



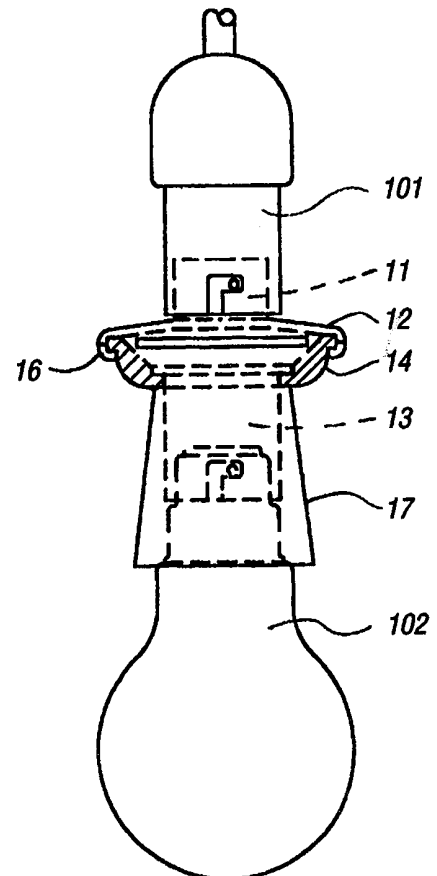
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(54) Title: LIGHTS

(57) Abstract

Many buildings incorporate secondary lighting systems that can be employed to provide a low but sufficient level of light in, say, an emergency, or where a bright light might be inappropriate. The invention proposes a novel form of secondary light (15) that is in use connected to (possibly physically connected as well as electrically connected) and powered from an ordinary (primary) light (101, 102) – either the light's mounting (as a ceiling rose or a table lamp), the light-bulb socket (101), or the light bulb itself. Furthermore, the invention suggests such a light-connected/powerd safety light that is switched from the very switch that operates the ordinary light to which the safety light is connected and from which it is powered. Not only will such a safety light shed its light exactly where it is required, and from a sufficiently high vantage point that it is likely to shine to the furthest extent of the relevant area without being blocked by other objects in that area, but it can most advantageously be switched on or off exactly as the main light itself is switched off or on.



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Lights

This invention relates to lights, and concerns in particular such lights, powered by electricity and usable as safety lights, night lights, or other forms of secondary lighting, as may be incorporated into an otherwise conventional electric light mounting, socket or bulb.

Most modern buildings, whether utilised as homes, as places of work, or for some other purpose, nowadays include electrically-powered lighting systems that provide a primary source of light usable at night. Many such buildings also incorporate secondary lighting systems that can be employed to provide a low but sufficient level of light in, say, an emergency, or where a bright light might be inappropriate. For example, there is often a requirement for a dim, small source of light to illuminate an area such as a bedroom in a manner sufficient for an occupant to see around the room at night but without being so bright as, for instance, to prevent the occupant going to sleep. Equally, it is similarly often desirable to have a low level secondary lighting system to illuminate an area in a building, such as a hall, a landing or some stairs, so that without switching on any main lighting system an occupant of the building can see well enough to move safely around the building after dark. Depending on its exact use, such a low level secondary source of light is generally referred to as a "safety light" or a "night light" (a night light was originally a small, stubby candle, but these days it will, like a safety light, be

a low power electric light bulb - maybe as little as 5 watts, or even less - that is sufficient to allow someone with dark-adapted eyes to see and move around in relative safety).

One common variety of modern, electrical night or safety light - the term "safety light" is for the most part used hereinafter, but it will be understood that it includes what might in other circumstances be called a "night light" - is much like a conventional electrical plug, save that it incorporates a small light bulb, glow bulb, LED, or the like. It plugs into an ordinary wall socket, and when the socket is switched on it glows gently, providing sufficient light to let a User - a person using this facility - see the surroundings. This type of safety light is quite satisfactory for most purposes, and yet it suffers from a number of trivial but irritating problems. For example, because the light-emitting plug is operated from a wall socket, and modern wall sockets (in a house) are at or near floor level, the light it provides is all down near the floor, which not only makes it difficult for the User to see anything that is higher up but means that the light is too easily blocked by furniture and the like, so that it may fail to illuminate the more distant parts of the area. Moreover, because the light-emitting plug is in a socket it can only be switched on and off by operating the socket's switch (if it has one), which is inconvenient when the area's main light system is probably turned on and off from a quite different switch. In addition, the mere fact that the plug is in the socket means that socket cannot be used for anything else unless the plug is first removed (or an adapter is employed).

