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(54) Bathing pool

(57) A spa bath comprises two pumps 20', 21' having single phase induction motors 20, 21, which drive respective water jets when activated by the user, and a pump 22' having a 3-phase induction motor 22. A control circuit 24 varies the speed of the 3-phase induction motor 22 of the pump 22' by varying the output of an inverter 23. The pump 22' is continuously driven at low speed to provide low-level filtering, which helps avoid Legionnaires disease. In order to thoroughly clean the spa bath, the pump 22' is periodically driven at a higher speed by the control circuit 24. An actuator connected to the control circuit 24 can be actuated by the user to energise the other pumps 20', 21' and to drive the pump 22' at high speed in order to drive water jets in the bathing area 14 of the spa.

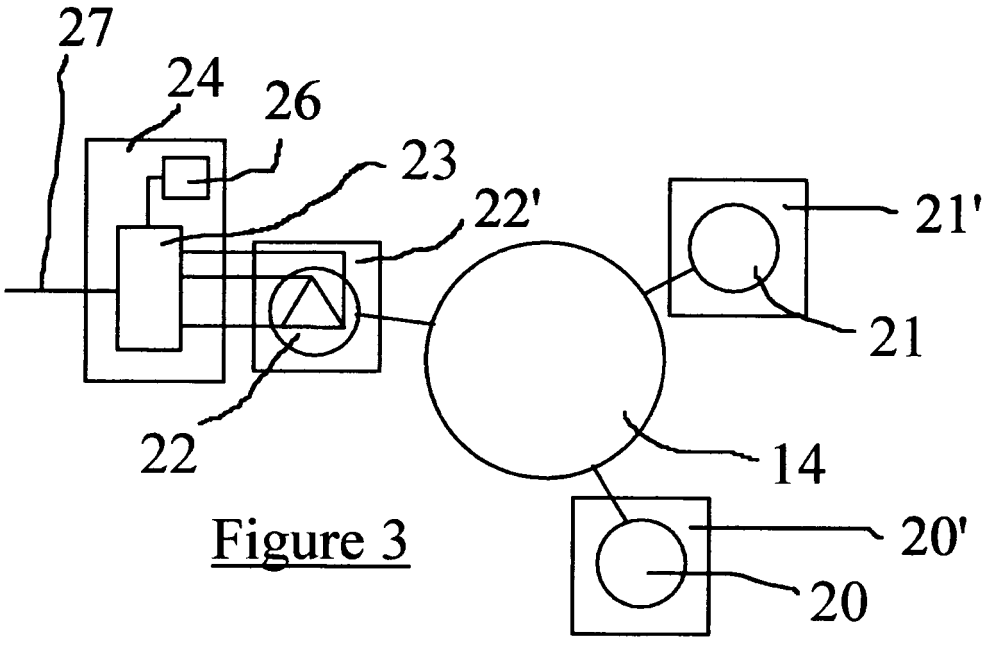

Figure 3

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Description

[0001] This invention relates to a bathing pool, such as a swimming pool or spa bath.

[0002] Spa Baths or so-called aerated spas, hot-tub spas, Jacuzzi spas, Whirlpool spas, Whirlpool baths, hot-tub baths or Jacuzzi baths are becoming increasingly popular in dwellings, hotels, health clubs, leisure centres and the like. Typically spa baths comprise a self-contained body of warm water and are designed for sitting rather than swimming. The water temperature is kept between 30 and 40°C and hydro-jets inside the spa direct water around the user.

[0003] Referring to Figure 1 of the drawings, a typical large spa bath comprises three recirculating pumps 11', 12', 13', each arranged to pump jets of water into the bathing area 14 of the bath when the latter is activated by the user. Each pump 11', 12', 13' comprises a single-phase induction motor 11, 12, 13. However, in order to provide a periodic filtering facility, one of the pumps 11' comprises a two speed single-phase induction motor 11. Single-phase induction motors require starting capacitors.

[0004] Hitherto, there have been several instances of the pumps of spa baths catching fire and the problem has been traced to the capacitors in the two speed single phase induction motors, which eventually break down under the constant starting and stopping performed by the pump.

[0005] In order to overcome the above-mentioned problem, one type of spa bath has been produced in which the pump 11 having the dual speed single phase induction motor is replaced by two pumps, one for driving the jet and one for providing the periodic filtering facility.

[0006] It is known that people can catch Legionnaires disease from exposure to contaminated water droplets. Air-conditioning systems (including cooling towers), and hot and cold water systems in buildings are common sources of Legionnaires disease. However, users of spa baths can also be at risk from catching Legionnaires disease, as well as other bacterial infections, if the spa has not been treated correctly at the recommended intervals on a regular basis.

