(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: 0 106 786
A1

(12) # EUROPEAN PATENT APPLICATION

(21) Application number: 83630167.1

(22) Date of filing: 10.10.83

(51) Int. Cl.³: A 61 H 33/02

(30) Priority: 11.10.82 AU 6294/82

(43) Date of publication of application:
25.04.84 Bulletin 84/17

(84) Designated Contracting States:
AT BE CH DE FR GB IT LI LU NL SE

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(54) **Air/water mixing nozzle.**

(57) An air/water mixing nozzle (3) for a spa bath. The nozzle (3) includes a pipe (9) extending into a main water supply pipe (2), the pipe (9) having an inlet (10) with a crossbar (11) extending across it, the crossbar (11) carrying a fairing member (12). Within the pipe (9) there is an adjustable central jet element (6) having a converging inlet portion (8) communicating with an aperture (7), which aperture (7) communicates with a mixing chamber (5) having an inlet (16) for air. The chamber (5) has an outlet (13) which communicates with the interior (14) of a spa bath by way of an adjustable outlet nozzle (15).

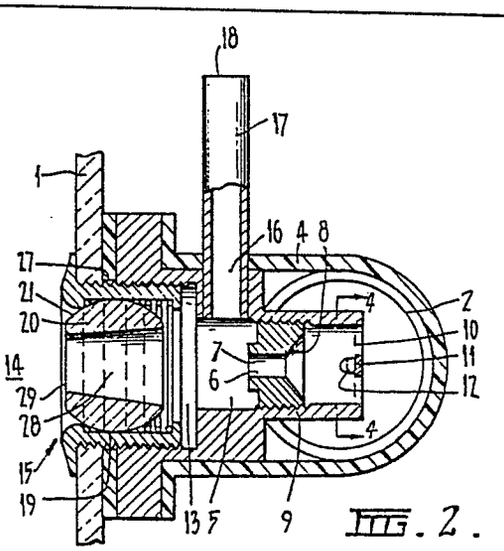

FIG. 2.

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AIR/WATER MIXING NOZZLE.

This invention relates to an air/water mixing nozzle suitable for use in spa baths or the like.

Air/water mixing nozzles are commonly used in spa baths or spa pools of the type where air is mixed with water and injected into the bath under pressure to provide a massage jet effect and to aerate the bath. In this specification the term 'spa bath' is to be taken to include all similar constructions of this type including spa pools and other similar arrangements.

It is desirable to provide an air water mixing nozzle which enables the aerated water to be injected a considerable distance into the body of water in the spa bath without the need for excessive pressure in the water supply or the use of auxiliary pressure air pumping. Previous air/water mixing nozzles have used a central air inlet around which water is passed under pressure in a venturi effect to entrain air with the water and inject the air water mixture into the bath. Such systems have the disadvantages that they are expensive to manufacture and that they frequently do not achieve the desired air to water ratio. It has also been found difficult to get a required penetration of the air/water mixture into the bath from nozzles of this type.

It is therefore an object of the present invention to provide an air/water mixing nozzle which will obviate or minimize the foregoing disadvantages in a simple yet effective manner.

The invention provides an air/water mixing nozzle including an inlet (10) for water, a jet (6) for supplying water from said inlet to an air/water mixing chamber (5) having an air inlet (16), and an outlet (13) from said mixing chamber (5) characterized in that a fairing member (12) is provided in said inlet (10), said fairing member (12) serving to direct the flow of water to said jet (6).

One preferred form of the invention will now be described by way of example only with reference to the accompanying drawings in which:

Fig. 1 is a plan view of a nozzle according to the invention,

Fig. 2 is a cross-sectional elevation on the line 2-2 of Fig. 1,

Fig. 3 is an enlarged cross-sectional elevation scrap view of the mounting of the jet within the outlet nozzle, and

Fig. 4 is a vertical cross-section on the line 4-4 of Fig. 2.

In the illustrated form of the invention an air/water mixing nozzle for a spa bath is constructed as follows:

The spa bath has a wall member 1 and a water supply pipe 2 which is typically arranged around the perimeter of the outside of the bath following the position of desired placement of the air/water mixing nozzles. At desired locations along the pipe 2 air/water mixing nozzles 3 are provided which are conveniently inserted into the pipe by way of T pieces 4. The pipe 2 and the T pieces 4 are conveniently plastic pipe fittings of a known type.