What the invention proposes in an attempt to deal with these minor inconveniences is a novel form of safety (secondary) light that is in use connected to (possibly physically connected as well as electrically connected) and powered from an ordinary (primary) light - either the light's mounting (as a ceiling rose or a table lamp), the light-bulb socket, or the light bulb itself. Furthermore, the invention suggests such a light-connected/powerd safety light that is switched from the very switch that operates the ordinary light to which the safety light is connected and from which it is powered. Not only will such a safety light shed its light exactly where it is required, and from a sufficiently high vantage point that it is likely to shine to the furthest extent of the relevant area without being blocked by other objects in that area, but it can most advantageously be switched on or off exactly as the main light itself is switched off or on.

In one aspect, therefore, the invention provides an electric light, usable as a safety light, night light or like form of secondary illumination, that is operatively - and possibly physically - connectable to an ordinary (or primary illumination) light, and that is switchable from the very switch that operates that ordinary light but separately from that light.

More specifically, the invention provides two electric lights, one for primary illumination, the other for secondary, each of which is connected to a common control circuit itself connectable to a switch by which may be supplied the power to the lights, the control circuit being such that it allows power to one or other light depending on the time since the switch was last used to turn a light on and then off.

The invention provides an electric light - that is to say, a device which is powered by electricity and which when actuated outputs electromagnetic radiation in that part of the spectrum corresponding to that of visible light. The term "a light" thus means a light device, or a source of light, and as is so in general parlance extends to include not only the actual source of the light (the filament of a light bulb, say) but also the mechanicals associated with that source - thus, the bulb, the bulb mounting, the power cabling and the physical structure supporting the mounting (as in a bedside light, a standard lamp, a wall lamp bracket, or a pendant light and its ceiling "rose"). The expression "light" used hereinafter has whatever meaning is appropriate in the circumstances.

The light may take any appropriate form not only as regards its overall physical and mechanical structure but also as regards its mode of operation. Thus, as to the latter it can for example be a conventional filament bulb, a neon discharge bulb, a Light Emitting Diode (LED) device or a thin-film electroluminescent device (such as that from Limelite, of Austin, Texas, USA). It can, more specifically, be a light source device of the sort described and claimed in the Specifications of our British Patents Nos: 2,251,980 (P1189Sub) and 2,284,711 (P1308), both of which disclose, *inter alia*, a mounting plate that is constructed partly as an annular light guide of the totally-internally-reflected type, to which light is supplied from a light source, and partly as an annular light diffusion member, to which light is uniformly delivered from the light guide and from which that light can escape into the surrounding space, the annular light diffusion member extending more or less evenly around the plate so that in effect the light from the light

source is seen as a halo-like glow surrounding the plate).

The invention is a light usable as a safety light, a night light or some other secondary-illumination device. By this is meant that, generally, the light is a *relatively* low-powered light, providing sufficient light for objects within an area to be seen (but, in night light form, not so much as to become obtrusive). Of course, the actual light output required of the light may depend of the size of the area to be illuminated; for a very large area, normally lit by many lights, a single "safety light" might actually have a fairly high output, in the tens or even hundreds of watts). Safety lights (and specifically night lights) are in general well known, so this concept should be well understood; for use in a dwelling's normal bedroom, landing or hall safety light an output of around 5 watts maximum is most convenient.

The secondary illumination light of the invention is operatively, and most preferably physically, connectable to an ordinary light. By this is meant that (as observed hereinbefore) the invention's secondary light - the actual source of the light, together with the various mechanical and control systems associated with it - is connectable to, or is actually part of, the mechanicals associated with the ordinary light - thus, the bulb, the bulb mounting, the power cabling and the physical structure supporting the mounting (as in a bedside light, a standard lamp, a wall lamp bracket, or a pendant light and its ceiling "rose"). In this context, however, there are three main preferred forms of the invention. The first is one where the invention's light is attached to, or built into, a wall or ceiling mounting; the second is one where the

invention's light is attached to, or built into, a conventional bulb socket (in the "attached" case, rather like an intermediate socket); and the third is one where the invention's light is actually built into a "conventional" light bulb itself. These can be further explained as follows.

If one imagines that the secondary light of the invention is a small package consisting of an actual light generating device (a neon bulb, say) together with mounting and control means, then this package can be designed to be either detachably attachable to or integrally formed with the ordinary light's mounting (such as a ceiling rose) or with the ordinary light's bayonet or screw socket (into which the ordinary light bulb is fitted). Or, that package can be built into the light bulb itself - this would be ideal for the relatively new sort of mini-fluorescent bulb made by Mazda or Phillips (and the like), which already has a relatively bulky base portion (with the "starter" and other necessary components in it). In the case of the package being attachable to the light socket it is conveniently constructed as an intermediate "link" sited between the ordinary socket and the ordinary light bulb, and has a male bayonet/screw fitting to allow it to be attached to the ordinary socket and a female bayonet/screw fitting to allow the ordinary light bulb to be fitted into it.