[0007] Legionnaires disease is a potentially fatal form of pneumonia caused by the Legionella bacteria. There are several pneumonia-like diseases caused by different types of Legionella bacteria, known as Legionellosis. The bacteria can survive at low temperatures, although will not multiply. However, at 20 - 45°C they thrive and readily multiply. There have been several outbreaks of Legionnaires disease with the causes traced back to a spa bath. Not only can people be exposed whilst using a spa bath, but also by being close enough to breath in the fine spray created.

[0008] Legionella are a particular problem in spa baths because:

(a) The water is at an optimum temperature for the bacteria to grow;

(b) Dirt, dead skin cells etc from the people using spa baths accumulate, providing food for the bacteria to grow;

(c) The ducting for the air and water circulation provide a large surface area for the bacteria to multiply; and

(d) The aerated water forms aerosols and sprays, via which the bacteria can be breathed in.

[0009] In the past, there have been various proposals to help reduce the risk of Legionnaires disease. One proposal is continue to use a dual speed pump: the high speed setting is used for the jets (when the spa is in use) and the low speed is activated at regular intervals to provide filter cycles. It is preferable to use the lower speed to agitate the water during the filter cycles, in order to reduce the current consumption and amount of acoustic noise generated by the process.

[0010] Another proposal is to use a pump which runs continuously to circulate the water (at a very low speed) throughout the day. Such pumps are much quieter than dual speed pumps. In addition to the low speed pump, there might also be a dual speed pump incorporated into the system and having a high speed for jets and low speed for filter cycles, as mentioned above. The introduction of the low speed pump is however an added precaution against the growth of Legionella.

[0011] Referring to Figure 2 of the drawings, another proposal comprises the provision of five pumps 15, 16, 17, 18, 19. Three of the pumps 15', 16', 17' each comprise a single speed single phase induction motor 15, 16, 17 and pump water through the jets when the spa is activated by the user, a smaller pump 18' runs continuously to provide continual low-speed filtering of the water and the larger pump 19' provides a periodic filtering facility.

[0012] It will be appreciated that the provision of so many pumps is both costly and complicated.

[0013] We have now devised a spa bath which alleviates the above-mentioned problems.

[0014] In accordance with this invention, there is provided a bathing pool comprising at least one pump, the or a said pump comprising a variable speed motor and electronic control means for controlling the speed of said variable speed motor.

[0015] Thus, a typical bathing pool in accordance with this invention comprises two pumps having conventional single phase induction motors plus a pump having a variable speed motor, which runs constantly at low speed to help prevent Legionella but which can be run at higher speeds for periodic filtering of the spa or for driving a jet.

[0016] The pump having the variable speed motor thus performs the function of 3 pumps and the cost and complexity of the spa bath is significantly reduced.

[0017] In one embodiment, the variable speed motor

comprises a 3-phase induction motor, the electronic control means comprising an inverter having a single phase input for connecting to the mains supply and a 3-phase output for connecting to respective windings of the 3-phase motor, and means for varying the output of the inverter to control the speed of said 3-phase induction motor.

[0018] 3-Phase induction motors are more efficient than single phase induction motors and thus have lower running costs. Furthermore, 3-phase induction motors have a longer life than single phase induction motors and do not require capacitor starting.

[0019] In another embodiment, the variable speed motor comprises a brushless dc motor.

[0020] Preferably the speed of the motor is controlled by varying the output voltage of the electronic control means, by varying the output frequency of the electronic control means, by varying the mark/space ratio of pulses output by the electronic control means or by a combination of the aforesaid.

[0021] Preferably the control means comprises an actuator, the control means being arranged to constantly run the variable speed motor at a low speed and to periodically increase the speed for an interval and/or when the actuator is actuated by the user.

[0022] Preferably the bathing pool comprises at least two pumps, one of the pumps being single phase induction motor.

[0023] Preferably the actuator is arranged to actuate the or each other pump.

[0024] Preferably the control means is arranged to drive the pump comprising said 3-phase induction motor to produce a pulsed jet of water.

[0025] An embodiment of this invention will now be described by way of an example only and with reference to the accompanying drawings in which:

Figure 1 is a schematic diagram of a conventional large spa bath;

Figure 2 is a schematic diagram of a more recent conventional spa bath; and

Figure 3 is a schematic diagram of a spa bath in accordance with this invention.

[0026] Referring to Figure 3 of the drawings, a spa bath in accordance with this invention comprises two pumps 20', 21' having single phase induction motors 20, 21, which drive respective water jets into the bathing area 14 when activated by the user, and a pump 22' having a 3-phase induction motor 22.

