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(54) **Device and method for controlling the color of a light source**

(57) A method and a device for controlling the color of a lighting source consisting of a plurality of luminous sources colored differently from one another are described. The device comprises a control circuit having

at least one microprocessor programmed to receive the command from a single button and activate at least the switching on/off functions and those of the variation of the light emitted from the lighting source.

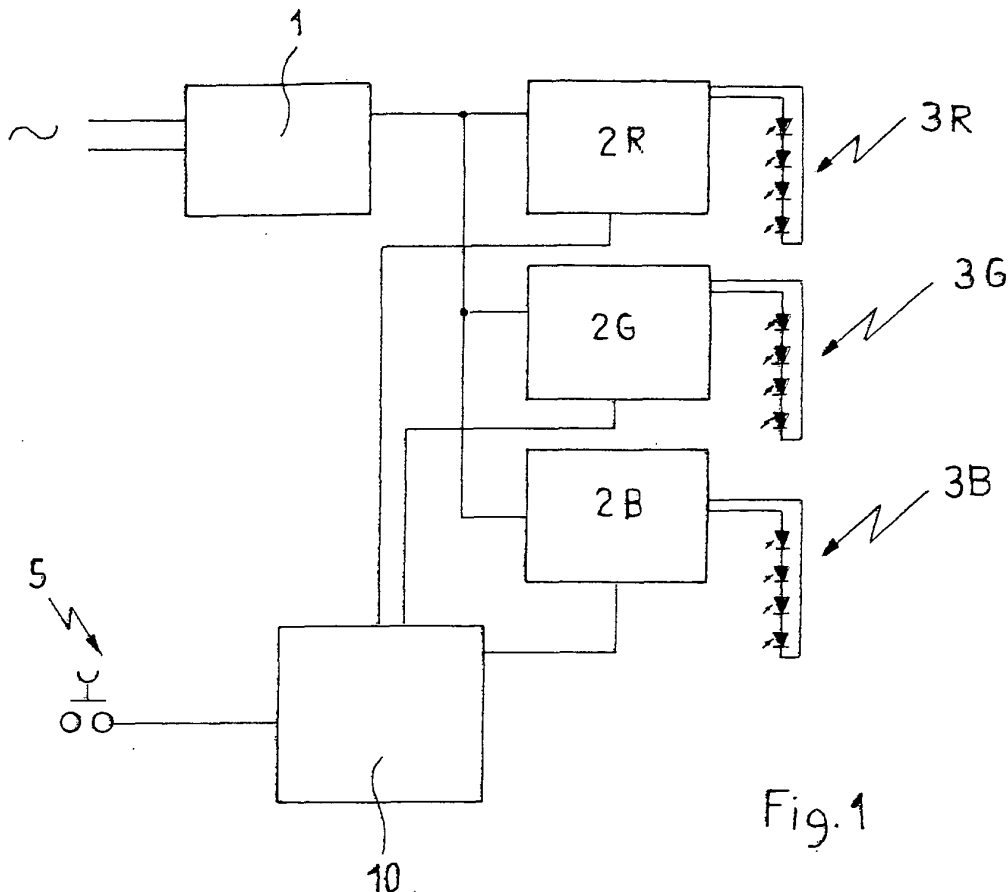


Fig. 1

Description

[0001] The present invention relates to a method and a device for controlling the color of the light emitted by a lighting source consisting of a plurality of luminous sources having different colors from one another.

[0002] The use of at least three colored light sources (such as red, green and blue) is known, and by suitably adjusting the intensity of each of the light sources, infinite chromatic shades can be obtained.

[0003] Prior art control devices use for example circuits commanded by three separate control buttons, one for each primary color. In order to obtain the desired color, formed by the combination of each of the separate light sources, the intensity of the light emission of each of the colored light sources must be varied by acting on each of the respective control buttons.

[0004] One of the main drawbacks of the prior art devices is the difficulty in regulating, as often it is necessary to vary the intensity of emission of each of the light sources several times in order to obtain the desired color. The user should previously know the percentage of intensity of each of the primary colors composing the shade of color desired in order to achieve the result in brief time frames.

[0005] Besides, from a practical point of view, the installation of the electrical systems for these devices requires a large number of wires, and sufficient space to install the three control buttons, which space is often not available in a wallbox.

[0006] In the attempt to overcome the difficulties of use, devices have been proposed on the market provided with further control buttons enabling to activate previously stored shades of color. However this further worsens the above mentioned installation problems.