An air inlet 16 is provided into the chamber 5 and in the preferred form of the invention the air inlet comprises an upwardly extending conduit 17 which is open to the atmosphere at its upper end 18. In a typical application the air inlet conduit 17 extends upwardly to the upper flange (not shown) of the spa bath where is terminates in a simple air inlet control valve.

The adjustable nozzle outlet 15 comprises a cylindrical socket 19 in which is mounted a jet 20 having a spherical outer surface 21. The diameter of the jet 20 is slightly less than the diameter of the socket 19 so that the jet forms a sliding and tilting fit within the socket. The jet is mounted within the socket by way of two sealing rings 22 and 23 which are wedged shaped in cross-section and serve to support and seal the jet within the cylinder 19. The cylinde is provided a first flange 24 and a second flange 25 and a compression spring 26 axially arranged within the cylinder. The first sealing ring 22 abuts the first flange 24 and the

second sealing ring 23 is held in position by an axial force provided by the spring 26 acting between the ring 23 and the second flange 25. The entire nozzle outlet 15 is conveniently located within the remainder of the nozzle by a screw thread 27.

The nozzle outlet jet 20 incorporates a central passage 28 therethrough for the passage of water and air from the chamber 5 to the interior 14 of the spa bath. The passage 28 is preferably circular in cross-section and converging from its inlet end adjacent the chamber 5 to its outlet end 29.

The air/water mixing nozzle 3 operates as follows. Water entering inlet 10 impinges on fairing member 12, which serves to direct water passing through inlet into the central jet 6, from which it issues at high velocity into the chamber 5.

In chamber 5, air from inlet 16 is mixed with water which spreads out into chamber 5 after being injected from jet 6. The air/water mix then exits through converging nozzle central passage 28 at high velocity.

Central jet element 6 is adjustable, as described hereinbefore. Adjustment towards outlet 29 results in less air being entrained in the water, and adjustment away from the outlet results in more air being entrained.

The air/water mixing nozzle 3 includes a pipe 9 extends into main pipe 2, the pipe being provided with an inlet 10. A crossbar 11 (Fig. 4) is provided across inlet 10, and on the crossbar 11 is mounted a fairing member 12, which may typically be conical in configuration.

Adjustably mounted within pipe 9 is a central jet element 6. The element 6 has external screw threads which co-operate with internal screw threads on pipe 9 such that rotation of element 6 will advance it towards inlet 10 or retract it from the inlet.

The central jet 6 has a converging inlet portion 8 which communicates with a reduced diameter (in comparison with the diameter of pipe 9) aperture 7, which itself communicates with an air/water mixing chamber 5. The chamber 5 has an

outlet 13 located directly opposite the jet 6, and the outlet 13 communicates with the interior 14 of a spa bath by way of an adjustable outlet nozzle 15.

In this manner an air/water mixing nozzle for a spa bath is provided which has been found to be extremely effective in mixing air with water and capable of achieving a higher air:water ratio than has been achieved with previous nozzles. The nozzle has also been found to give a greater penetration of the air water mixture into the spa bath than previously achieved which results in a superior massage effect and greater aeration of the water within the spa bath.

The adjustable nozzle outlet has been found to be simple and therefore cheap to manufacture and result in an adjustable nozzle which is simple to operate, as the jet 20 can turn and tilt freely within the cylinder 19, and furthermore has a long life with little component wear.

Claims

1. An air/water mixing nozzle including an inlet (10) for water, a jet (6) for supplying water from said inlet to an air/water mixing chamber (5) having an air inlet (16), and an outlet (13) from said mixing chamber (5) characterized in that a fairing member (12) is provided in said inlet (10), said fairing member (12) serving to direct the flow of water to said jet (6).

2. An air/water mixing nozzle according to claim 1, characterized in that said fairing member is of generally conical configuration, and is arranged with its axis generally parallel to that of said pipe (9).

3. An air/water mixing nozzle according to claim 2, characterized in that said jet (6) is a small diameter jet adapted to inject water into said mixing chamber (5) at high velocity.

4. An air/water mixing nozzle according to claim 3, characterized in that said jet (6) includes a converging inlet portion (8) communicating with an aperture (7) having a diameter less than that of said inlet (10), said aperture (7) communicating with said mixing chamber (5).

