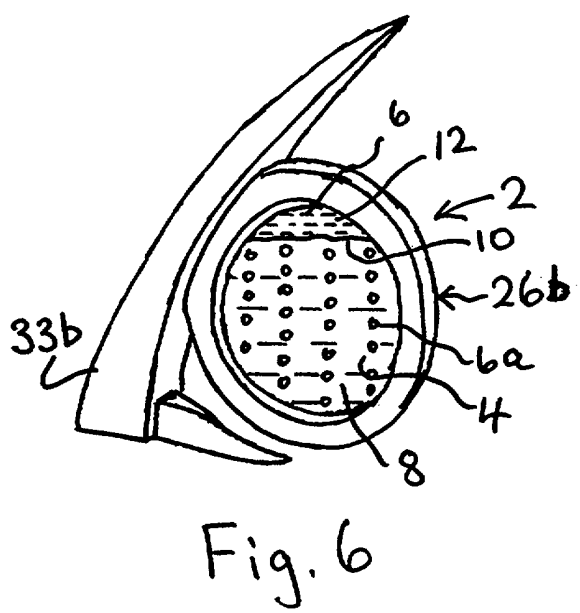
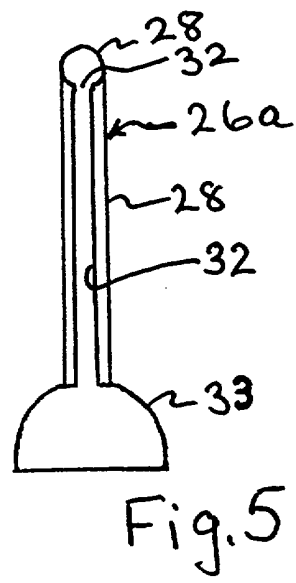
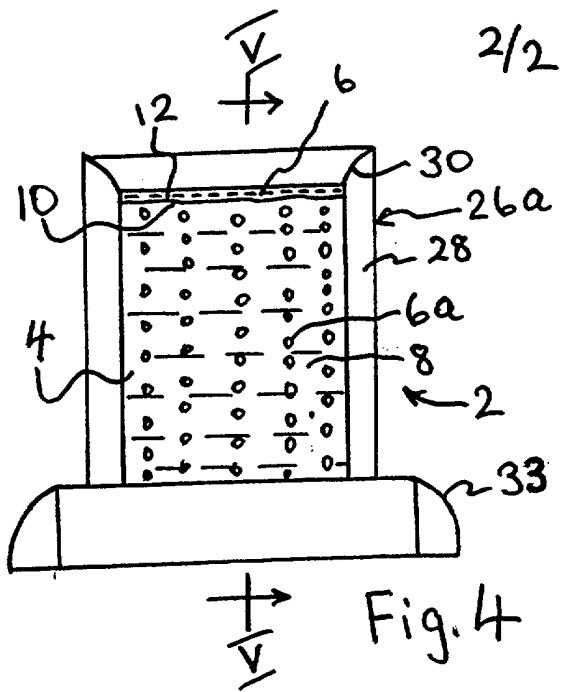
(54) Abstract Title  
**An illuminated liquid display device**

(57) The invention concerns a free standing or wall mounted illuminated liquid display device comprising a reservoir 4 containing two immiscible fluids; The two fluids being of different densities, the higher density fluid 8 forming the main body within the reservoir and the lower density fluid 6 naturally sitting in the top part of the reservoir. A pump 16 is mounted within the framework of the device and draws the lower density fluid through an outlet in the reservoir and releases it through a series of delivery ports 24 in the base of the reservoir into the higher density fluid thus creating a circulatory flow as the lower density fluid rises through the higher density fluid. The reservoir is a sealed unit. The delivery ports are connected to the pump by a tube 18. The pump has a second tube 14 that sucks the lower density fluid from the reservoir and delivers it to the series of delivery ports that release it into the higher density fluid. The tube at the base has a check valve to prevent backflow of the lower density fluid. A variable speed controller alters the rate at which the lower density fluid ascends through the higher density fluid in the reservoir. The device can be operated by a sound sensor switch and a motion sensor switch.



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**DISPLAY DEVICE**

This invention concerns a display device.

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An object of the invention is to provide a device giving a fascinating or interesting visual effect which may also be soothing or have therapeutic value.

