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

(11) EP 1 460 333 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
22.09.2004 Bulletin 2004/39

(51) Int Cl.[7]: **F21S 8/00**, F21S 9/03, F21V 23/04

(21) Application number: **04425064.5**

(22) Date of filing: **05.02.2004**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HU IE IT LI LU MC NL PT RO SE SI SK TR
Designated Extension States:
AL LT LV MK

(30) Priority: **18.03.2003 IT cr20030003 U**

(71) Applicant: **Cappa S.n.c.**
46040 Casalodo, Mantova (IT)

(72) Inventor: **Ferrari, Paolo**
46040 Casaloldo, Mantova (IT)

(74) Representative: **Mascioli, Alessandro**
Via Leonina 26
00184 Roma (IT)

(54) A projector for swimming pools emitting selectively variable coloured light

(57) A projector for swimming pools emitting selectively variable coloured light, comprising a casing (1), a lighting device (2) consisting of groups of different coloured LEDs (4), an electronic control (5) that is housed in said watertight casing (1), and dedicated control units for said groups of different coloured LEDs.

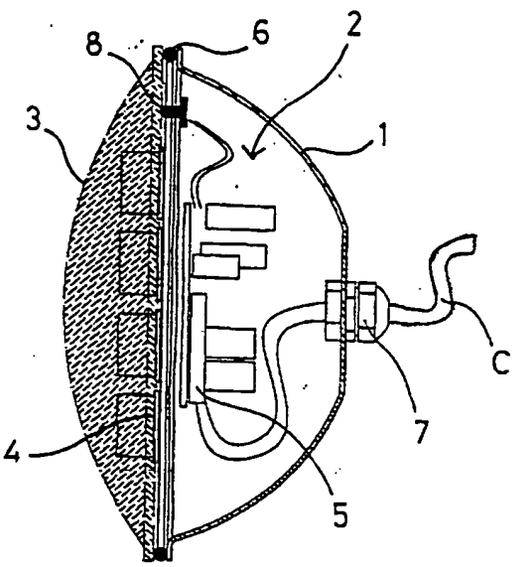

Fig. 1

EP 1 460 333 A1

Description

[0001] This invention concerns a projector or lamp for swimming pools emitting selectively variable coloured light.

[0002] In the prior art, swimming pools are generally provided with a lighting system comprising projectors arranged along the walls of the swimming pool, normally in a submerged position, to illuminate said swimming pool and to create a pleasing aesthetic effect.

[0003] Said projectors essentially comprise a lamp, a front flange fitted flush with the edge of the swimming pool and a rear cupola, fixed to the flange by screws that is watertight against the body of the lamp by means of a seal and protects the electrical contacts.

[0004] The lamp is of the traditional type with an incandescent filament, and emits white light.

[0005] These projectors therefore enable the swimming pool to be lighted but do not enable the colour of the emitted light to be selectively varied, which would obviously have an aesthetically much more pleasant, attractive and easily customisable result. It is in fact not possible to make lamps with variable colours except with motor-driven systems that alternate coloured lenses in front of the lamp, which are, however, rather expensive and complicated and give unsatisfactory results.

[0006] Furthermore, using a traditional lamp has the disadvantage of its limited working life and high electric energy consumption. Said disadvantages are accentuated by the fact that the projector is submerged, so that replacement of the lamp is difficult and by the fact that the swimming pool's lighting system normally stays switched on all night.

[0007] One solution is to use multicoloured LED lamps. A multicoloured LED lamp for the underwater lighting of swimming pools is disclosed in particular in US 6.184.628, which discloses a lamp with a bulb with a substantially truncated tapered shape, a front lens sealed thereto, a plurality of LED diodes of different colours fitted to a card inside the bulb, a control circuit, and a screw base of the standard type that is identical to those of common incandescent lamps.

[0008] However, this lamp can be used only if watertight assembly seats already exist on the walls of the swimming pool that are compatible with said screw base, and if the electrical system has the required voltage. Otherwise, the advantages of the LED diodes would be overcome by high installation costs.

