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(54) Sealingly closed fluorescent lamp apparatus for illumination or germicide purposes for installation in water and/or moist environments, and feed system therefor.

(57) Fluorescent lamps (1) for illumination or germicide purposes are sealingly mounted in appropriate terminal members (3) of suitable plastic material such as PVC by means of the threaded ends (9, 11) of said terminal bodies (3) and appropriate fixing ring nuts (13) screwed on to said ends, appropriate O-rings (7) being provided between said ends (9, 11) and the lamp (1).

Each of said terminal members (3) is provided with an appropriate recess (27, 29) adapted to contain, one of them (27), the electronic ignition or lighting circuit of the lamp (1) and the other (29) the elements for closing the feed circuit.

Insulation of said electric and electronic parts is provided by complete immersion in polymerizable resin which will then completely fill said recesses (27, 29).

The ignition and feed circuit is provided by diode voltage doublers (31, 33, 35, 37) arranged so as to provide a sufficient voltage for the ignition of the lamp (1) and subsequently stabilized current.

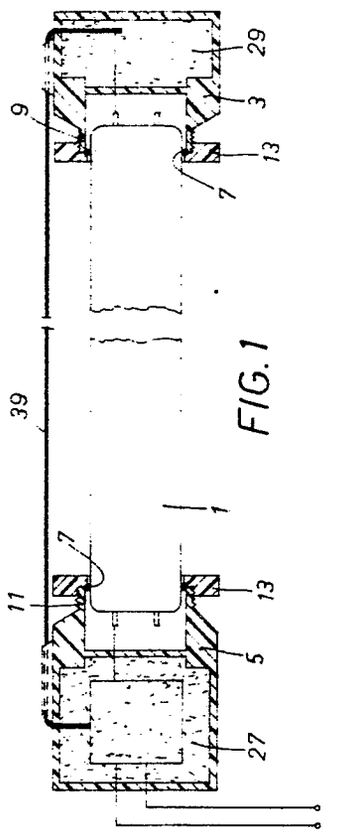

FIG. 1

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"Sealingly closed fluorescent lamp apparatus for illumination or germicide purposes for installation in water and/or moist environments, and feed system therefor"

The present invention relates to a sealingly closed fluorescent lamp apparatus for illumination or germicide purposes for installation in water and/or moist environments, and a feed system therefor.

It is known that in moist environments generally as well as in aquariums for fish and similar basins, sealingly closed illumination apparatus is required, obviously because of the very location of said apparatus, as analogous apparatus is often also required which, however, instead of the illumination lamps recited above, carries special germicide lamps, for example, ultraviolet ray lamps hereinafter referred to as "UV-lamps".

The holder of the present application for patent of invention is already the holder of other applications for industrial models relating to embodiments of this kind.

These embodiments are good and efficient; the only point to be considered is that in the above-mentioned apparatus normal incandescent germicide or UV-lamps are provided, i.e. lamps provided with a threaded socket to be screwed into the lamp holder.

The spreading of fluorescent lamps both for illumination and germicide purposes has raised the problem of how to use, in apparatus of this kind, said fluorescent lamps which, as is known, require a starter or other contrivances for their lighting and operation.

It is the object of the present invention to eliminate these disadvantages by providing a sealingly closed apparatus for fluorescent lamps for illumination or germicide purposes, adapted for moist environments or immersion, and a feed and lighting system therefore which does not require a starter and affords the best guarantee of safety and operation.

The present apparatus in its version for illumination purposes substantially comprises at least one fluorescent lamp sealingly mounted between two terminal members to which the ignition circuit and the closure section of the feed circuit are connected, sealing closure between the terminal members and the lamp being obtained by appropriate O-rings inserted between the terminal members and the lamp and clamped on said terminal members by means of appropriate clamping ring nuts, the apparatus being characterised in that said terminal members are each provided with an appropriate recess, with the recess of one of the terminal members being adapted to accommodate therein the electronic circuit for lighting the lamp and the recess of the other terminal member being adapted to receive the elements for closing the feed circuit, said electric elements, ignition circuit and closure elements being embedded in polymerizable resin filling the entire recess of the terminal member and producing sealing insulation of said elements, appropriate covers being provided for closing said recesses.