5. An air/water mixing nozzle according to any preceding claim, characterized in that said mixing chamber (5) is dimensioned relative to said jet (6) to allow the water injected by said jet (6) into said chamber (5) to spread out in said chamber, thereby facilitating the mixture of air and water.

6. An air/water mixing nozzle according to any preceding claim, characterized in that said outlet (13) communicates with an adjustable nozzle outlet (15) having a nozzle jet (20) with a converging passage (28) therein.

7. An air/water mixing nozzle according to claim 6, characterized in that said adjustable nozzle outlet (15) comprises a substantially cylindrical socket (19), a jet (20) positioned within said socket and having a generally spherical

outer configuration of slightly lesser diameter than the diameter of said socket and a passage therethrough for the passage of water and air, the spherical surface of said jet being supported by two sealing rings (22,23), between the jet and the socket (19) being held in place by a compression spring (26) axially arranged within the cylinder.

8.. An air/water mixing nozzle according to claim 5, characterized in that said socket (19) is provided with inwardly protruding flanges (24,25) on either side of said jet (20), one of said sealingrings (22) being located against one said flange (24) and the other said sealing ring (23) being forced into position by said compression spring (26) which abuts between said second sealing ring (23) and said second flange (25).

9. An air/water mixing nozzle according to any preceding claim, characterized in that said air inlet (16) comprises a conduit (17) extending upwardly from said chamber, and is open to the atmosphere at its upper end.

10. An air/water mixing nozzle according to claim 9, characterized in that the upper end of said air inlet conduit (17) is provided with an air inlet control valve.

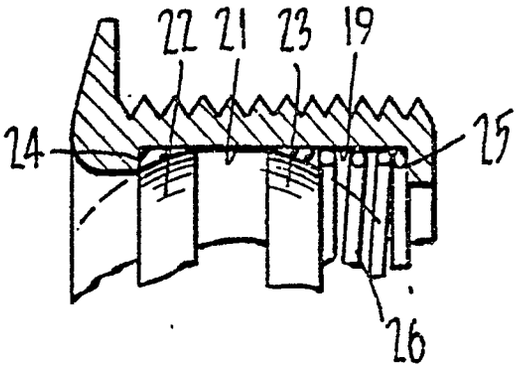

FIG. 3.

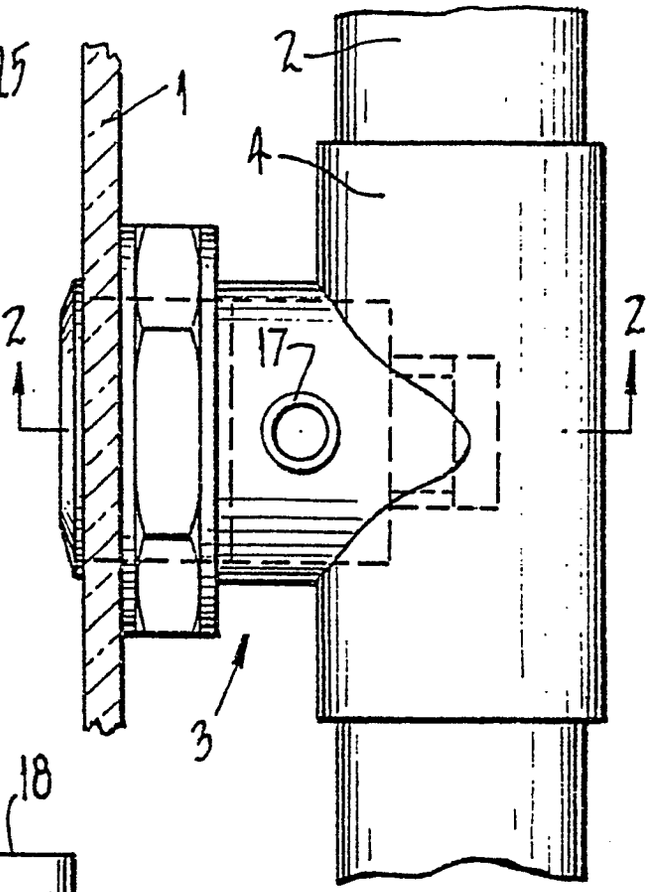

FIG. 1.