[0009] It must also be borne in mind that in order to obtain good lighting effects, diodes with great power and performance must be used. The thermal dissipation from the electronic control may be not negligible, making necessary to optimise thermal dissipation in order to ensure that the lamp can operate safely and reliably even at relatively high ambient temperatures.

[0010] The object of this invention is to eliminate said disadvantages.

[0011] In particular, the object of the invention is to realize a projector for swimming pools that enables the color of the light emitted to be selectively varied and which furthermore has better performance, longer life, lower consumption and lower operating costs compared with a traditional projector,.

[0012] It is also an object of the invention to realize a projector that enables a traditional white-light lighting system for swimming pools to be transformed into a lighting system with selectively variable coloured light without any modification to the pre-existing system.

[0013] Another object is to make the lamp constituting the projector also usable in swimming pools or tanks without a fixed electrical system, both as a floating lamp for decorative lighting effects and as an underwater lamp for lighting.

[0014] A further object is to create a lamp with optimal heat-dispersion characteristics, that is able to use the latest generation of high-power and high-performance LED diodes, that can also work at relatively high ambient temperatures, for example in summer, without drawbacks.

[0015] The objects are achieved by means of the invention as it is characterised by the claims, consisting of a projector for swimming pools emitting selectively variable coloured light, comprising a casing, a lighting device consisting of a set of LEDs subdivided into groups of different colours, and a front lens, characterised in that it comprises an electronic control that is housed in said watertight casing, and furthermore comprises dedicated control units for said groups of LEDs of different colours.

[0016] According to one embodiment, the LEDS are provided in the three colours red, green and blue, plus a possible fourth group of LEDs with white or amber light, with respective dedicated control units.

[0017] According to another aspect of the invention, the waterproof casing is of standard diameter and dimensions, for example identical to those of a standard PAR 56 lamp, which is most commonly used in swimming pools.

[0018] According to a further aspect of the invention, the projector comprises screw clamps for electrical connection, of the same type as those of the PAR 56 projectors; it furthermore comprises a waterproof cover with which a flexible cable is associated, said cable being connectable to the clamps, if an assembly seat with electric cables is not available, for example in swimming pools without their own lighting system or for use as a floating lamp.

[0019] Preferably, the waterproof casing has an IP 68 protection grade, which enables it to operate fully submerged.

[0020] In order to better dissipate heat, two support plates are provided respectively for the electronic control and for the LEDs, which cooperate for transmitting the heat to the entire casing of the lamp.

[0021] The invention also provides for the use of LED

diodes comprising an emitter and a collimated optical system to increase lighting performance.

[0022] For maximum convenience of use, a radio-wave or infrared remote control is provided.

[0023] The main advantage of the invention is the possibility of selectively varying the colour of the light emitted by the projector thanks to the presence of the groups of LEDs of different colours connected to the respective control units.

[0024] A further advantage stems from the compactness of the projector and from the fact that the projector in itself is made up of a waterproof lamp and comprises within itself all the components required for operation.

[0025] Further advantages that are obtainable with the invention are the long durability and the minimum maintenance required, the low consumption, the minimum heat emission, the instantaneous switch-on and switch-off, the improved light quality compared with a traditional lighting apparatus.

[0026] The multicoloured LED lamp that is thus obtained can be installed instead of a traditional incandescent lamp, without any modification to or adaptation of the assembly seat and/or the electrical system, therefore with maximum convenience and minimal expense.

[0027] A further advantage is that the lamp, being in itself waterproof, can be placed directly in the water, floating or completely submerged, and does not require particular assembly procedures.

[0028] These and further advantages of the invention will become even clearer hereinafter with the help of drawings that show an example of a preferred embodiment, illustrated by way of non-limiting example.

Figure 1 shows a cross-section of a first example of a projector for swimming pools that has been made according to the invention

Figure 2 shows an exploded view of the projector in figure 1.

Figures 3a and 3b show another example of the projector according to the invention, with the rear cover of the clamps connected to the body in Fig. 3a, and separated from the body in Fig. 3b.

Figure 4 shows the detail of a LED diode with relative optical system.

Figures 5 and 6 show two diagrams indicating the distribution of the light beam, on the horizontal and on the vertical plane respectively.

Figures 7, 8, 9, 10, 11 and 12 show some examples of use.