It will be understood that, where the secondary light of the invention is physically associated with an ordinary pre-positioned light, in operation it necessarily sheds its light exactly where it is required - and, especially in the case of such a light associated with a room's central ceiling rose light mounting, that light will emanate from a sufficiently high vantage

point that it is likely to shine to the furthest extent of the relevant area without being blocked by other objects in that area.

A key feature of the secondary light of the invention is that it is switchable from the very switch that operates that ordinary (primary) light with which the secondary light is associated. This can be arranged in any appropriate way, but one very advantageous way - a way which obviates the need for any additional wiring of any sort - depends firstly on the secondary light being positioned electrically to take its power from the same source - the same conductive leads - that power the ordinary light, and secondly on the two lights being associated with control means that can be sent switching signals along the normal power leads to cause that control means to switch power to one or other of the two lights - either to the secondary light and *not* to the ordinary light or *not* to the secondary light but instead to the ordinary light. Physically arranging the lights like this presents no difficulties; in the three preferred forms discussed above, for example, the package made up from the secondary light and the control means is electrically as well as physically mounted somewhere along the power-supply circuit to the ordinary light. Arranging the required switchability, however, is not so trivial - but one convenient way is to incorporate within the control means a mechanism that can recognise, and count, voltage pulses (as the ordinary light's switch is operated to connect the light up to the mains power supply or disconnect it therefrom), and then do different things depending on how many pulses are received in a defined length of time. Thus, if a single pulse is received in a reasonably short time (a second, say), the electronics switch the ordinary light on, whereas if *two* pulses are

received in that time the electronics switch on the invention's light instead. An example of such a system is described hereinafter in more detail with reference to the accompanying Drawings; it can, for convenience, be described as a combination of separate primary and secondary electric light sources and a switching control circuit by which both are connectable to a suitable power supply for energisation thereby, this circuit being sensitive to the time period elapsed since the power connection was last made and being arranged, on a further connection, to energise the primary light source if the period be greater than a predetermined value but otherwise to energise only the secondary light source.

The switching control circuit determines which of the primary and secondary light sources is switched on - in a common wall-switch lighting system, the control circuit switches on - energises - the primary light if the wall switch is switched on and left on but it switches on the secondary light if the wall switch is rapidly switched on, off and then on. This may be organised by including within the control circuit two different counting devices that between them in effect measure the times taken since the power was switched off and since the power was switched on. Each counter counts down once power is switched off, and then counts back up once power is switched on, but the first counts fast while the second counts more slowly; if on connection of the power supply the first counter's value exceeds the second counter's value then the circuit energises the secondary light, while if not then the circuit energises the primary light.

As will be seen, the invention provides a novel form of secondary light system - especially suited for use as a safety light (and so a night light, or some other type of secondary illumination) - that is in use connected to and powered from an ordinary, primary light system, and indeed that is switched from the very switch that operates that ordinary light. It naturally sheds its light exactly where it is required, and can most advantageously be switched on or off exactly as the main light itself is switched off or on.

Although for the most part the discussion herein refers to the invention's secondary light as though there were only one such light, there may of course be several of them, of the same or different types. Thus, the one lighting system of primary and secondary lights may include one or more primary light (such as the bulbs in a chandelier or a wall-light pair) associated with one or more secondary light (such as a glow plate of the type of our earlier aforementioned Patents, a rose-mounted light, or a bulb-incorporated light).

An embodiment of the invention is now described, though by way of illustration only, with reference to the accompanying diagrammatic Drawings in which:

Figures 1A,B show partly in "see-through" the components, in unassembled and then assembled form, of a safety light "light socket" of the invention;

Figures 2A,B show partly in "see-through" the components, in unassembled and then assembled form, of a "ceiling rose" safety light of the invention;

Figures 3A,B show partly in "see-through" the components, in unassembled and then assembled form, of a "light bulb" safety light of the invention; and

Figure 4 shows a schematic circuit diagram of the control circuitry for use with a safety light of the invention.

The collocation of components shown in Figures 1A,B includes a male bayonet fitting (11) against which is mounted in both physical and electrical contact a circuit board (12) carrying the electronic components (not shown) of the control means of the safety light of the invention and against which is pressed, in both physical and electrical contact, a female bayonet fitting (13). Around the female fitting is a light diffuser lens (14: with recesses as 15 for two neon

bulbs), held in place by a fixing ring (16). The whole is secured together by a skirt and insulation ring (17) internally threaded (at 18) to screw onto an external thread (19) on the female fitting. The whole is shown assembled in Figure 1B, which also shows the assembly mounted to a standard bayonet light socket (101) and with an ordinary light-bulb (102) affixed in place.