A further basic characteristic of the present invention consists in that, when the present apparatus is provided with only one lamp, the feed circuit substantially comprises two series of two diodes each, arranged one upstream and the other downstream of the lamp after insertion of an appropriate ohmic resistance, said two series of diodes forming the first section being connected to a feed pole, the other feed pole being connected to said first section at intermediate points between the two diodes after insertion of appropriate resistors, the two sections of the circuit being in turn provided with four capacitors, two for each section, arranged respectively between one pole and the lamp and the other pole of said respective points of connection interposed between the diodes, thus providing a stabilized diode voltage doubler circuit.

It is obvious that when the apparatus is intended to be used for germicide fluorescent lamps, said fluorescent lamp is inserted in an appropriate tubular casing with appropriate inlet and outlet ducts, the opposed ends of said tubular casing being sealingly secured to said lamp by means of appropriate O-rings and respective fixing ring nuts locked by screwing them down on to the ends of said tubular body, the fluorescent germicide lamp thus having two sealed closures: one adjacent the terminal members and the other adjacent said ends of the tubular body.

A further basic characteristic of the present invention according to a variation thereof, relating to a case when two lamps are provided in the circuit, consists in that the feed circuit, which is substantially similar to the circuit described above, is constituted by two series of three diodes each, arranged one upstream and the other downstream of the two lamps which are connected in series by means of an appropriate ohmic resistance analogous to the ohmic resistance recited above, the section of the circuit being identical to those recited above except that in said embodiment there is provided a third section connected to a feed pole and to intermediate points between the third diodes and the feed terminals of the lamp, appropriate capacitors being provided also in this third section

between the pole and the points of connection to provide also in this third section a diode voltage doubler, the overall circuit thus having a further stabilized voltage doubler.

The apparatus will now be described in detail with particular reference to the accompanying drawings provided by way of a non-limitative example, in which:

Fig. 1 is a longitudinal sectional view of the present apparatus intended for illumination purposes;

Fig. 2 is a view similar to Fig. 1 according to a variation thereof relating to an apparatus for germicide fluorescent lamps;

Fig. 3 is the electric circuit diagram of the lighting and feed circuit of the apparatus when one lamp is provided therein;

Fig. 4 is the electric circuit diagram of the lighting and feed circuit of the apparatus when two lamps are provided therein.

As shown in Fig. 1, which shows the present apparatus in an embodiment in which the lamp is used for illumination purposes, a fluorescent lamp 1 is sealingly secured to appropriate terminal members 3 and 5 provided one on each side.

Sealing coupling between the terminal members 3, 5 and the lamp 1 is obtained in the usual manner: appropriate sealing rings or "O-rings" 7 are interposed between the threaded ends 9 and 11 of the terminal members 3 and 5 and the lamp 1 and are locked by screwing down appropriate ring nuts 13.

In Fig. 2, which shows the version of the apparatus when the fluorescent lamp is provided for germicide purposes, said lamp 1 is mounted coaxially in a hollow tubular body 15 provided with a water inlet pipe 17 and a water outlet pipe 19. Said tubular body 15 is secured to the lamp 1 by means of the threaded ends 21 of the hollow body 15 which are coupled to appropriate ring nuts 23. Also here appropriate sealing rings or "O-rings" 25 are provided between said threaded ends 21 and the lamp 1.

It is to be noted that in this manner the fluorescent lamp 1 has a double seal, still one on each side: the seal between the terminal members and the lamp and the seal between the tubular body and the lamp.

The terminal members 3 and 5 are in reality each composed of two elements: the actual terminal members adapted for mechanical coupling to the respective fixing ring nuts with the interposition of the sealing rings and the recesses 27 and 29 adapted to receive therein the electronic assembly for ignition of the lamp and the connection wires for closing the circuit, respectively, which will be described in detail hereinafter. It is contemplated to fill said recesses 27 and 29 with polymerizable resin for the purpose of perfect insulation of all the electrical and electronical components both of the ignition or lighting assembly and the connection wires. Said recesses 27 and 29 are then closed by appropriate covers.