10 According to a first aspect of the invention a display device comprises a reservoir having at least a wall portion which is transparent to allow the human eye to see into an interior of the reservoir, said reservoir containing at least a first liquid and a second liquid, said first and second liquids being immiscible and of respective colours which can be  
15 distinguished one from the other by said eye, said first liquid being less dense than the second liquid, pump means whereby said first liquid supplied from the reservoir is pumped to nozzle means in the reservoir from which nozzle means globules or bubbles of said first liquid can ascend through the second liquid to a higher level in the reservoir and be  
20 observed, in the course of ascent, through said wall portion.

A supply of said first liquid may float on top of the second liquid, and first liquid from said supply may be pumped to said nozzle means.

25 Said reservoir may comprise at least a first transparent said wall portion and a second transparent said wall portion, and said first and second wall portions may be disposed at respective opposite sides of the reservoir.

Said reservoir may be of substantially flat screen form wherein a  
30 substantially horizontal depth dimension between opposite front and rear

substantially upright sides or walls of the reservoir is a plurality of times less than a height dimension of at least one of said front or rear sides or walls.

5 The first liquid may comprise light mineral oil. The first liquid may comprise a parafin. The first liquid may comprise a dye.

The second liquid may comprise water and a diol. The second liquid may comprise a dye. Said diol may be ethanediol. Preferably the second  
10 liquid may be translucent.

Preferably, the nozzle means comprises a plurality of outlet holes each for globules or bubbles of said first liquid to emerge into said second liquid. If desired, the display device may be provided with motion  
15 inducing means to cause aforesaid ascending bubbles to swirl or follow a substantially spiral ascending path. Said motion inducing means may comprise one or more driven rotors.

Preferably the pump means is a peristaltic pump.  
20

Desirably, the display device may further comprise lamp means to illuminate the interior of the reservoir. Said lamp means may be electric lamp means. For example, the lamp means may be a fluorescent lamp. The lamp means may be above said reservoir.

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The reservoir may be surrounded at least in part by a frame.

The display device formed according to the first aspect of this invention may be used in therapy for human beings or animals. The therapy may  
30 be light therapy.

According to a second aspect of the invention performance of light therapy on human beings or animals comprises using the display device formed according to the first aspect of the invention.

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The invention will now be further described, by way of example, with reference to the accompanying drawings in which:-

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**Figure 1** is a perspective view of a fragment of a display device formed according to a first aspect of the invention and may be used in a method according to a second aspect;

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**Figure 2** is a front view of a display device formed according to the first aspect of the invention comprising the fragment in Figure 1;

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**Figure 3** is a diagrammatic section on line III-III in Figure 2 with parts absent;

25

**Figure 4** is a front view of a modification of the display device in Figure 2;

**Figure 5** is a diagrammatic section on line V-V in Figure 4 with parts absent, and

**Figures 6 and 7** are views of further respective modifications of the display device in Figure 2.

In the drawings like references identify like or comparable parts.

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With reference to Figures 1 to 3, a display device 2 comprises a tank or reservoir 4 with one or more transparent walls so that the human eye can see into the interior of the reservoir. In Figures 1 and 2 the reservoir 4 is of parallelepiped shape and has an open top. But the reservoir may have  
5 a covered top with or without airway provision. The reservoir 4 in Figures 1 and 2 is of a flat or screen type shape in that its depth dimension D is considerably less than its height dimension H or its width dimension W. For example dimension D may be not greater than about 30mm, or than about 25mm, or than about 20mm. Though it should be  
10 understood that other shapes or forms of reservoirs may be used as substitutes for the reservoir 4 in Figures 1 and 2. Preferably in the reservoir 4 in Figure 1, at least the two larger or main, opposite side walls are transparent.

15 The reservoir 4 contains two immiscible liquids 6 and 8 in which the liquid 6 of an oily character and less dense than the liquid 8 which occupies a greater part of the reservoir and has an upper surface on which a layer 12 of the liquid 6 floats. The liquid 6 may be of a visually distinctive colour. Likewise, the liquid 8 may be of a visually distinctive  
20 colour which is different to that of the liquid 6.