A variation on the same theme is shown in Figures 2A,B, which relate to an electrically-connected assembly for a safety light of the invention which is attached to, and effectively forms a part of, a ceiling rose for a pendant light.

The rose mount (21) has placed within it the control means circuit board (22) and around this is screwed on a light diffuser and lens (23) onto which is screwed an ordinary top closure (24). Out of this extends a power lead (25) to which is secured a standard light socket (26) into which is mounted an ordinary light bulb (27).

In Figures 3A,B there is shown a version of the safety light of the invention which is "built in" to a light bulb. The bulb (31) is of the special fluorescent type, and has a purpose-designed starter and load section (32) which includes the control means (not shown separately) of the safety light of the invention. Around this is a light diffuser/lens section (33), held in place by a locking ring (34); the combination fits into a purpose-built socket device (35) that has a bayonet fitting end (36) so that it can be fitted as normal to an ordinary light socket.

The circuit diagram of Figure 4 shows how the control means for a safety light of the invention enables either the main (or primary) light (LP1) or the two safety (secondary) lights (LP2,LP3) to be switched on.

The main lamp LP1 is connected to the mains via an electronic switch. The switch is implemented by thyristor Q4, with its gate signal amplified by MOSFET transistor Q3, and bridge rectifier D3-6. When the thyristor Q4 is on, the voltage across the bridge rectifier will be small (i.e. insufficient to light LP2 and LP3), and the lamp LP1 will be lit. When it is off, but mains voltage is still available, virtually the entire mains voltage will be across the switch. This voltage is used to power the (green) night light neons, LP2 and LP3.

npn Transistors Q1 and Q2, along with resistors R2, R15, R4, R3, R5, R10, form a cross-coupled bistable latch - that is to say, either transistor may be on, with the other off, and this state is self-sustaining. The collector of Q2 is connected to the gate of MOSFET Q3, so that when Q2 is off, the electronic switch is turned on, and the main lamp is lit. Conversely, with Q2 on, the switch will be turned off, LP1 will be off, and neons LP2 and LP3 will be lit.

The bistable latch is powered by a half-wave rectified power supply comprising diode D1, resistor R1, Zener diode ZD1 (which limits the operating voltage to 22 volts) and capacitor C1, which provides a degree of smoothing.

The important (and novel) aspect of the circuit so far as concerns the present invention is the means by which it is ensured that the bistable latch is set with Q2 on and Q1 off, when it is powered up for the first time (thereby ensuring that the main light LP1 is on),

but by which the act of turning the supply off and then almost immediately on causes the state of Q1 and Q2 to be reversed, and hence the night light lamps LP2,LP3 to come on.

When the circuit has been powered down for a long time, capacitors C2 and C3 may be assumed to be discharged. As voltage is applied to the bistable, the capacitors start to charge up. Capacitor C3 starts to charge up via resistors R15, R4 and the base of Q2, while C2 charges up via diode D2, resistors R3, R5 and the base of Q1. The time constants (Tc) are given by

$$Tc3 = (C3 * R15 * R4)/(R15 + R4)$$

and

$$Tc2 = (C2 * R3 * R2)/(R3 + R2)$$

Suitable values for these are around 8 and 37 msecs respectively. C3 will therefore charge up much faster than C2. Once the capacitor has charged to close to the supply voltage, the charging current will cease. There will therefore certainly be a time during which the C3 charging current through the base of Q2 has ceased, but the C2 charging current through the base of Q1 is continuing. In this condition, the only stable state for the circuit is with Q1 on and Q2 off. The main light will therefore be lit. Because the latch is stable in either state, this condition will then continue indefinitely, even after both the capacitor charging currents have ceased.

The mains is then turned off. The power supply to the bistable collapses, and all the capacitors begin to discharge. C1 discharges rapidly, through R10 and Q2 (a suitable time constant here is 70 msecs). Capacitor C3 discharges through resistors R15 and R2 (a suitable time constant is 8 msecs). Diode D2 is now reverse-biased,

meaning that the only available discharge path for C2 is via resistors R17 and R6 (a suitable time constant is 2 seconds).

If the mains is restored, and hence the power rail to the bistable returned rapidly to 22 volts, before C2 has discharged significantly, then diode D2 will be reverse-biased, and the longer time constant formed by C2 and R3/R5 will be ineffective. Capacitor C3 will charge up, at least partly via R4 and the base of Q2. This will turn Q2 on. The reverse bias on D2 and the low voltage on the collector of Q2 ensure that there is no base drive current for Q1, and it cannot turn on. The result is that in this case, the bistable latch remains indefinitely with Q1 off, Q2 on, and the night light neons LP2 and LP3 lit.