[0027] The windings of the 3-phase induction motor 22 of the pump 22' are connected in a delta configuration to the respective 3-phase outputs of an inverter 23 of a control circuit 24. The input 27 of the inverter 23 is connected to the single phase mains supply.

[0028] A drive circuit 26 varies the speed of the 3-phase induction motor 22 of the pump 22' by varying the output frequency of the inverter 23, by varying the mark/space ratio of pulses output by the inverter 23 or by combination of the aforesaid.

[0029] In one mode of operation, the pump 22' is continuously driven at low speed to provide low-level filtering, which helps avoid Legionnaires disease. However, in order to thoroughly clean the spa bath, the pump 22' is periodically driven at a higher speed by the drive circuit 24. An actuator connected to the drive circuit 24 can be actuated by the user to energise the other pumps 20', 21' and to drive the pump 22' at high speed in order to drive water jets in the spa.

[0030] An advantage of the 3-phase induction motor 22 is that it can be driven to provide pulsed or variable jets of water.

[0031] A spa bath in accordance with this invention is relatively inexpensive yet does not suffer from the problem of fires or Legionnaires disease.

Claims

1. A bathing pool comprising at least one pump (22'), the or a said pump (22') comprising a variable speed motor (22) and electronic control means (24) for controlling the speed of said variable speed motor (22).

2. A bathing pool as claimed in claim 1, comprising at least one other pump (20', 21') having a conventional single phase induction motor (20, 21).

3. A bathing pool as claimed in claims 1 or 2, in which the variable speed motor (22) comprises a 3-phase induction motor.

4. A bathing pool as claimed in claim 3, in which the electronic control means (24) comprises an inverter (23) having a single phase input (27) for connecting to the mains supply and a 3-phase output for connecting to respective windings of the 3-phase motor (22), and means (26) for varying the output of the inverter (23) to control the speed of said 3-phase induction motor (22).

5. A bathing pool as claimed in claims 1 or 2, in which the variable speed motor (22) comprises a brushless dc motor.

6. A bathing pool as claimed in any preceding claim, in which the speed of the variable speed motor (22) is controlled by varying the output voltage of the electronic control means (24).

7. A bathing pool as claimed in any preceding claim, in which the speed of the motor (22) is controlled by varying the output frequency of the electronic control means (24).

8. A bathing pool as claimed in any preceding claim, in which the speed of the motor (22) is controlled by varying the mark/space ratio of pulses output by the electronic control means (24).

9. A bathing pool as claimed in any preceding claim, in which the control means (24) comprises an actuator, the control means (24) being arranged to constantly run the variable speed motor (22) at a low speed and to periodically increase the speed thereof for an interval and/or when the actuator is actuated by the user.

10. A bathing pool as claimed in claim 9, in which the actuator is arranged to actuate the or each other pump (20', 21').

11. A bathing pool as claimed in claims 9 or 10, in which the control means (24) is arranged to drive the pump (22') comprising the variable speed motor (22) to produce a pulsed jet of water in a bathing area (14) of the pool.

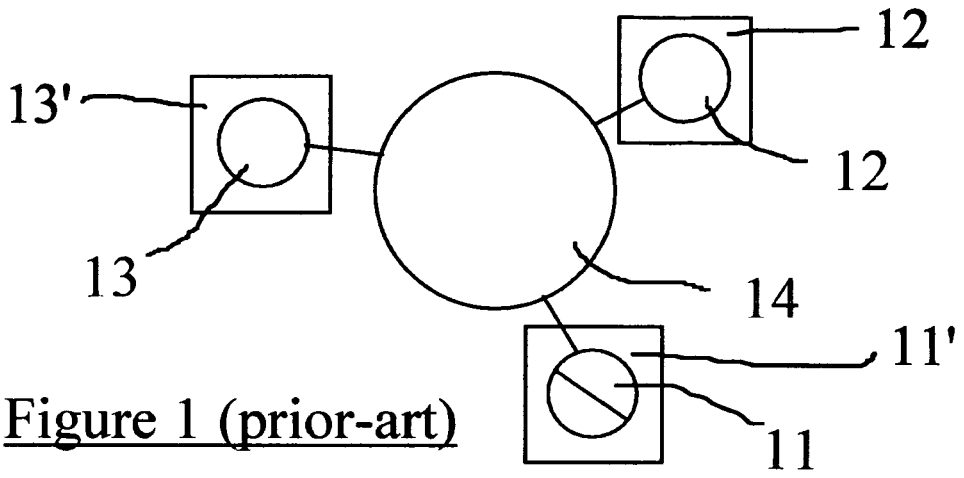

Figure 1 (prior-art)