A pipe 14 opens into the layer 12 of the liquid 6 and is an inlet pipe supplying an electrically driven pump 16 which, preferably, may be a peristaltic pump so moving rotating parts thereof need not contact the  
25 liquid. Liquid output from the pump 16 is supplied along pipe 18 to a nozzle 20 shown as a horizontal pipe closed at one end 22 with a plurality of holes 24 in its upper wall. The pumped liquid 6 emerges from the nozzle holes 24 and being immiscible with the liquid 8 and less dense than liquid 8 ascends as globules or bubbles 6a of the liquid 6 through the  
30 liquid 8 to replenish the liquid layer 12. For example, the liquid 6 and

its bubbles 6a may be a blue and the colour of the liquid 8 may be a red or pink. The speed at which the bubbles 6a ascend may be a function of a difference in density between that of liquid 6 and liquid 8 and may also be a function of flow rate from the pump 16, volumetric capacity or cross-sectional area of the nozzle 20 and size of the holes 24. So the bubbles 6a can be arranged to ascend as some desired condition ranging between brisk flowing streams of bubbles and rather slow languid flow of a drifting nature.

Also the bubbles 6a can differ in size. Whatever the speed of bubble flow the ascent of the bubbles 6a can present a fascinating and interesting visual effect which if the bubbles ascend relatively slowly can also have a soothing or calming effect on the viewer rather as a tank of fish. The display device<sup>2</sup> may have a therapeutic effect or be used in therapy, for example light therapy.

Whilst the reservoir 4 may be back-lit by natural or artificial light, it is preferred to provide the display device with an electrically powered lamp, for example a lamp 25, which may be a fluorescent tube, over the reservoir.

The reservoir 4 may be disposed within a frame 26 comprising hollow side members 28 secured together at 30 and with slots 32 (Figure 3) along their inner edges to receive edges of the reservoir 4. Also the hollow interiors of frame members 28 may contain the lamp 25 and the pipes 14, 18 and pump 16. The frame 26 may be arranged to stand on a surface or hang on a wall. If desired the frame members 28 may be metal tubes, for example stainless steel tubes, welded at 30.



The respective densities or specific gravities of the liquids may be relatively close together. For example the difference in specific gravities, at the same temperature, for example 15.6°C, may be within a range of about 20% to about 30%. The oily liquid 6 may be or comprise light  
5 mineral oil, for example highly refined technical white oil available under the Trade Mark "KRISTOL T4" or highly refined technical parafin available under the Trade Mark "KRISTOL T 70" both from Carless Refining and Marketing Limited of Romford, Essex, England, in combination with a suitable dye, for example a blue dye available under  
10 the Trade Mark "DYEGUARD SOLVENT BLUE 35" from John Hogg Technical Solutions Limited of Trafford Park, Manchester, England. The liquid 8 which contains dye, may be preferably translucent, and comprise water, a diol, and said dye. A suitable liquid 8 which may be of a red colour from the dye is a blend of water and ethanediol, for example as  
15 supplied under the Trade Mark "GLYCENT 346" as a water glycol hydraulic fluid by Fuchs Lubrication (UK) Limited, of Belper, Derbyshire, England. If desired the liquid 8 may have a specific gravity at 15.6°C of about 1.090, and the liquid 6 may have a specific gravity at 15.6°C in the range of about 0.860 to about 0.885.

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The display device 2 in Figure 4 comprises frame 26a formed of three aforesaid frame members 28 mounted on a hollow stand or foot 33 so the display device can be free standing. The hollow interior of the foot 33 may contain the aforesaid pump 16 and, if desired, electrical or other  
25 controls.

If desired one or more motion inducing means, for example one or more driven bladed rotors or fans 38 each driven by an electric motor 40, may be provided in the reservoir 4, preferably in a lower part, for example  
30 adjacent to the nozzle 20, to create a swirling or spiralling flow whereby

one or more of the ascending streams of liquid bubbles 6a follows a swirling or spiral path.

In Figure 6, the display device 2 comprises the reservoir 4 within a circular frame 26b mounted cantilever fashion on a stand 33b.

In Figure 7 the display device 2 comprises the reservoir 4 within a generally triangular frame 26c on a stand or foot 33c.