Referring now to Fig. 3 showing the feed circuit of the apparatus when only one tubular lamp 1 is provided therein, it will be evident that said circuit substantially comprises two series of two diodes each, 31 and 33, and 35 and 37, arranged one upstream and the other downstream of the lamp 1 after insertion of a suitable ohmic resistance 39, said two series of diodes constituting the first section connected to a feed pole 41. The other feed pole 43 is connected to said first section at intermediate points 45 and 47 between the diodes 31, 33 and 35, 37 after the insertion of appropriate resistors 49, 51 and constitutes the second section of the circuit.

The first section of the circuit is provided with two capacitors 53 and 55 arranged between the feed pole 41 and the connection points 57, 59 for connection to the lamp 1.

The second section, which is connected to the pole 43, is likewise provided with two capacitors 61 and 63 interposed between said pole 43 and the connection points 45 and 47 for connection to the first section.

In this manner it will be evident that said second section serves as a voltage doubler for the capacitors 61 and 63 which, assuming that the base voltage is 220 V, will be brought to at least ~320 V(220 x 1.41) whereas the capacitors 53 and 55 will undergo a further doubling and be brought to a nominal voltage of ~ 630 V (220 x 2.8).

It is also worth-while to stress that the arrangement of the doublers in said circuit diagram produces a rectifying action both on the positive and negative phases of the alternating current (more uniform current and not only in the positive peaks), and that said further doubling contributes efficiently to the production of a stabilized current for ignition of the lamp 1.

Fig. 4 shows the feed circuit of the apparatus when two tubular lamps 1 and 1′ connected in series are provided therein. As said two lamps connected in series necessitate a higher ignition voltage than only one lamp, the feed circuit is provided with a third section connected to the pole 43 and connected at 65, 67, after the insertion of appropriate capacitors 69, 71, to the feed conductors of the lamps 1, 1′ upstream of the connection points 57, 59. The first section of the circuit, which is connected to the pole 41, is provided with a further pair of diodes 73, 75.

Due to the arrangement of said diodes 73, 75 in the circuit, said third section likewise serves as a voltage doubler and, due to its particular location in the circuit, supplies the capacitors 69, 71 with a nominal voltage of 2.8 x V_B namely about 630 V (with a base voltage of 220 V).

In this manner the voltage for ignition of the two lamps 1 and 1' will be determined by said two sources of power of 630 V and the ignition current will be further stabilized in a suitable and efficient manner by the arrangement of said **two** lamps in series.

It is evident that the invention is not limited to the described and illustrated embodiment and that numerous variations and further improvements may be made therein without thereby departing from the scope of the invention.

Claims

1. Sealingly closed fluorescent lamp apparatus for illumination or germicide purposes for installation in water and/or moist environments, substantially comprising at least one fluorescent lamp (1) sealingly mounted between two terminal members (3) to which the ignition circuit (27) and the closure section (29) of the feed circuit are connected, sealing closure between the terminal members (3) and the lamp (1) being obtained by appropriate O-rings (7) inserted between the terminal members (3) and the lamp (1) and clamped at (9) and (11) on said terminal members by means of appropriate clamping ring nuts (13), characterized in that said terminal members (3) are each provided with an appropriate recess (27, 29) with recess (27) of one of the terminals being adapted to accommodate therein the electronic circuit for lighting the lamp (1) and the recess (29) of the terminal member being adapted to receive the elements for closing the feed circuit, said electric elements, ignition circuit and closure elements being embedded in polymerizable resin filling the entire recess of the terminal member and producing sealing insulation of said elements, appropriate covers being provided for closing said recesses.