[0029] In terms of the details illustrated in the Figures, the invention concerns a projector, or lamp, for swimming pools basically comprising a casing 1, a lighting device 2, a front lens 3.

[0030] According to the present invention, the lighting device 2 comprises a set of LEDs 4, consisting of LEDS serially connected together and subdivided into groups of different colours.

[0031] Preferably, three groups of LEDS of the basic colours, i.e. red, green and blue, are used to obtain a light of any colour by combining said basic colours. Obviously, a white or amber light unit can be added to these three coloured units.

[0032] The lighting device 2 further comprises an electronic control 5, placed directly into the casing 1 and basically comprising a voltage stabiliser, a microprocessor and dedicated control units, connected to said groups of LEDs of different colours.

[0033] A seal 6 is interposed between the casing 1 and the lens 3, that makes the casing 1 waterproof and enables said electronic control 5 and the electric contacts to be housed therein.

[0034] At the back of the casing 1 a waterproof lead 7 is provided for the passage of a power cable C.

[0035] The front lens 3 is advantageously a borosilicate lens, with diffusing treatment.

[0036] The waterproof casing 1 can for example be made with a forged stainless steel dome.

[0037] The projector can be advantageously powered at low voltage, e.g. 12 or 24 V and with direct current; in view of the low voltage required, it can also be powered by a battery or by photovoltaic solar panels.

[0038] If necessary, it can nevertheless be provided with a power transformer, which is also preferably housed in the casing 1.

[0039] The projector advantageously also comprises a sensor 8 and a radio or infrared remote control that is not illustrated for switching on or switching off the selection of the colour and the control of any special or stroboscopic effects.

[0040] The use of lenses with different projection angles furthermore enables the scope to be varied using the same power.

[0041] Advantageously, to facilitate its insertion in existing systems, the projector is made with a standard diameter, typically 178 mm.

[0042] According to one aspect of the invention in particular, the projector has been made with a diameter and dimensions that are substantially identical to those of a 12-volt PAR 56 incandescent lamp, which is the most widely used type in the field of swimming-pool lighting.

[0043] The projector according to the invention is waterproof and can ensure an IP 68 protection grade. The IP 68 protection grade is preferred because it enables the projector to operate completely submerged.

[0044] According to the embodiment of Fig. 3, at the back of the casing 1 two screw clamps 20 and 21 are provided that are substantially identical to those of said PAR 56 lamps.

[0045] Advantageously, a waterproof rear cover 22 is also provided that is fitted with an electric cable C con-

nectable to said clamps 20 and 21, and passing through said cover 22 by means of a seal 23 obtained, for example, with epoxy resin. In this way, the lamp can be used to light swimming pools or tanks without an electrical system, and in all those cases wherein a prearranged housing for the assembly of the projector with the relative power cables is not available.

[0046] The cover 22 is connected to the casing 1 by a quick-fit connection that in the illustrated example is obtained by a threaded fitting 24 with a seal 25. As a result, the same lamp can be used both in the manner shown in Figure 7, i.e. assembled in a wall seat with external power cables connected to the clamps 20 and 21, and in the manner shown in Figs. 8 and 9, i.e. powered directly from outside by its own cable C.

[0047] According to a further aspect of the invention, within the lamp two separate support plates are provided, a first plate 30 that supports the electronic command 5 and a second plate 31 that supports the LED diodes 4.

[0048] The presence of the two separate plates enables the transmission of heat by conduction to the external casing to be improved. For this purpose, the plates 30 and 31 are advantageously in aluminium, due to the high heat conductivity coefficient of this material.

[0049] It must be noted that owing to the IP 68 grade seal the lamp can operate normally in direct contact with the water, and this also brings advantages from the point of view of cooling.

[0050] The LEDs advantageously comprise an emitter 40 and a collimated optical system 41. This feature enables a cone of light to be obtained with an amplitude of approximately 40° and even more on the horizontal plane, and of approximately 20° on the vertical plane.

[0051] Figures 5 and 6 illustrate two diagrams of the emitted cone of light and give the distance L from the lamp centre and the diameter D of the cone of light, in metres.