10 If desired at least one of the walls of reservoir 4 may have at or on its inner face a mirror or mirror finish.

## CLAIMS

- 1 An illuminated liquid display device comprising a reservoir containing two immiscible fluids, the first fluid ascending through the other to create a visual and therapeutic effect, lit by a lamp positioned at the side, rear, top or base of the device. The movement of the first fluid is achieved by use of a pump that draws the fluid from an outlet through tubes to the base of the reservoir into a plenum from where it is released through delivery ports into reservoir to ascend in globules or bubbles through the second fluid.
- 2 A device according to claim 1 wherein a reservoir has at least a wall portion which is transparent to allow the human eye to see into an interior of the reservoir.
- 3 A device according to claims 1 and 2 wherein the reservoir is of a polymer or glass material. The characteristics of the said polymer material are non-polar and the characteristics of the said glass material are polar.
- 4 A device according to any preceding claims wherein the reservoir contains at least a first fluid and a second fluid said first fluid and second fluid being immiscible and of respective colours that can be distinguished one from the other by the human eye.
- 5 A device according to any preceding claims wherein the first fluid is less dense than the second fluid enabling the said first fluid to float on top of said second fluid and after circulation ascend through it. Said first fluid supplied from the reservoir is pumped to a plenum and released via delivery ports into the reservoir from which globules or bubbles of said first fluid can ascend through the second fluid to a higher level in the reservoir and be observed in course of ascent through said wall portion.
- 6 A device according to any preceding claims wherein the reservoir comprises at least a first transparent wall portion and a second transparent wall portion and said first and second wall portions are disposed at respective opposite sides of the reservoir.
- 7 A device according to any preceding claims wherein the said reservoir wall materials are polymer based having non-polar characteristics the nature of the said first fluid will be polar and hydrophilic and the said second fluid will be non-polar and hydrophobic. The property of the said hydrophilic fluid in conjunction with a polymer screen enables the said hydrophobic fluid to ascend within the main body of the hydrophilic fluid.
- 8 A device according to any preceding claims wherein the said reservoir wall materials are glass based having polar characteristics the nature of the said first fluid will be non-polar and hydrophobic and the said second fluid will be polar and hydrophilic. The property of the said hydrophobic fluid in conjunction with a glass screen enables the said hydrophilic fluid to ascend within the main body of the hydrophobic fluid.

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- 9 A device according to any preceding claims wherein the reservoir is of substantially flat-screen form wherein a substantially horizontal depth dimension between opposite front and rear substantially upright sides of walls of the reservoir is a plurality of times less than a height dimension of at least one of said front or rear sides or wall.
- 10 A device according to any preceding claims wherein the delivery port method comprises a plurality of outlets fed by a plenum containing a proportion of the said first fluid. The plenum equalises the pressure applied to the said first fluid by the pump and distributes equal measures of said first fluid to each delivery port thus releasing an equal flow of globules or bubbles.
- 11 A device according to any one preceding claim, wherein the device is provided with a motion inducing means to cause aforesaid ascending globules or bubbles to swirl or follow a spiral ascending path, said motion inducing means will comprise one or more electrically driven motors and will incorporate a speed controller enabling the motion of the said first fluid to be varied.
- 12 A device according to any preceding claims wherein the first fluid will be distinguishable from the second fluid by use of contrasting colours achieved by means of dyes.
- 13 A device according to any preceding claims wherein the device includes a lamp as a means of illuminating the reservoir said lamp will be electrically powered and positioned above, below, behind or adjacent to said reservoir.
- 14 A device according to any preceding claims wherein the reservoir will be surrounded at least in part by a functional and decorative frame.
- 15 A device according to any preceding claims wherein the display device formed according to the first aspect of this invention will be used in therapy for human beings.



INVESTOR IN PEOPLE

Application No: GB 0010920.7  
Claims searched: 1-15

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Examiner: Nicholas Mole  
Date of search: 8 August 2001

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.S): F4R (RAG, RL, RE, RFN)  
Int Cl (Ed.7): F21S (6/00, 2/00, 10/00, 11/00) F21V 9/12 G09F (13/24)  
Other: Online: WPI EPODOC JAPIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2270106 A (YEN CHOU) see figures and page 2 line 17 to page 3 line 9	
X	WO 99/04380 A (JOHNSON) see esp. figure 25 and page 15 lines 24-29 and page 38 lines 4-21	1, 2, 5, 6, 10, 13, 14 at least
X	WO 97/44772 A (DUARTE) see esp. figure 2	1, 2, 5, 10, 13, 14 at least
X	WO 95/19026 A (HAKKERT) see esp. figure 5 and page 6 line 32 to page 7 line 3	1, 2, 5, 6, 10, 13, 14 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.