2. Sealingly closed fluorescent lamp apparatus for illumination or germicide purposes according to claim 1, characterized in that the feed circuit for the lamp (1) substantially comprises two serie of two diodes each (31, 33, 35, 37) arranged one upstream (31, 33) and the other downstream (35, 37) of the lamp (1) after insertion of an appropriate ohmic resistance (39), said two series of diodes (31, 33, 35, 37) forming the first section being connected to a feed pole (41), the other feed pole (43) being connected to said first section at intermediate points (45, 47) between the two diodes (31, 33, 35, 37) after insertion of appropriate resistors (49, 51), the two sections of the circuit being in turn provided with four capacitors (53, 55; 61, 63), two for each section, arranged respectively between one pole 41 and the lamp (1) and the other pole (43) of said respective points of connection (45, 47) interposed between the diodes (31, 33; 35, 37), thus providing a stabilized diode voltage doubler circuit.

3. Fluorescent lamp apparatus for illumination or germicide purposes according to claim 1 and a variation of claim 2 in which two fluorescent lamps (1,1') are provided in the circuit, characterized in that the feed circuit, which is substantially similar to the circuit described above, is constituted by two series of three diodes each (31, 33, 73; 35, 37, 75) arranged one upstream and the other downstream of the two lamps (1, 1') which are connected in series by means of an appropriate ohmic resistance (39) analogous to the ohmic resistance recited above, the section of the circuit being identical to those recited above except that in said embodiment there is provided a third section connected to a feed pole (43) and to intermediate points (65, 67) between the third diodes (73, 75) and the feed terminals (57, 59) of the lamp (1, 1'), appropriate capacitors (69, 71) being provided also in this third section between the pole (43) and the points of connection (65, 67) to provide also in this third section a diode voltage doubler, the overall circuit thus having a further stabilized voltage doubler.

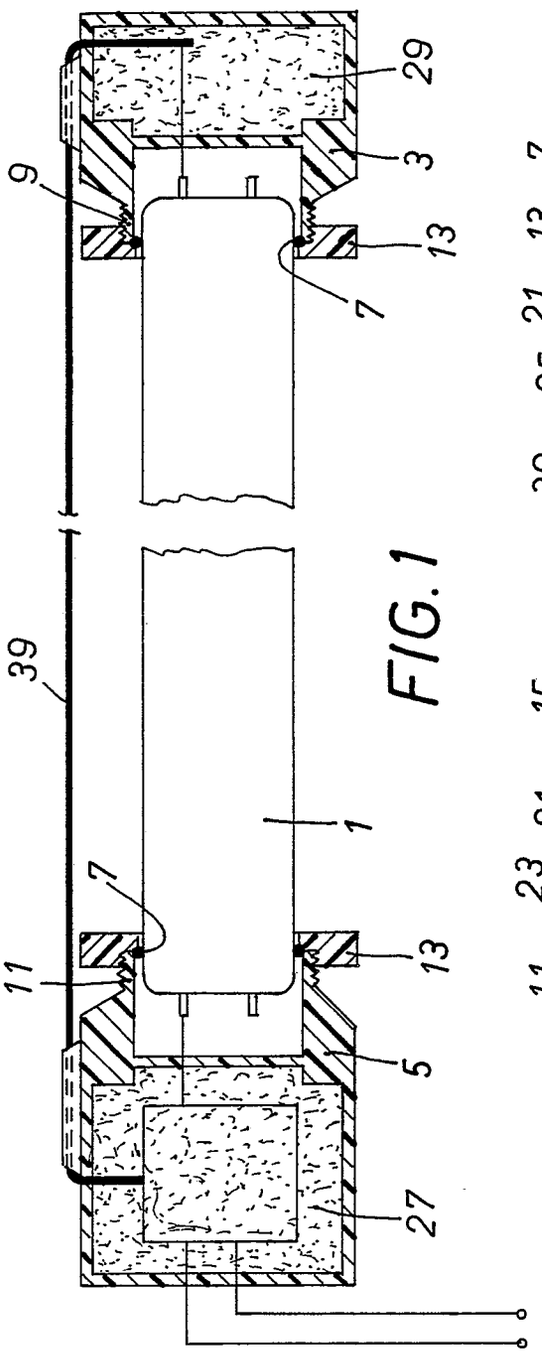
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FIG.1