[0052] A further constructional feature is the positioning of silicon salts 50 inside the lamp to absorb excess humidity. This is because in a LED lamp like the one disclosed the process of removal of the air from the glass bulb that is used for traditional lamps cannot generally be actuated.

[0053] Some uses are shown by way of non-exclusive example in Figs. 7 to 12. Fig. 7 illustrates its use as a wall-mounted projector for swimming pools, below the level of the water; Fig. 8 illustrates the possibility of using it in tanks or swimming pools without a lighting system, with the relative recessed seats for the projectors; Figs. 9 and 10 refer to its use as a floating projector to create particular effects and luminous choreography; Fig. 11 illustrates the possibility of using the projector also as a luminous danger or warning signal; Fig. 12 shows another possible arrangement, with the projectors floating in the comers of the swimming pool, pointing downwards.

[0054] The projector according to the example permits much greater durability and energy savings up to 80%, with the same light emissions as a traditional projector for swimming pools.

[0055] By way of example, a projector according to the example with average consumption of 10 W and maximum consumption of 20 W replaces a traditional 300-W lamp.

[0056] The presence of several sources of light rather than a single incandescent filament further reduces the need for maintenance interventions, because the projector continues to emit light even if one of the lighting elements gets damaged.

[0057] The instantaneous on-off capability of the LEDs enables to be obtain stroboscopic and sequential effects that are virtually impossible with filament lamps, because of their natural inertia.

[0058] Owing to the fact that all the components are housed in the waterproof casing 1, the projector can be substituted for the incandescent lamp of a pre-existing projector, transforming a traditional white-light lighting system of a swimming pool into a selectively variable colour lighting system without any modification to the other parts of the system.

[0059] The invention can obviously be implemented in numerous variations, thus constituting a creative instrument for interior designers and architects.

[0060] Finally, it is clear that it will be usable in addition to swimming pools, in fountains, thermal or hydromassage baths and in all the submerged applications or applications in damp environments wherein a low-voltage multicolour source of light is required.

Claims

1. A projector for swimming pools emitting selectively variable coloured light, comprising a casing (1), a lighting device (2) consisting of a set of LEDs (4) subdivided into groups of different colours, and a front lens (3), **characterised in that** it comprises an electronic control (5) that is housed in said watertight casing (1), and furthermore comprises dedicated control units for said groups of LEDs of different colours.

2. A projector according to claim 1, **characterised in that** said set of LEDs (4) comprises three groups of LEDs of the basic colours red, green and blue, and said electronic control (5) comprises three respective dedicated control units.

3. A projector according to claim 1, **characterised in that** said lighting apparatus (2) also comprises a unit of LEDs emitting white light.

4. A projector according to claim 1, **characterised in that** it comprises a seal (6), which is interposed between said casing (1) and said front lens (3), that is suitable for making the inside of said casing water-

tight to enable said electronic control (5) to be housed therein.

5. A projector according to claim 1, **characterised in that** said casing (1) is waterproof and of standard diameter, enabling the projector to be inserted in a pre-existing housing for incandescent lamps.

6. A projector according to claim 5, **characterised in that** it has dimensions that are substantially identical to those of PAR56 lamps for swimming pools.

7. A projector according to claim 6, **characterised in that** it comprises screw clamps (20, 21), for electrical connection, that are identical to the standard ones for 12-volt PAR56 lamps.

8. A projector according to claim 7, **characterised in that** it comprises a waterproof cover (22) that is applicable around said screw clamps (20, 21), provided with a flexible power cable (C) connectable to said clamps.

9. A projector according to claim 1, **characterised in that** it comprises a sensor (8) and a remote control.

10. A projector according to claim 1, **characterised in that** it possesses an IP68 grade of intrinsic protection such as to enable submerged operation or operation in direct contact with water.

11. A projector according to claim 1, **characterised in that** it comprises internally two separate support plates, a first plate (30) for supporting said electronic control (5) and a second plate (31) that supports the LEDs (4), wherein said plates are suitable for transmitting heat to the casing (1) of the lamp.

12. A projector according to claim 11, **characterised in that** said plates (30) and (31) are made of aluminium.

13. A projector according to claim 1, **characterised in that** the LED diodes comprise an emitter (40) and a collimated optical system (41), suitable for increasing the luminous performance of every single LED.