[0007] Generally, the object of the present invention is to provide a novel device and a novel method for controlling the color of the light emitted by a lighting source enabling to overcome the prior art problems.

[0008] One particular object of the present invention is to provide a control device which is particularly simple to use and a control method which is particularly easy to implement.

[0009] Another particular object of the present invention is to make a control device that is simple and economical from a constructive point of view and that can be easily installed without creating space problems.

[0010] These objects are achieved by the present invention, that relates to a device for controlling the color of a lighting source consisting of a plurality of luminous sources colored in a different way to one another, characterised by comprising a control circuit having at least one microprocessor programmed to receive commands from a single button and thus activate at least the switching on/off functions and those of the variation of the color of the light emitted by the lighting source.

[0011] It is understood that a single control button dedicated to activating all the control functions makes

use of the device by the user particularly simple.

[0012] Besides, the presence of a single control button also offers a considerable advantage from the installation point of view. In fact only two conductors are required for connecting the single button to the control device and the single button is also easier to arrange in a previously installed wallbox.

[0013] In order to control the switching on/off functions and those of the variation of the color of the light emitted from the lighting source using the single button, a control circuit is provided with at least one programmed microprocessor.

[0014] The latter is able to detect the time during which pressure is applied on the control button so as to distinguish a discrete pressure applied on the control button for a brief time, from continuous pressure. In the first case, the lighting source switching on/off functions are activated, whereas in the second case the function of varying the color of the light emitted from the lighting source is activated.

[0015] According to the invention, three outputs of the microprocessor control circuit are provided, which outputs are destined to the control of the lighting source of the red light, green light and blue light respectively. The outputs emit control signals that give a periodic sinusoidal shape to the intensity of the emission of each luminous source, with phase shift that is varied continuously when continuous pressure is applied on the single control button.

[0016] Further characteristics and advantages of the present invention will be more understood by the following description of non-limiting examples with reference to the schematic drawings attached, wherein:

- Figure 1 is a block diagram of a control device according to a possible embodiment of the present invention;
- Figure 2 is a circuit diagram that illustrates in greater detail a part of the device according to the invention; and
- Figure 3 is a diagram that illustrates an example, with a particularly marked phase displacement, the sinusoidal shape in time of the emission of luminous sources.

[0017] In the block diagram in Figure 1 a power block 1 is shown being input with power supply voltage, for example alternating current at 220 V and output a reduced direct current voltage.

[0018] The value of the reduced direct current is selected to power a control circuit 10 and the driving circuits 2R, 2G and 2B of the respective red light 3R, green light 3G and blue light 3B sources. Each of the driving circuits 2R, 2G and 2B comprises an adjustable constant current generator.

[0019] To the control circuit 10 it is connected a single control button 5 through which at least the switching on/off functions can be activated as well as at least those

of the variation of the color of the light emitted from the lighting source consisting of the three luminous sources 3R, 3G and 3B.

[0020] In the embodiment illustrated herein, the luminous sources consist of power LED groups, but it should be noted that the principles of the present invention are also applicable to other luminous emission means, such as, for example, incandescent lamps or the like.

[0021] The circuit diagram of Figure 2 represents in greater detail the control circuit 10 and at least one of the driving circuits (the block 2R of Figure 1) of the red luminous source. The input of the low voltage direct current power supply is indicated by the numerical reference 20.

[0022] Inside the control circuit 10 a microprocessor 11 is provided that is programmed to receive in input the commands from the single button 5, for example by detecting the time during which pressure is applied on the control button 5. As an example of a microprocessor suitable to this use those of the 908Q series distributed by Motorola can be mentioned.

[0023] In the embodiment illustrated herein, the microprocessor 11 in the control circuit 10 comprises three independent outputs, i.e. 12R, 12G and 12B that send the command signals to the respective driving circuits of the light sources.

[0024] As can be seen in the diagram of Figure 2, the control signal at output 12R is input to the driving circuit 2R and, in particular, to an integrated device 21 for power control, such as an LM2594-type integrated device distributed by National Semiconductor. The remainder of the circuiting of the adjustable constant current generator, known per se, is schematically represented in a block 22 from which power supply terminals 30R of the red light source come out.

[0025] The activation of the device according to the present invention by the user is particularly easy and user friendly.

[0026] In order to activate the switching on and off functions it is sufficient to apply a discrete pressure for a brief time on the control button 5. Upon switching off, the microprocessor is advantageously programmed to maintain the setting of the luminous intensity of each of the controlled light sources so that, when subsequently switched on, the lighting is reposed with the same color.