Although, in the implementation described here in detail, the timing elements are resistor-capacitor combinations, alternative implementations can readily be devised, where the time measurement is achieved digitally, by means of an oscillator and two counters which count up/down at different rates. Such an implementation would have the advantage of the times being much more accurately determined.

The important components of the system are therefore two timing elements, which count in one direction in the presence of electrical power and the opposite direction in its absence. Both timing elements should have the characteristic of a maximum and minimum value. The third essential component is a bistable memory device, which retains one of two stable states when both counters are at their maximum or minimum, and selects which stable state to adopt when the values of the two counters differ, according to whether one counter or the other is the larger.

Claims

1. An electric light, usable as a safety light, night light or like form of secondary illumination, that is operatively - and possibly physically - connectable to an ordinary, or primary illumination, light, and that is switchable from the very switch that operates that ordinary light but separately from that ordinary light.
2. A light as claimed in Claim 1, which incorporates two electric lights, one for primary illumination, the other for secondary, each of which is connected to a common control circuit itself connectable to a switch through which may be supplied the power to the lights, the control circuit being such that it allows power to one or other light depending on the time since the switch was last used to turn a light on and then off.
3. A light as claimed in either of the preceding Claims, wherein the secondary illumination light is one with an output of around 5 watts maximum.
4. A light as claimed in any of the preceding Claims, wherein the secondary illumination light is operatively, and physically, connectable to an ordinary (primary) light in one of three ways: one where the secondary light is attached to, or built into, a wall or ceiling mounting; one where the secondary light is attached to, or built into, a conventional bulb socket; and one where the secondary light is actually built into a conventional light bulb itself.
5. A light as claimed in Claim 4, wherein the secondary light is in the form of a small package consisting of an actual light generating device together with mounting and control means, and this package is

designed to be: detachably attachable to or integrally formed with the ordinary light's mounting or with the ordinary light's bayonet or screw socket; built into the ordinary light bulb itself; or an intermediate "link" sited between the ordinary light's socket and the ordinary light bulb.

6. A light as claimed any of the preceding Claims, wherein the required switchability from the very switch that operates the ordinary, primary, light with which the secondary light is associated is arranged by firstly positioning the secondary light electrically to take its power from the same source - the same conductive leads - that power the ordinary light, and by secondly associating the two lights with control means that can be sent switching signals along the normal power leads to cause that control means to switch power to one or other of the two lights - either to the secondary light and *not* to the ordinary light or *not* to the secondary light but instead to the ordinary light.

7. A light as claimed in Claim 6, wherein the required switchability is attained by incorporating within the control means an electronic mechanism that can recognise, and count, voltage pulses - as the ordinary light's switch is operated to connect the light up to the mains power supply or disconnect it therefrom - and then to do different things, as required, depending on how many pulses are received in a defined length of time.

8. A light as claimed in Claim 7, wherein if a single pulse is received in a reasonably short time the electronics mechanism switches on the ordinary, primary, light, whereas if *two* pulses are received in that time the electronics mechanism switches on the secondary light instead.

9. A light as claimed in any of the preceding Claims which is a combination of separate primary and secondary electric light sources and a switching control circuit by which both are connectable to a suitable power supply for energisation thereby, this circuit being sensitive to the time period elapsed since the power connection was last made and being arranged, on a further connection, to energise the primary light source if the period be greater than a predetermined value but otherwise to energise only the secondary light source.

10. A light as claimed in Claim 9, wherein the switching control circuit determines which of the primary and secondary light sources is switched on - in a common wall-switch lighting system, the control circuit switches on - energises - the primary light if the wall switch is switched on and left on but it switches on the secondary light if the wall switch is rapidly switched on, off and then on.

11. A light as claimed in Claim 10, wherein this differential switching is organised by including within the control circuit two different counting devices that between them in effect measure the times taken since the power was switched off and since the power was switched on; and wherein each counter counts down once power is switched off, and then counts back up once power is switched on, but the first counts fast while the second counts more slowly, so that if on connection of the power supply the first counter's value exceeds the second counter's value then the circuit energises the secondary light, while if not then the circuit energises the primary light.

12. An electric light, usable as a safety light, night light or like form of secondary illumination, as claimed

in any of the preceding Claims and substantially as hereinbefore described.

13. A lighting system, suitable for a building, that includes one of more lights as defined in any of the preceding Claims.