14. A projector according to claim 13, **characterised in that** the optical system (41) generates a cone of light with approximately 40° amplitude on the horizontal axis (X) and about 20° amplitude on the vertical axis (Y).

15. A projector according to claim 1, **characterised in that** it is able to float on water.

16. A projector according to claim 1, **characterised in that** it is powered by a battery or by photovoltaic solar panels.

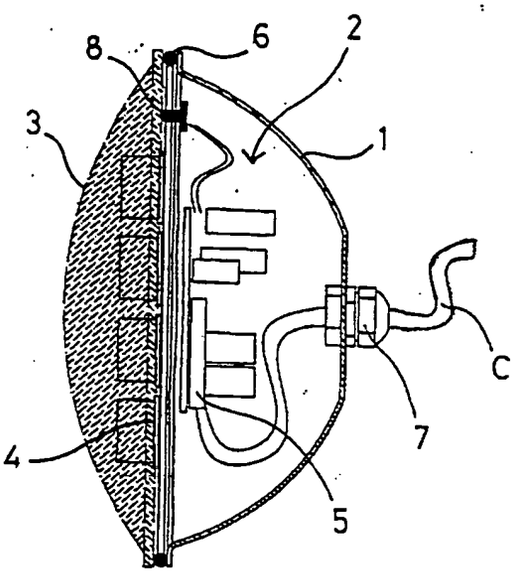

Fig. 1

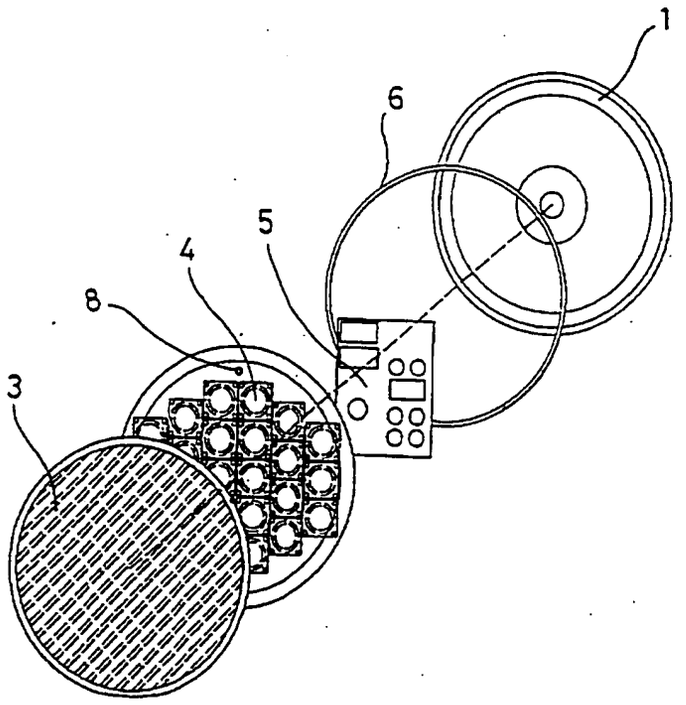

Fig. 2

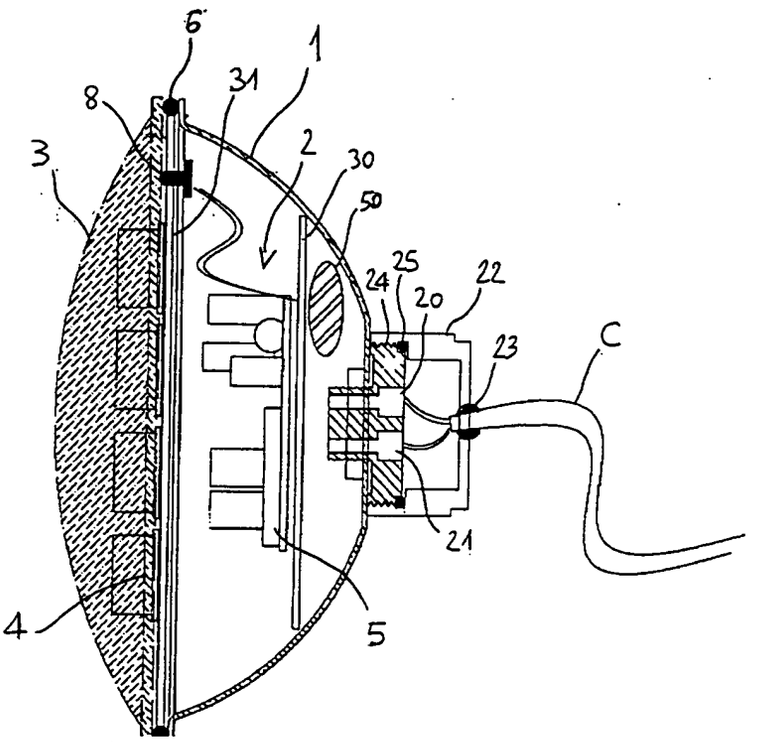

Fig. 3a

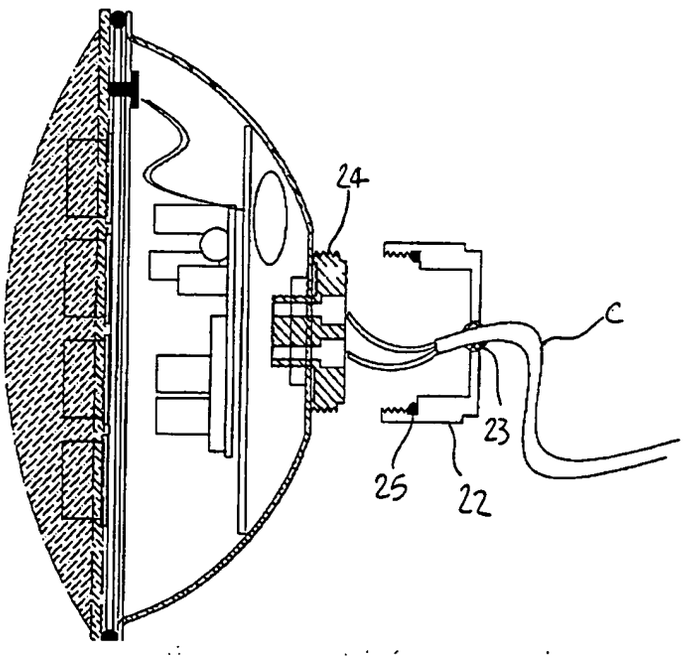

Fig. 3b

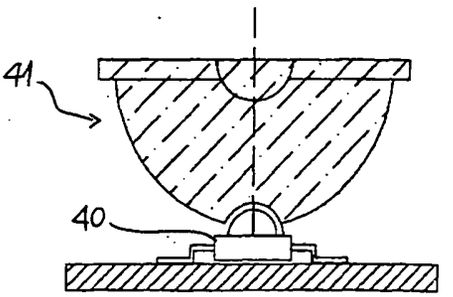

Fig. 4

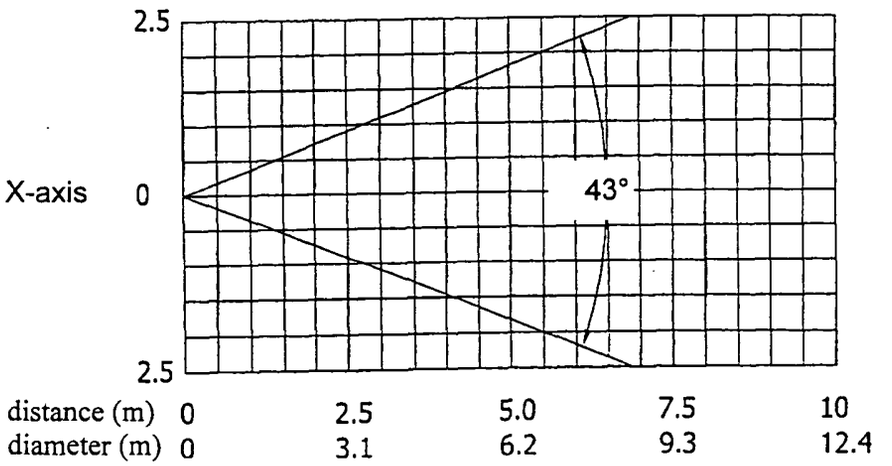

Fig. 5

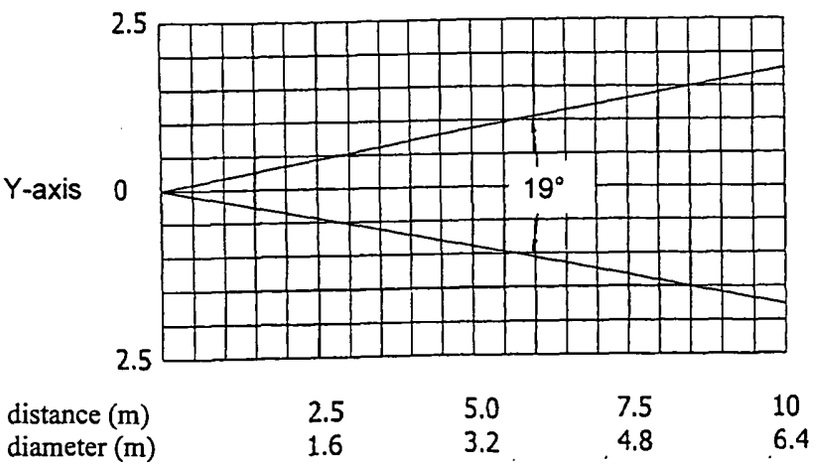