[0027] Another possible function is that of being able to apply continuous pressure on the control button 5 for a preset period in order to take all the light sources back to their maximum intensity, so as to obtain a white light. This can be made by the microprocessor, which is programmed to detect and distinguish the time during which pressure is applied on the control button 5.

[0028] In order to change the color of the light emitted from the luminous source, it is instead sufficient to apply and maintain continuous pressure on the control button 5 until the desired color or, more precisely, the color with the desired shade is achieved. When the pressure on

the button 5 is released, the desired color is maintained.

[0029] The principle of the invention, in order to enable the generation of an infinite number of colors, is based on a calculation algorithm that takes into account certain factors.

[0030] One can consider for example that each of the red, green and blue luminous sources can be generated with 256 different intensity levels. Therefore considering the three base color sources alone, there are 256^3 possible combinations, i.e. some 2,097,000 combinations. Starting from the color white, in which all the other luminous sources start from the maximum intensity level, the time necessary to be able to visualise the all the possible colors would be very long. For this reason, this kind of possibility is in fact impracticable.

[0031] According to the present invention, the microprocessor is instead programmed to be able to achieve the desired color in a short timeframe.

[0032] The operating principle of the microprocessor programming software is illustrated with reference to the diagram in Figure 3, which shows the variation in time of the luminous intensity of each of the sources (sinusoidal curves R, G and B).

[0033] In the initial instant, all the luminous sources have maximum intensity (white light). By holding the control button 5 pressed, the intensity of the three base colors periodically varies with a sinusoidal shape, in the same way as the phase shift between the three sinusoidal curves R, G and B varies continuously. The variation of the phase shift in time has been particularly accentuated for clarity reasons.

[0034] It is exactly the continuous variation of the phase shift that enables to continuously modify the blending of the colors thus reposing at each cycle, with a duration of just a few seconds, different shades of the same sequence of colors.

[0035] In other words, by holding the control button 5 pressed, the device generates for example the sequence of red, violet, blue, light blue, green, orange, etc, in a short time; by holding the button 5 pressed, the sequence of colors is repeated but with different shades, and so on every time the cycle repeats. This change of shade allows to generate for example a green color with different shades at each cycle.

[0036] As the cycles repeat very quickly, the user does not have to wait for long before seeing a color similar to that desired appear and, by awaiting the subsequent cycles, he will be able to see appear all the hues or shades of the same color.

[0037] Thanks to the continuous variation of the phase shift between the three sinusoidal functions of the luminous intensities, one has the guarantee that the colors repeat cyclically in a particularly rapid way, thus presenting however a different shade at each cycle.

[0038] Various modifications can be made without departing from the scope of protection of the present invention. For example, the number of the luminous sources that can be controlled by the device according

to the invention may also be different from the three base ones represented herein as an example. In the same way, in the place of the colors herein represented, that is red, green and blue, luminous sources with different colors may also be selected.

Claims

1. A device for controlling the color of a lighting source consisting of a plurality of luminous sources colored in a different way to one another, **characterised by** comprising a control circuit having at least one microprocessor programmed to receive the commands from a single button and to activate at least the switching on/off functions and those of the variation of the color of the light emitted by lighting source. 10
2. A device according to claim 1, wherein said control circuit comprises a number of independent control outputs equal to the number of luminous sources to be controlled. 20
3. A device according to claim 1, wherein each of the independent outputs of said control circuit is connected to a driving circuit comprising an adjustable constant current generator for powering a respective one of said luminous source. 25
4. A device according to claim 1, wherein said control circuit comprises at least three independent outputs for controlling at least one red light sources, at least one green light source and at least one blue light source. 30
5. A device according to claim 1, wherein said luminous sources consist of groups of power LEDs. 35
6. A method for controlling the color of a lighting source consisting of a plurality luminous sources colored in a different way to one another, **characterised by** providing at least the control of the switching on/off functions and those of the variation of the color of the light emitted by said lighting source by a single control button connected to a control circuit provided with at least one programmed microprocessor. 40
7. A method according to claim 6, wherein said microprocessor is programmed at least to detect the time during which pressure is applied on said control button. 45
8. A method according to claim 6, wherein said microprocessor is programmed to activate the switching on/off functions of said lighting source following a discrete pressure applied for a brief time on said control button. 50
9. A method according to claim 6, wherein said microprocessor is programmed to activate the function of variation of the color of the light emitted by said lighting source following continuous pressure applied on said control button. 55
10. A method according to claim 6, wherein said control circuit comprises a number of independent control outputs equal to the number of luminous sources to be controlled.
11. A method according to claim 6, wherein the luminous intensity of each of the light sources is varied according to periodic curves with sinusoidal shapes, and wherein the phase shift between said periodic sinusoidal curves is varied in a continuous way when continuous pressure is applied on said single control button.