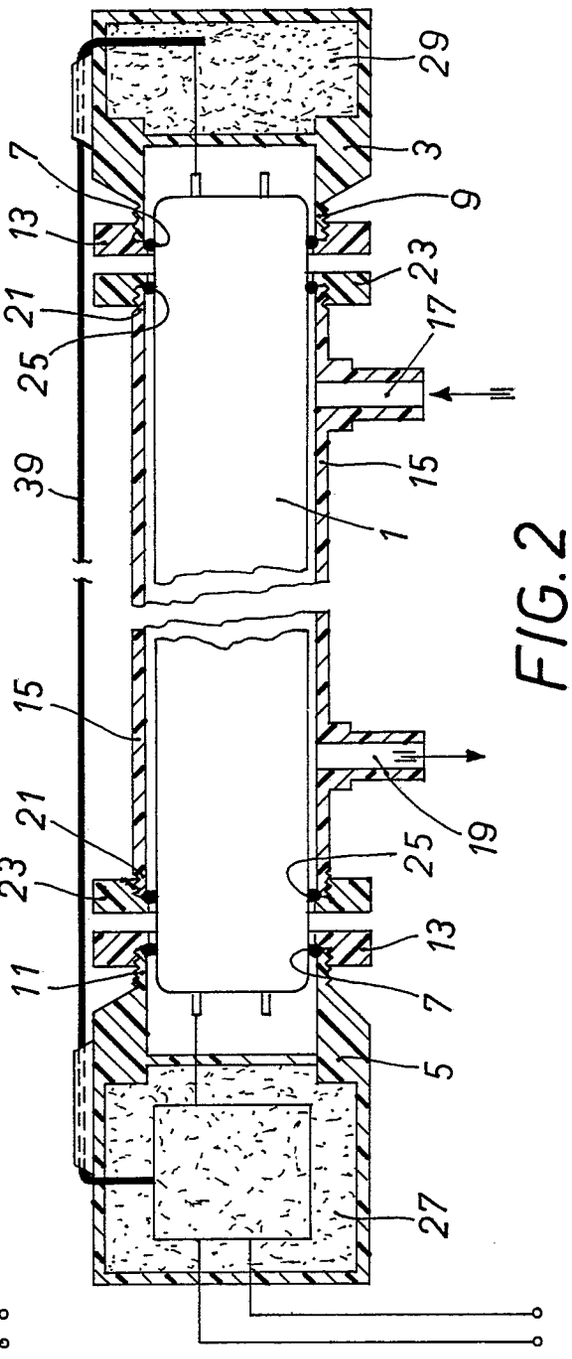
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FIG.2

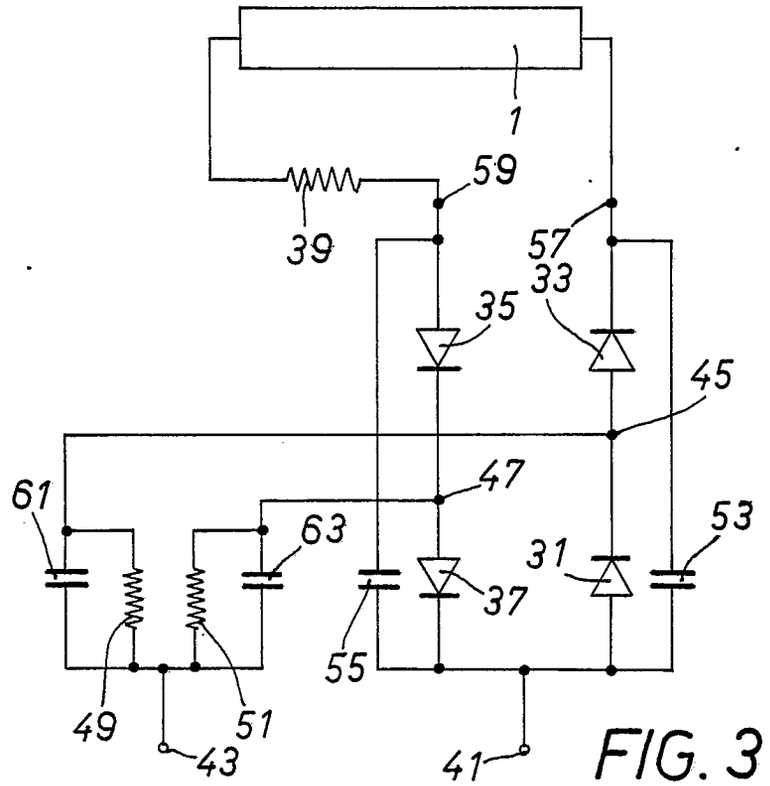
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FIG. 3