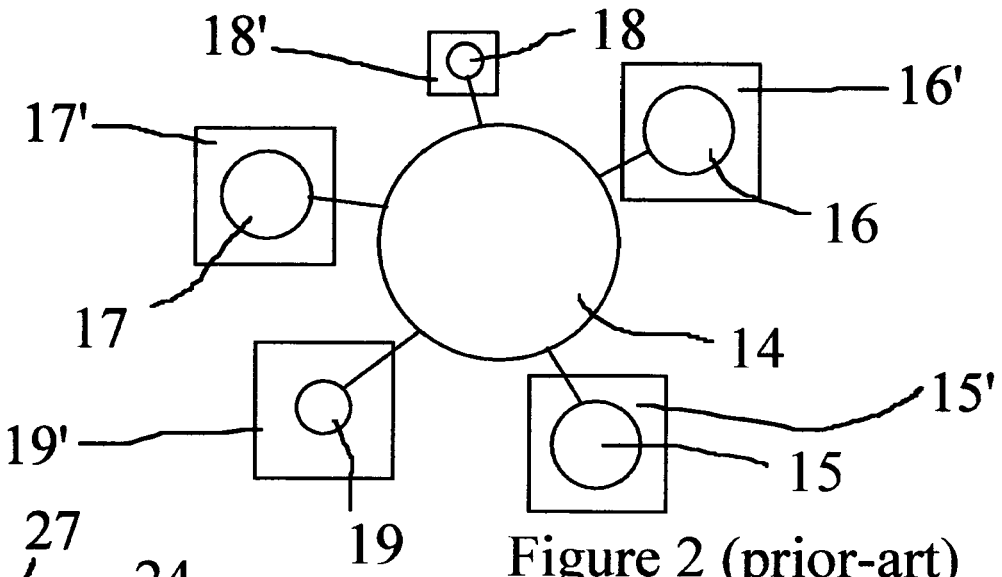

Figure 2 (prior-art)

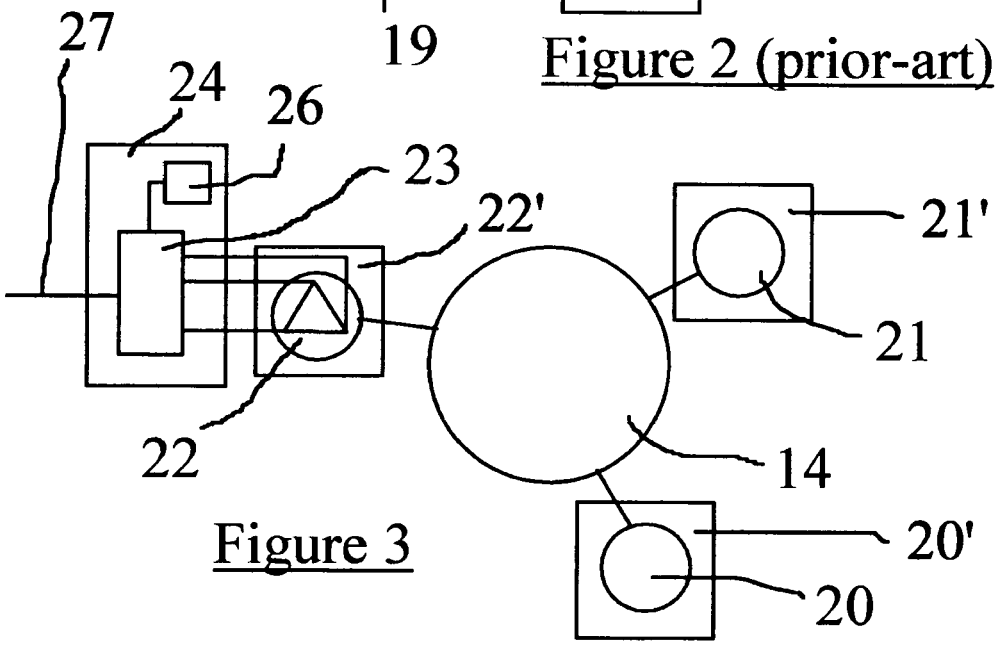

Figure 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 25 5983

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 5 457 826 A (HARAGA ET AL) 17 October 1995 (1995-10-17) * column 1, line 64 - column 2, line 52 * * column 15, line 2 - column 23, line 17; figures 37-46 *	1,3-8	A61H33/00
X	US 6 206 036 B1 (LOYD CASEY ET AL) 27 March 2001 (2001-03-27) * column 1, line 11 - column 3, line 36; figures *	1,2,9-11	
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A	US 5 032 292 A (CONRAD ET AL) 16 July 1991 (1991-07-16)		TECHNICAL FIELDS SEARCHED (IPC) A61H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	8 December 2005	Squeri, M

CATEGORY OF CITED DOCUMENTS

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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 05 25 5983

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82