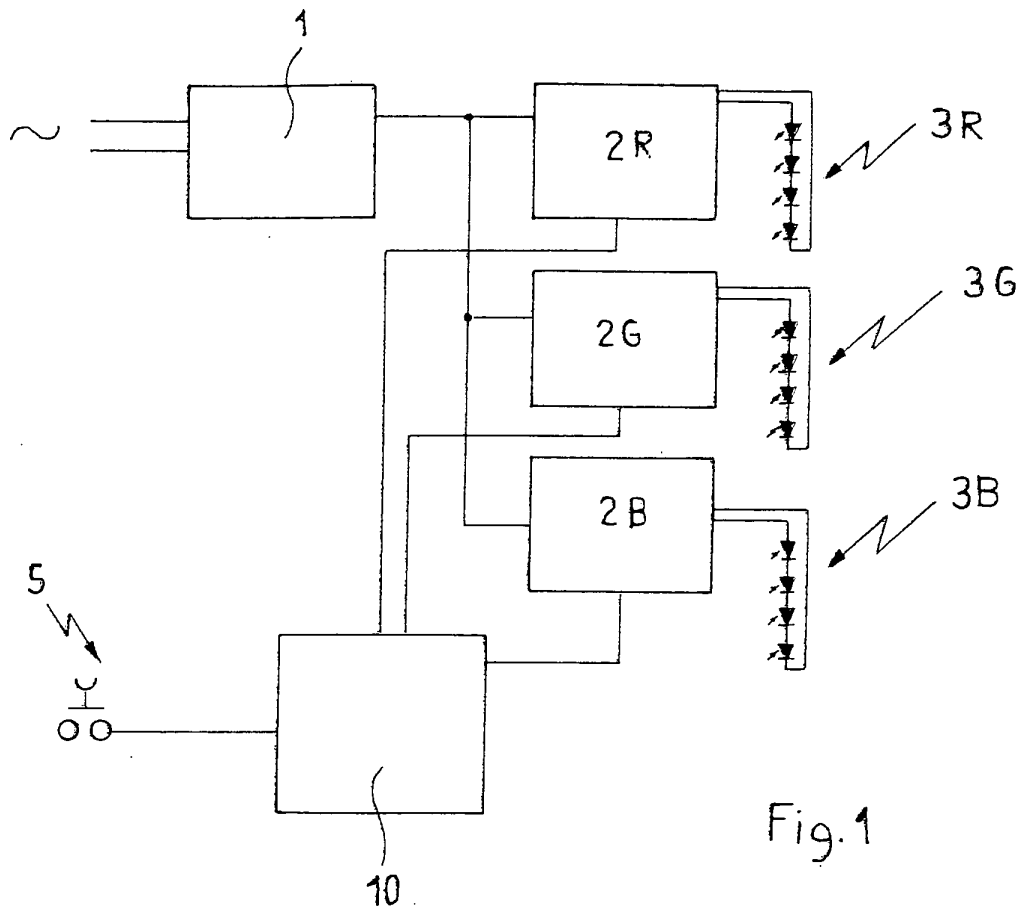


Fig. 1

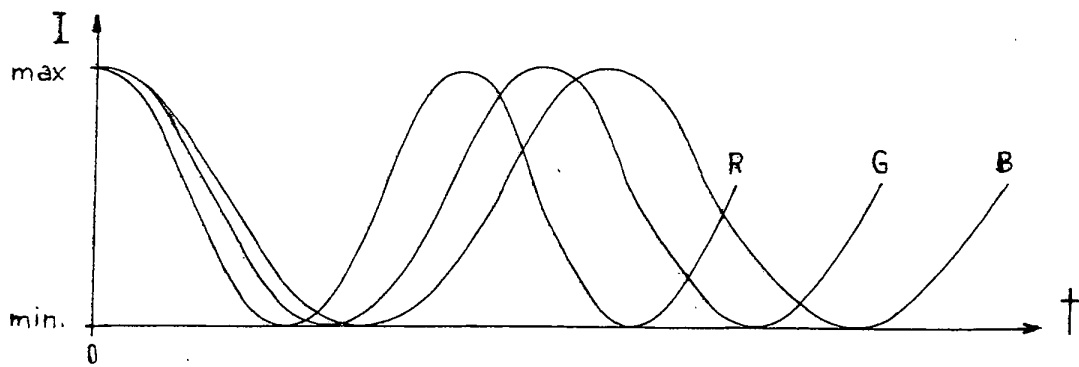


Fig. 3

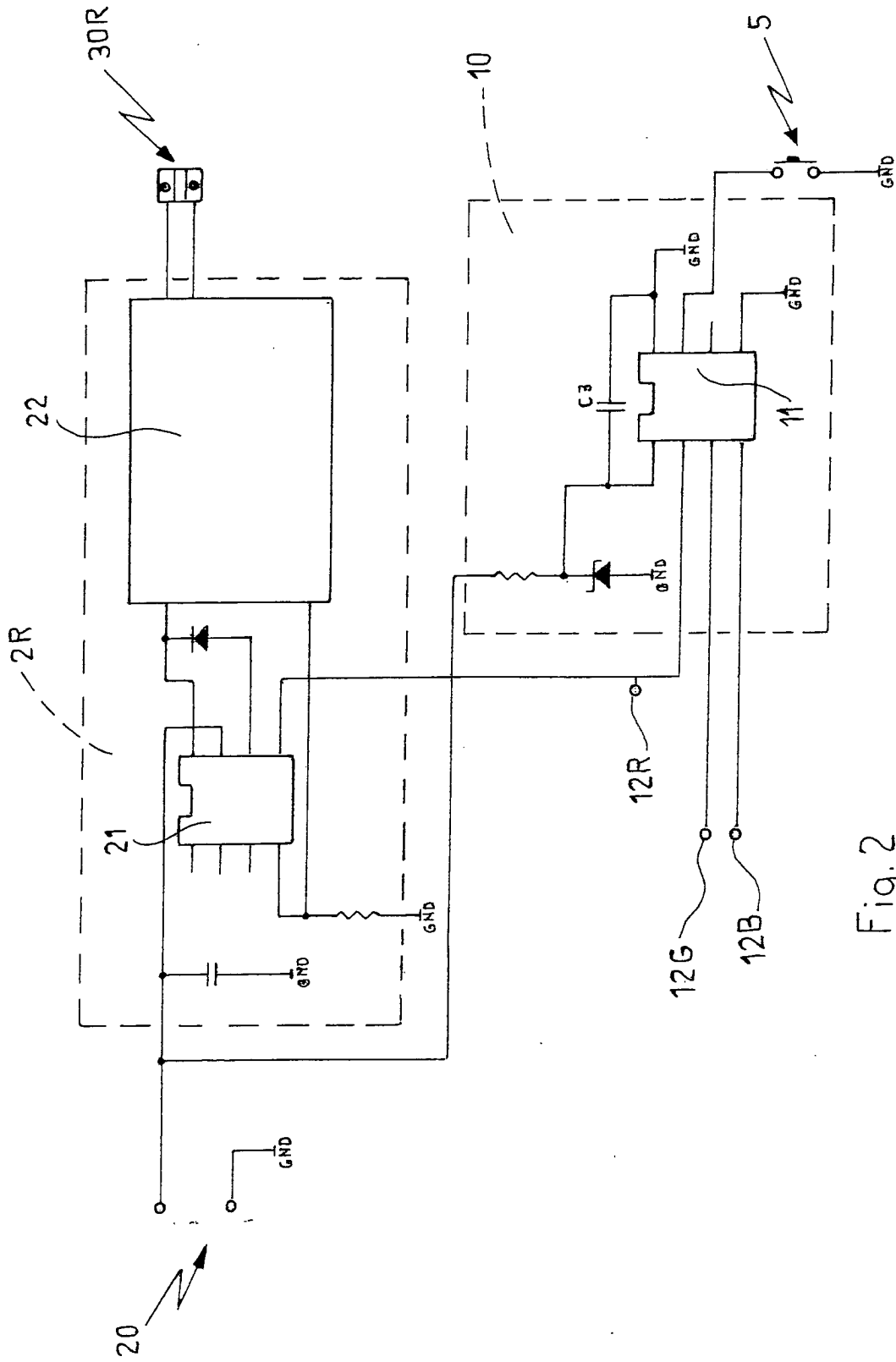


Fig. 2



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A	* page 12, line 4 - line 11 * -----	11	
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
			H04N H05B
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 2 March 2005	Examiner Pigniez, T
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

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ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.

EP 04 00 5538

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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