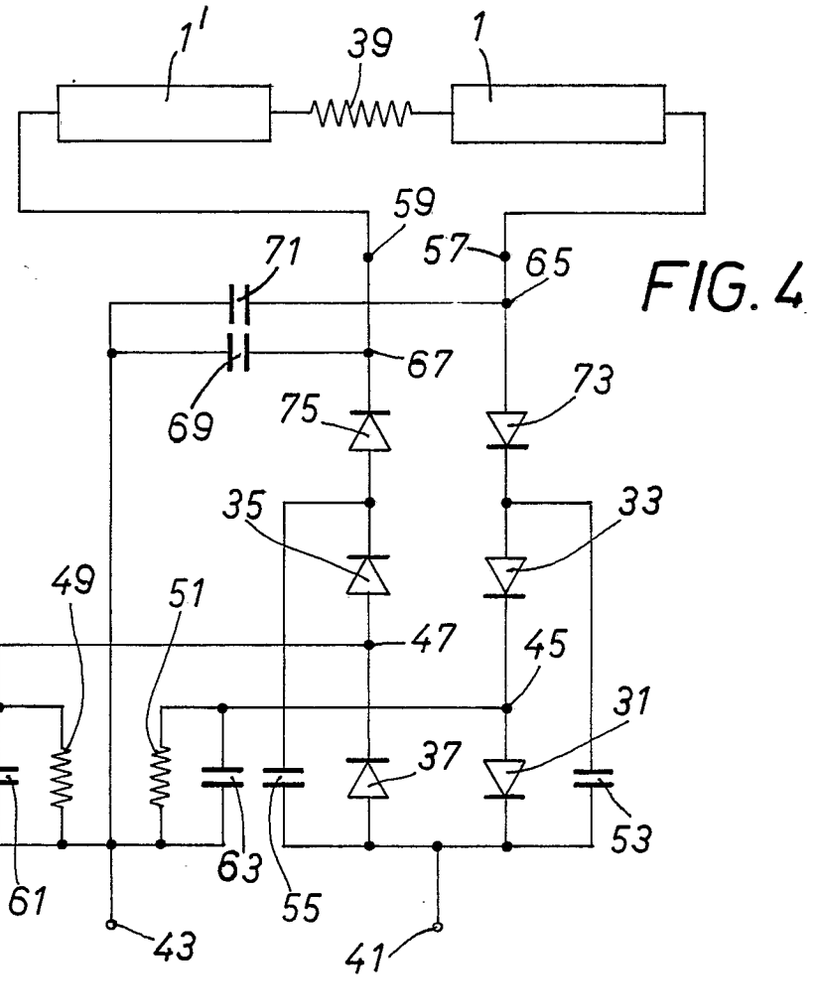
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FIG. 4

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EUROPEAN SEARCH REPORT

Application number

EP 86107807.9

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 4)
A	US - A - 3 567 993 (STURM) * Abstract; fig. 1-3 * --	1-3	H 05 B 41/16
A	US - A - 3 974 418 (FRIDRICH) * Abstract; fig. 1 * --	1	
A	DE - A - 2 309 989 (STANDARD) * Claims 1-2; fig. 1,2 * --	1-3	
A	DD - A - 92 763 (WALZ) * Claims 1-15; fig. 1-7 * --	1-3	
A	DE - A - 2 321 063 (WALZ) * Claims 1-4; fig. 2 * ----	1-3	

TECHNICAL FIELDS SEARCHED (Int. Cl 4)

H 05 B 41/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	05-06-1987	VAKIL

CATEGORY OF CITED DOCUMENTS

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