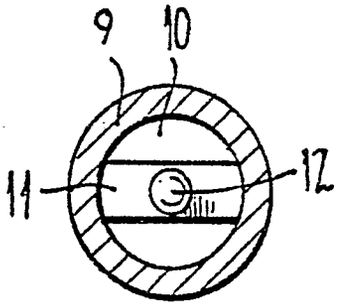

FIG. 4.

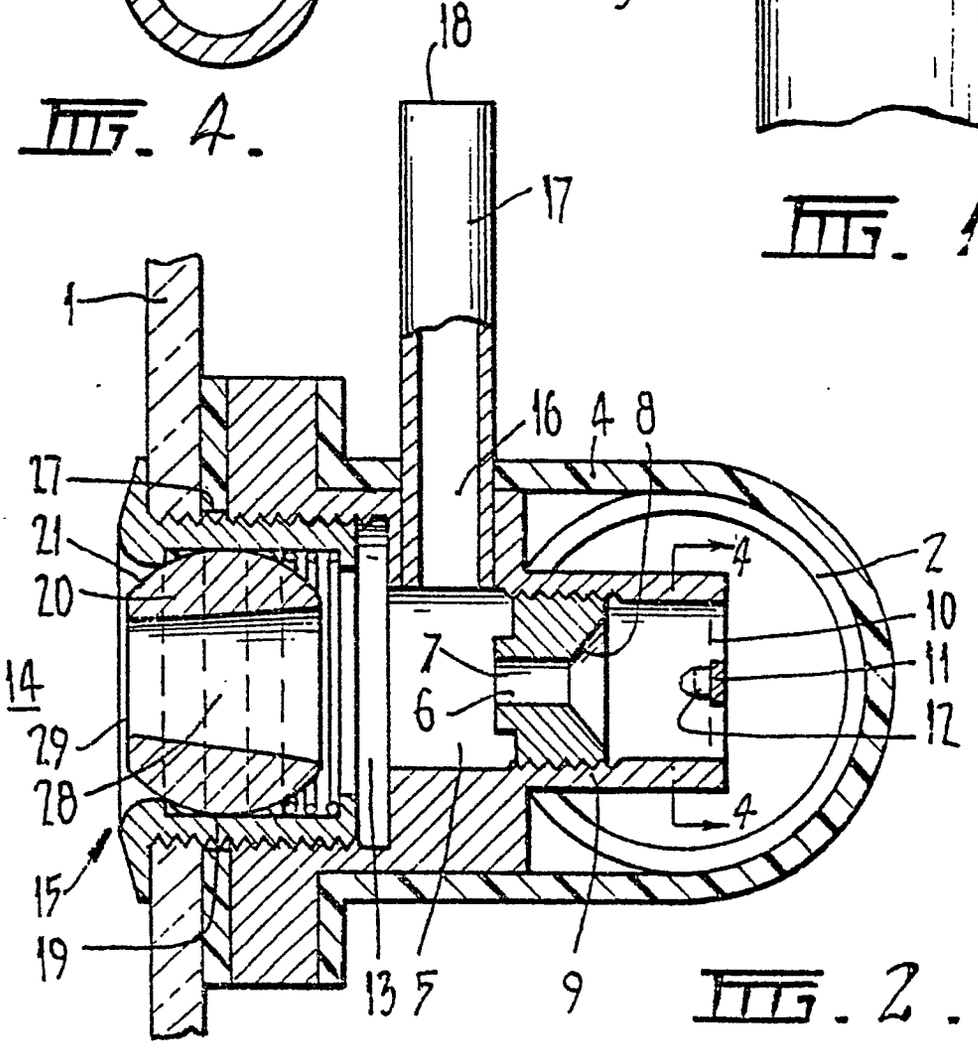

FIG. 2.

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EUROPEAN SEARCH REPORT

Application number

EP 83 63 0167

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
X	US-A-3 302 640 (JACUZZI) * Column 2, line 50 - column 3, line 12; figure 1 *	1,2	A 61 H 33/02
Y		3-10	

Y	US-A-4 221 336 (DIAMOND) * Abstract; figure 2 *	3-10	

X	US-A-3 874 374 (JACUZZI) * Column 1, line 66 - column 2, line 42; figure 3 *	1,2,5, 9,10	

X	US-A-4 168 705 (JACUZZI) * Abstract, figure 1 *	1,5,9, 10	TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

A	US-A-3 985 303 (STEIMLE)		A 61 H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20-12-1983	GERMANO A.G.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
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