Fig. 6

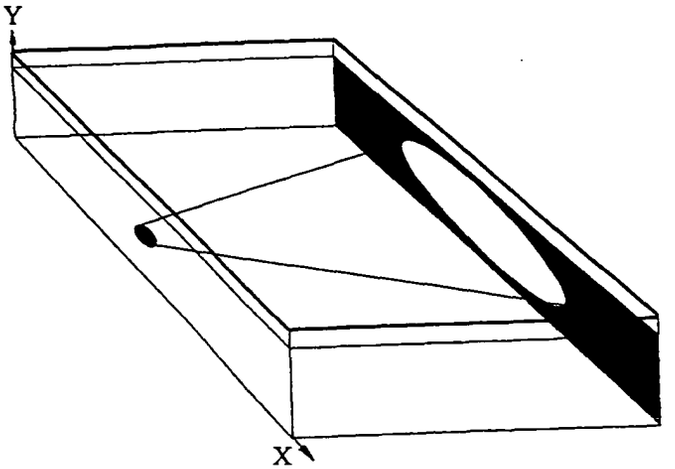

Fig. 7

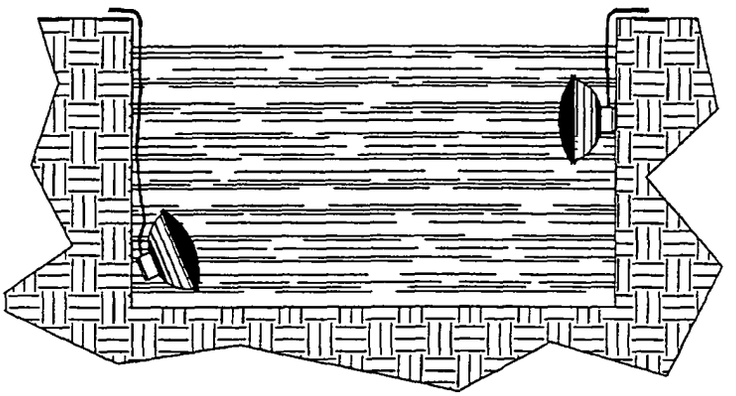

Fig. 8

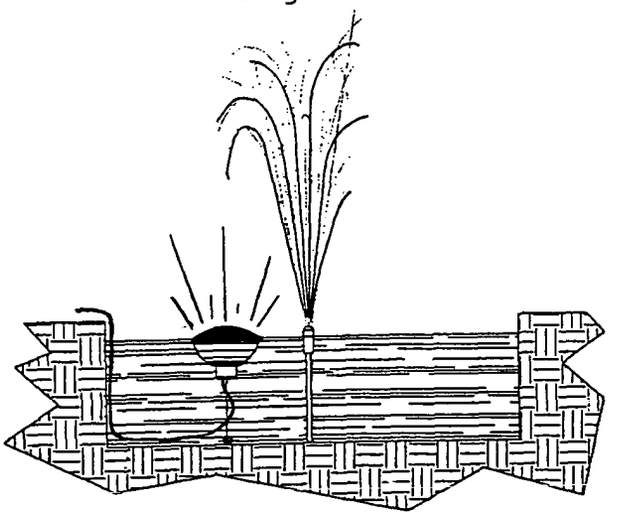

Fig. 9

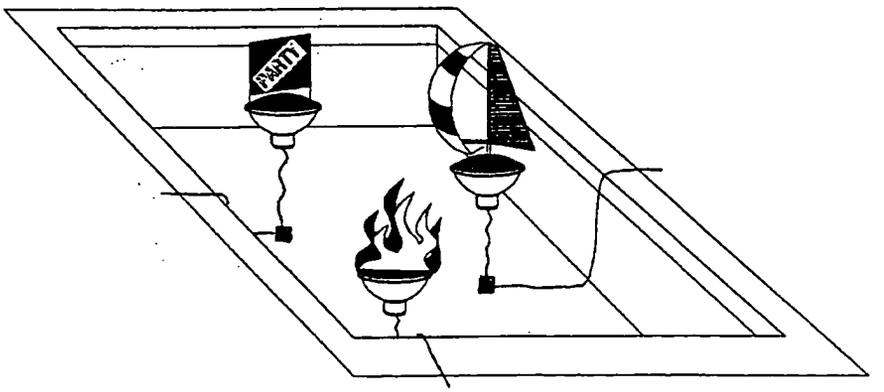

Fig. 10

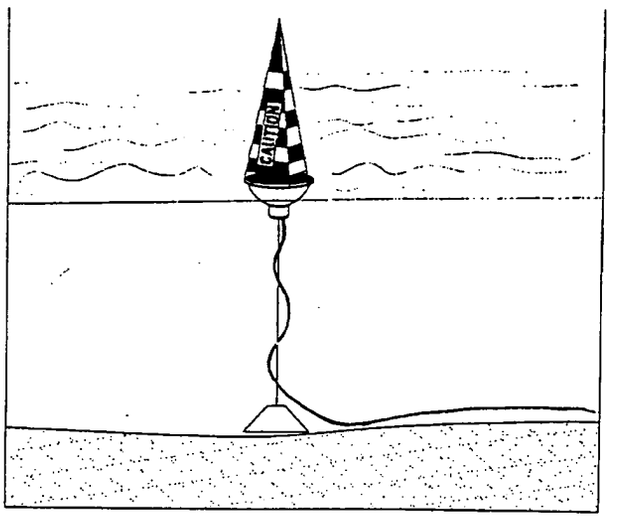

Fig. 11

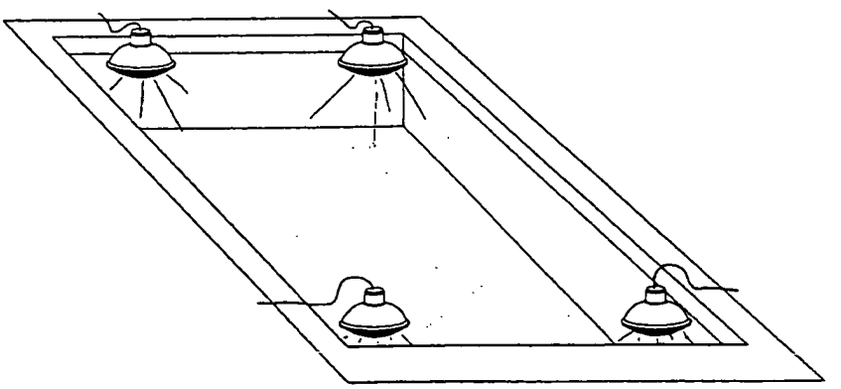

Fig. 12

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
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A		1,5	

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	25 June 2004	Cosnard, D

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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Application Number
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 04 42 5064

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