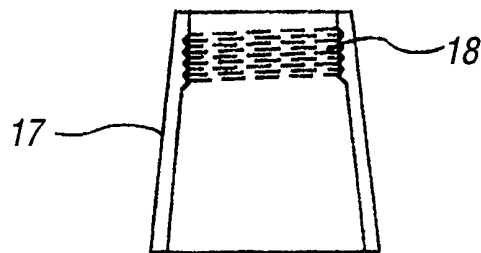
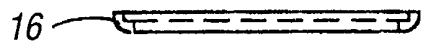
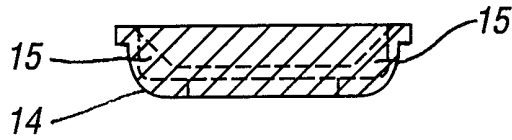
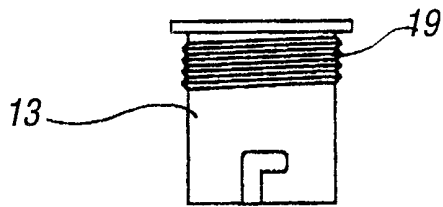
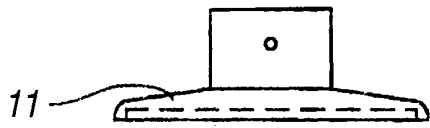


FIG 1A

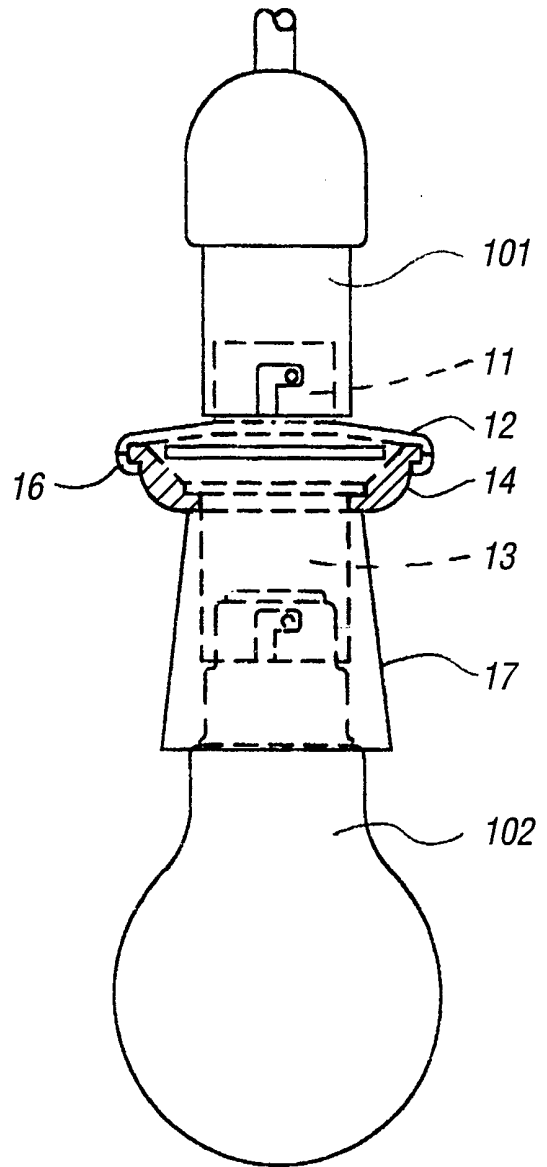


FIG 1B

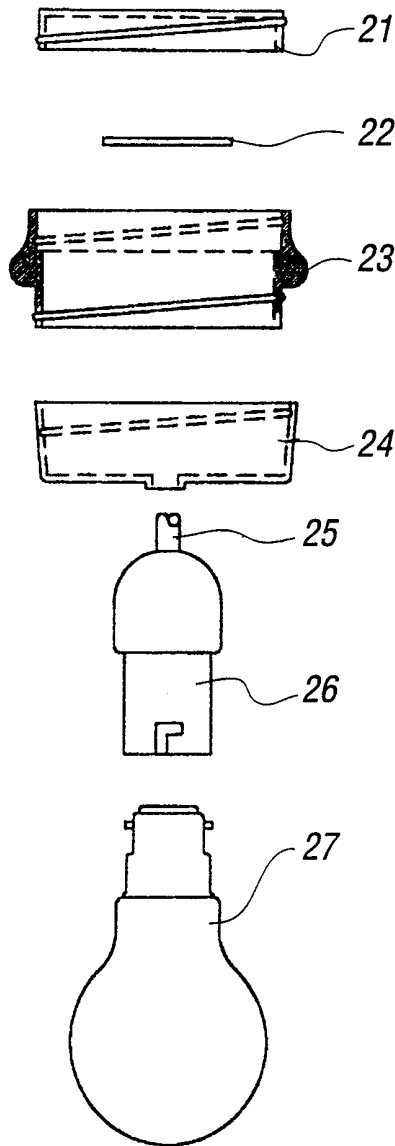


FIG 2A

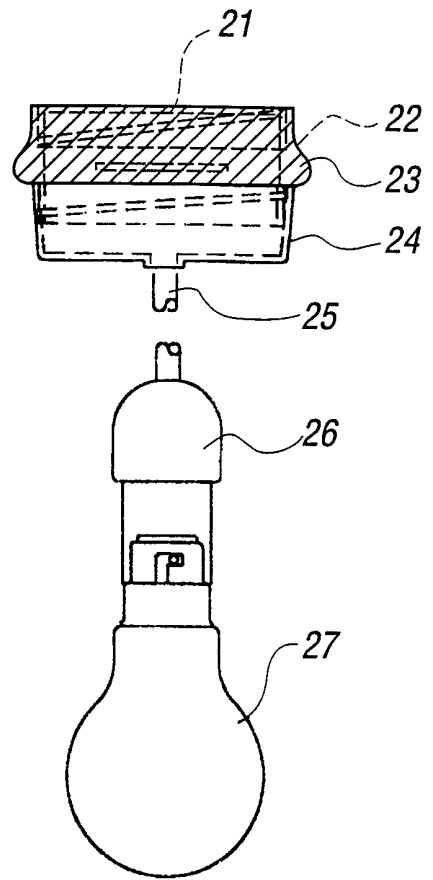


FIG 2B

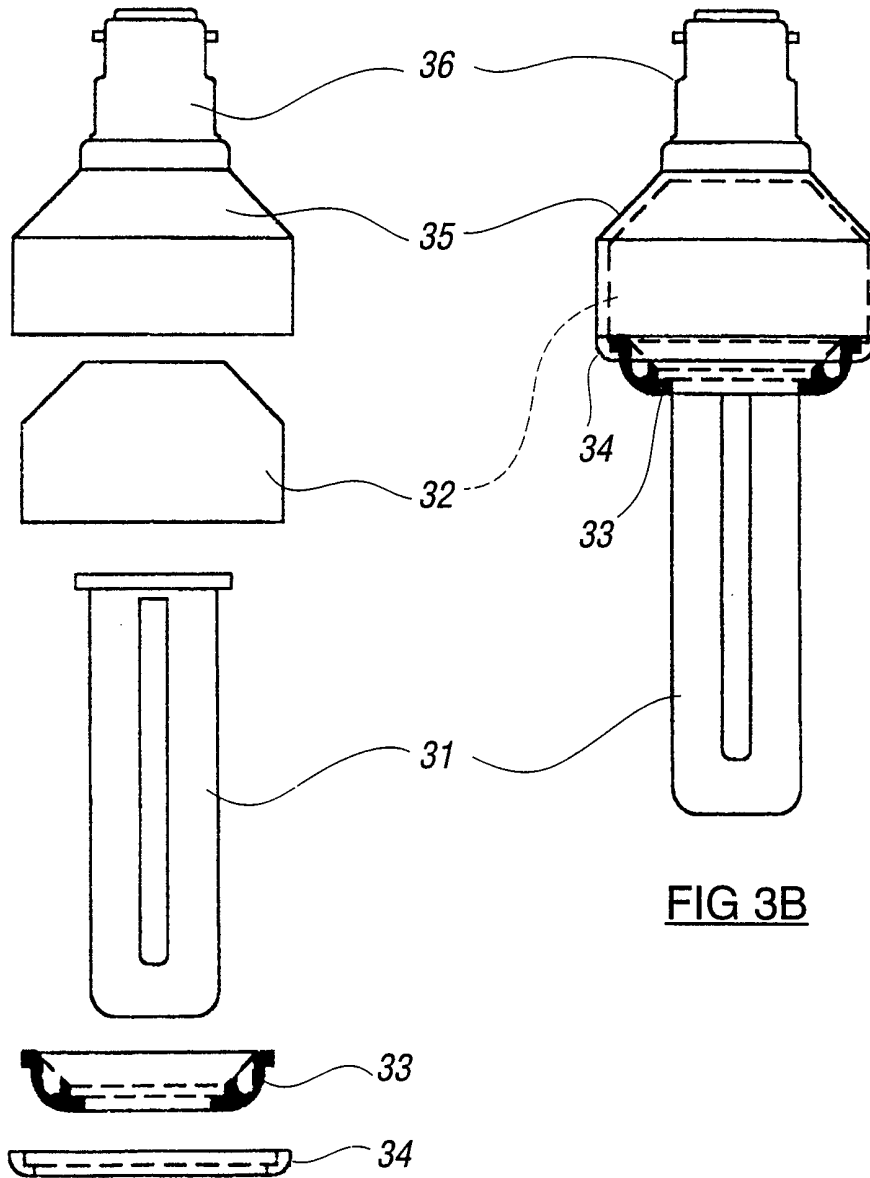


FIG 3A

FIG 3B

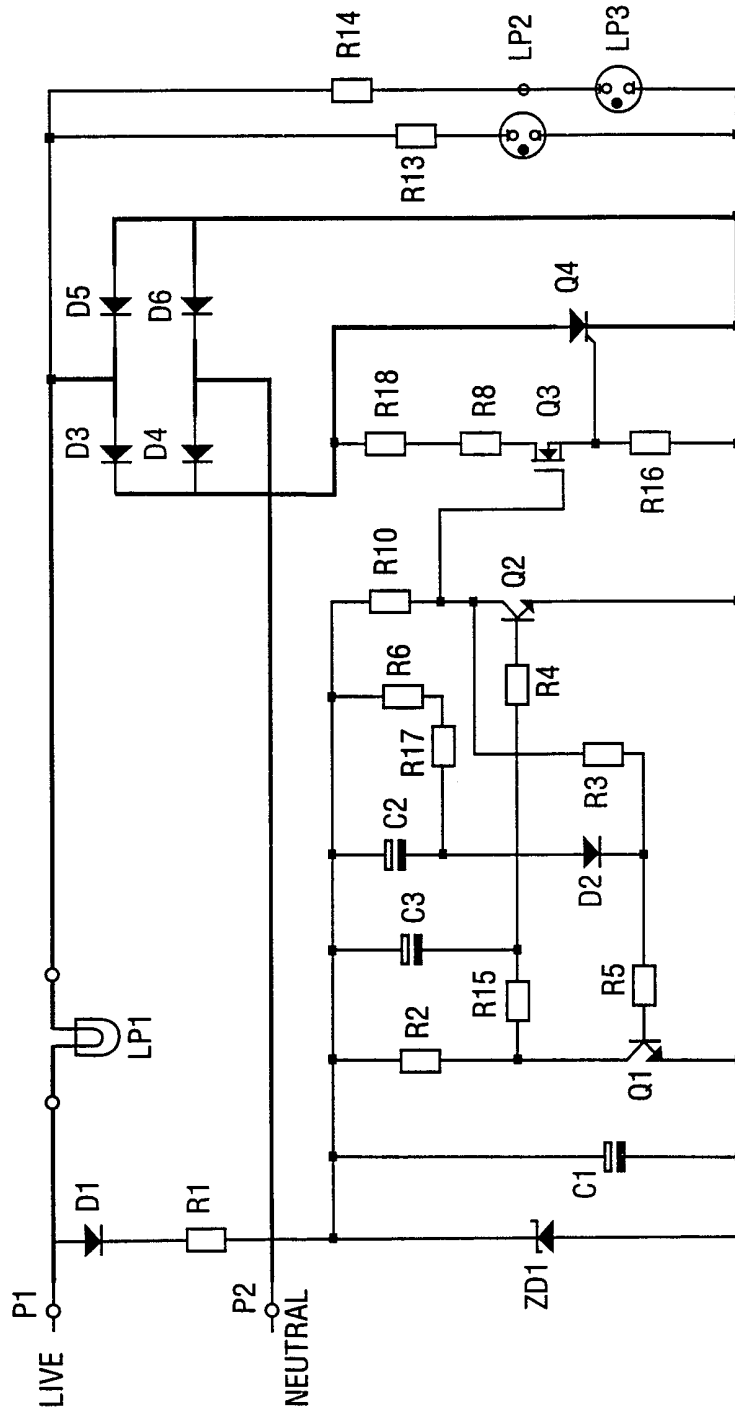


FIG4

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/00562

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 H05B37/02 H05B37/04 F21Q3/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 H05B F21Q H01K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 896 079 A (TABOR JIM) 23 January 1990 see column 3, line 36 - column 6, line 16; figures 1-5 ---	1,2,4,6, 7,9-13
X	US 5 610 448 A (DATILO DONALD P) 11 March 1997 see page 3, line 26 - page 12, line 58; figures 1-8 ---	1,2, 6-10,12, 13
A	US 5 111 105 A (YAMAMOTO TERUAKI) 5 May 1992 see abstract; figure 1 ---	3-5
A	US 5 548 494 A (BLACKMAN STEPHEN B) 20 August 1996 see abstract; figures 1,2 ---	3-5
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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Date of the actual completion of the international search

31 May 1999

Date of mailing of the international search report

09/06/1999

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INTERNATIONAL SEARCH REPORT

Inter nal Application No
PCT/GB 99/00562

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 196 16 066 A (KULLIK GUENTER R J) 30 October 1997 ---	
A	EP 0 488 002 A (HOLZER WALTER) 3 June 1992 ---	
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Information on patent family members

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